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 I & II

OITHONIDÆ, CYCLOPINIDÆ, CYCLOPIDÆ (part).

WITH 16 AUTOTYPIC PLATES



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INTRODUCTION.

Under the head *Cyclopoida* I comprise a number of Copepoda, which on the whole may be said to be built upon the type of our common fresh-water fleas (Cyclops), though exhibiting many modifications, both as to their general appearance and to their habits, the latter affecting chiefly the structure of the oral parts. The present group, or sub-order, exhibits some relations both to the *Calanoida* and to the *Harpacticoida*, and also shows a certain approach to some of the other sub-orders distinguished by the present author, especially to the *Notodelphyoida* and the *Caligoida*, though the Cyclopoid type may always be easily recognisable. Whereas the extensive group *Harpacticoida* by earlier authors has generally been comprised within a single family, the *Harpacticidæ*, several families referable to the present sub-order were established very early, though their real connexion under a common type has not been recognised.

According to the system proposed by Dr. Giesbrecht, the *Cyclopoida*, like the *Harpacticoida*, should be included in the 2nd of his 2 primary divisions, the so-called *Podoplea*. This very extensive and heterogeneous group has been divided by that author into 2 sections, *Isokerandria* and *Ampharthrandria*, according to the non-prehensile or prehensile character of the anterior antennæ in the male, each section comprising several families, which have been enumerated in his recent work on the family *Asterocheridæ*, p. 57. I am, however, by no means prepared to adopt this classification, which appears to me quite artificial, like the primary grouping of the Copepoda into *Gymnoplea* and *Podoplea*. In the sense here adopted, the sub-order *Cyclopoida* comprises families referred by Dr. Giesbrecht partly to the *Isokerandria* and partly to the *Ampharthrandria*, whereas other families included by that author in the latter section are wholly removed as types of distinct sub-orders. One of these, the *Harpacticoida*, has been treated of in the preceding volume, the 4 remaining sub-orders, *Notodelphyoida*, *Monstrilloida*, *Caligoida* and *Lernæoida*, being reserved for the succeeding volumes of the present work.

As mentioned above, the habits of the *Cyclopoida* are much more varied than is the case with the *Calanoida* and *Harpacticoida*. Some of them, for instance the species of the genus *Oithona*, are true pelagic animals, constituting a chief part of the plankton in almost all regions of the Oceans. Several other forms, like the *Harpacticoida*, live near the shores among algæ or on a muddy bottom at different depths, and a great number of forms lead a more or less pronounced parasitic existence, attacking different invertebrate animals, in some instances also fishes. In most cases, however, the parasitism may be said to be merely temporary, though there are also a few examples of a more permanent parasitism, for instance in the case of *Ergasilus* and *Nicothoë*. The different mode and degree of parasitism has a great influence on the structure of the oral parts, and indeed we have in this feature a good guide for an exact subdivision of this group of Copepoda. The parasitic forms exhibit, as regards the structure of the oral parts, 2 well-marked types, both again differing conspicuously from the non-parasitic forms. We may accordingly divide the Cyclopoida into 3 natural sections, for which I propose to retain the well-known names: *gnathostoma, siphonostoma* and *poecilostoma*. These names were first proposed by Thorell, but were taken in a much wider sense, viz., to divide the entire order Copepoda. I here restrict them to the group of Copepoda which will be treated of in the present volume.

As to the general characters distinguishing this group, the external appearance of the body, as a rule, looks rather different from that found in the typical *Harpacticoida* by the very sharp demarcation of the 2 chief divisions of the body, the anterior one being more or less tumefied, the posterior very narrow. So far the Cyclopoida more resemble the *Calanoida* than the Harpacticoida, though they are easily distinguished from them by the very moveable articulation between the last 2 trunk-segments, the posterior of which, as a rule, is very small and firmly connected with the genital segment, so that, at first sight, it has the appearance of belonging more properly to the posterior than to the anterior division of the body.

The anterior antennæ are, as a rule, more elongated than in the Harpacticoida and are composed of a greater number of articulations. There are, however, also some instances of a more or less great reduction of these limbs, both in size and in the number of joints.

The posterior antennæ are generally simple, without any outer ramus or exopodite. Only in a few of the parasitic forms is there a slight rudiment of such a ramus. In several of the poecilostomous Cyclopoida these antennæ are transformed into powerful prehensile organs.

The oral parts, as mentioned above, are of very different structure in the 3 sections of Cyclopoida.

The natatory legs are, as a rule, shorter and stouter than in the Harpacticoida, with the basal part broad and flattened and the rami generally well developed and subequal in size. The 1st pair are smaller than the succeeding ones and never prehensile. In a few of the parasitic forms, for instance *Cancerilla*, a considerable reduction of the natatory legs is found to have taken place, at least in the female.

The last pair of legs are always very small and simple in structure, being in most cases exactly alike in the two sexes.

The ova are carried in 2 ovisacs, which are lateral or even subdorsal, never, as in the Harpacticoida, ventral. Only in one instance, viz., in our indigenous species of *Corycæus*, have I found only a single ovisac, which, however, is attached quite dorsally.

The Cyclopoida are well represented also in fresh water by numerous species of the genus *Cyclops* and allied forms, and some of the parasitic forms, for instance *Ergasilus*, are also true fresh-water animals.

Section 1. Gnathostoma.

General Characters.—Anterior antennæ in male distinctly hinged. Posterior antennæ without any outer ramus, and carrying on the tip a number of curved setæ. Oral parts adapted for mastication. Masticatory parts of mandibles and maxillæ strongly dentate. Maxillipeds not subchelate; the posterior ones smaller than the anterior, and of the same appearance in the two sexes. Natatory legs well developed, with both rami generally 3-articulate.

Remarks.—The several forms belonging to this section have generally been combined within a single family, the *Cyclopidæ*. It is, however, very easy to distinguish at least 3 well-defined families of gnathostomous Cyclopoida. All these 3 families are represented in the fauna of Norway, and will be shortly characterised below.

Fam. 1. Oithonidæ.

Characters.—Body slender and of a very delicate structure, with thin and pellucid integuments. Anterior antennæ in female very slender and provided with long diverging setæ; those in male much more robust and distinctly geniculate. Posterior antennæ comparatively small, with the number of joints reduced. Oral parts well developed, and rather different in structure from those in other Cyclopoida, being partly armed with claw-like spines. Natatory legs with comparatively slender 3-articulate rami edged with unusually long setæ. Last pair of legs rudimentary and partly confluent with the corresponding segment. Caudal rami differing in shape and armature in the two sexes.

Remarks.—This family is founded upon the genus *Oithona* Baird, which in several respects differs rather conspicuously from the other genera included in the present section, and may accordingly be entitled to constitute the type of a distinct group. We do not know as yet any other genus referable to this family. The genus *Mormonilla* of Giesbrecht, it is true, exhibits some resemblance to Oithona in the general appearance of the body as also in the structure of the anterior antennæ; but the posterior antennæ are very different and built wholly on the type of the *Calanoida*. The systematic position of this genus is still very doubtful, though it perhaps may be found to be nearest related to the Cyclopoida. In this case it must be regarded as the type of a very anomalous family of the gnathostomous Cyclopoida.

Gen. 1. Oithona, Baird, 1843.

Syn: Scribella, Dana.

Generic Characters.—Body slender and attenuated, with the anterior division only slightly dilated, the posterior very narrow, linear in form. Head defined from the 1st pedigerous segment by a well-marked suture, and generally produced in front to a sharply-pointed rostrum, wanting, however, in male. Anterior antennæ long and slender, scarcely tapered distally, and composed of a limited number of joints, some of which are imperfectly defined. Posterior antennæ abruptly bent in the middle, and apparently only consisting of 2 joints, the 1st carrying about in the middle behind a short seta arising from a knob-like prominence. Mandibular palp with the basal part greatly produced, pediform, terminating in 2 claw-like spines, inner ramus represented by a very small seti-

ferous appendage attached outside the basal part at some distance from its end, outer ramus well developed and abruptly reflexed, being composed of 3—4 joints carrying long plumose setæ. Maxillæ with the masticatory lobe well defined and carrying a number of sharp claw-like spines accompanied inside by a thick setiform appendage, palp lamellar, with the outer distal lobe very small, proximal lobe well developed, recurved, and provided at the tip with long plumose setæ[1]). Both pairs of maxillipeds slender and elongated, the anterior ones 5-articulate, the posterior ones 4-articulate, both carrying long anteriorly-curving spines. Natatory legs with no distinctly developed seta inside the 1st joint of the outer ramus, apical spine of this ramus very slender and serrate outside, spines of outer edge more perfectly developed in male than in female. Last pair of legs represented by a small conical joint terminating in a long seta; another similar seta issuing from a knob-like prominence on each side of the segment itself, seems to answer to that arising from the basal joint of these legs in other Cyclopoida. Caudal rami in female strongly divergent, with the 2 middle apical setæ much elongated and crossing each other at the base; those in male of quite normal appearance.

Remarks.—The present genus was established in the year 1843 by Baird, to include a species, *O. plumifera*, taken in the tropical part of the Atlantic. Another genus with the same name has been established by Alder and Hancock for a nudibranchiate Mollusc; but as this genus is of younger date than that of Baird, its name must be changed. The genus *Scribella* of Dana is identical with that of Baird, and likewise of later date. Several species of this genus have in recent times been described from different parts of the Oceans. Thus Dr. Giesbrecht records no less than 8 species, and some additional species have been named by other authors. There is, however, still considerable confusion about the right identification of some of these species, partly owing to their close relation and partly to the difficulty which is connected with an exact anatomical examination of such delicate and fragile animals. One of the species described by Dr. Giesbrecht, *O. nana*, seems in some respects to differ more conspicuously from the others, and may perhaps be regarded as the type of a separate, though nearly allied genus, for which the name *Oithonina* may be proposed. To the fauna of Norway belong 2 well-defined species, to be described below.

[1]) I have formerly described these 2 lobes as the *exopodal* and *epipodal* lobes, but find that these names cannot properly be retained, since they unquestionably, as is clearly seen in the present genus, answer to the inner and outer rami of the mandibular palp. As, however, both these lobes are always attached outside the palp, I find it more appropriate to give them the indifferent names of *proximal* and *distal* outer lobes.

1. Oithona spinirostris, Claus.

(Pl. I & II).

Oithona spinirostris, Claus, Die freilebenden Copepoden, p. 105, Pl. XI, figs. 4—9.

Syn: *Oithona challengeri*, Thompson.
„ *plumifera*, Scott, (not Baird).
„ *atlantica*, Farran.

Specific Characters.—Female. Body exceedingly slender, with the anterior division narrow fusiform in shape, the greatest width scarcely exceeding $^1/_3$ of the length and occurring somewhat in front of the middle. No conspicuous plumes present laterally. Rostrum strong, spiniform, and only very slightly curved, so as to be visible in the dorsal aspect of the animal. Tail not much shorter than the anterior division and very narrow; genital segment about the length of the 2 succeeding segments combined, and conspicuously dilated in its anterior part. Caudal rami nearly as long as the anal segment and rather divergent, seta of outer edge attached close to the base, the 2 middle apical setæ almost twice the length of the tail. Eye narrow linear in form and of a deep red colour. Anterior antennæ very slender and elongated, reaching, when reflexed, to the end of the 2nd caudal segment, and composed of about 12 more or less distinctly defined joints of rather unequal length and carrying scattered exceedingly long setæ pointing in different directions. 1st pair of natatory legs with the inner ramus distinctly 3-articulate, all joints of outer ramus spiniferous outside. 2nd and 3rd pair with no spine outside the middle joint of the outer ramus, terminal joint of this ramus, as in the 1st pair, with 2 spines outside. 4th pair with no spines outside the first 2 joints of the outer ramus and with only a single setiform spine outside the terminal joint. Ovisacs narrow oblong in form and greatly divergent, in some cases extending nearly at right angles to the axis of the body, each sac containing only a limited number of very pellucid ova, generally arranged in a double row.

Male much smaller than female and of a rather different appearance, the body being comparatively less slender, with the front obtusely truncate and wanting any trace of a rostrum. Tail distinctly 5-articulate, with the 1st or genital segment greatly swollen, to receive the 2 spermatophores. Caudal rami shorter than the anal segment and not at all divergent, apical setæ much shorter than in female and of quite normal appearance. Anterior antennæ scarcely longer than the anterior division of the body and exhibiting the usual geniculation; middle section only slightly tumefied, terminal one biarticulate. Natatory legs with all the joints of the outer ramus spiniferous outside, 3 such spines being

present on the terminal joint in the 2nd and 3rd pairs. Setæ of last pair of legs much shorter than in female.

Body in both sexes highly pellucid and nearly colourless, though in adult females generally a light orange pigment is seen clothing the oral area and partly also the sides of the head. A large oil-bubble is often found within the posterior part of the trunk, and 2 smaller ones at the limit between the head and the 1st pedigerous segment.

Length of adult female 1.35 mm., of male 0.82 mm.

Remarks.—I regard it as beyond all doubt that the above-described form is that originally recorded by Claus under the name *Oithona spinirostris*. It has generally been confounded with the very nearly allied species described by Baird as *O. plumifera*, from which, however, it is at once distinguished by the absence of the very conspicuous brightly-coloured plumes projecting in the latter at each side of the trunk, and from which indeed the specific name *plumifera* has been derived. These plumes in reality belong to the natatory legs, and are formed by the setæ attached outside the 2nd basal joint of the legs, which in the said species are richly plumose, whereas in the form here under consideration they ars simple and do not even project laterally. In addition to this distinguishing character, Mr. Farran has recently pointed out some minute differences in the structure of the oral parts between these two forms, which accordingly must be regarded as distinct, though closely-allied species. Mr. Farran has proposed a new specific name for the present species, viz., *atlantica*. but I think that his doubt about the identity of Claus' species with the one here under question cannot properly be approved.

Occurrence.—I have observed this form in many different places on the Norwegian coast, at least up to the Trondhjem Fjord. It is, however, not nearly so common as the next species, and seems more properly to be an inhabitant of the open sea, from which it is only occasionally brought in by the currents to the shores and fjords.

When kept living in a vessel with fresh sea-water, the specimens are always found freely suspended in the water, more generally in an erect attitude, with the anterior antennæ and the caudal setæ spread to each side, these parts apparently serving as a very effective balancing apparatus. In this attitude the animal often rests for long time nearly immobile, only now and then, by the action of the natatory legs, making a short bound to change its place. To judge from the structure of the oral parts, the animal must be of a very rapacious nature, probably feeding upon other small pelagic animals. These may at first be seized by the slender maxillipeds and by them thrown in against the

other oral parts, the structure of which indeed seems to be more adapted for killing than for masticating the prey.

Distribution.—As this form has generally been confounded with *O. plumifera*, its true distribution is as yet rather difficult to determine. In all probability it has a similar wide range in the Oceans to that of the next species. With full certainty it may be said to be distributed all over the North Atlantic, as also in the Mediterranean.

2. Oithona helgolandica, Claus.

(Pl. III).

Oithona helgolandica, Claus, Die freilebenden Copepoden, p. 105, Pl. XI, figs. 10—12.

Syn: *Oithona spinifrons*, Boeck.
„ *pygmæa*, Boeck.
„ *similis*, Claus.
„ *spinirostris*, Giesbrecht (not Claus).

Specific Characters.—Female. Body of the usual slender form, though somewhat less so than in the preceding species. Rostrum, as in that species, acutely pointed, but abruptly bent downwards at a right angle to the axis of the body, so as not to be visible in the dorsal aspect of the animal. Genital segment somewhat less dilated in its anterior part. Caudal rami not nearly attaining the length of the anal segment, and less divergent than in *O. spinirostris*, seta of outer edge shorter. Anterior antennæ, when reflexed, extending scarcely beyond the anterior division of the body, and composed of about 10 joints, some of which, however, are only faintly defined. Posterior antennæ and oral parts agreeing in structure with those in the preceding species. Natatory legs, however, exhibiting some characteristic differences: 1st pair with the outer ramus armed in a manner similar to that in *O. spinirostris*, except that the apical spine is less strong and almost setiform; inner ramus apparently only biarticulate, the 2 outer joints being confluent. 2nd and 3rd pairs with no spine outside the middle joint of the outer ramus, though exhibiting at the end of the joint a small dentiform projection of the margin. 4th pair without any spines either on the 1st or 2nd joints. Terminal joint of this ramus in all 3 pairs with only a single small spine outside, attached close to the end, and exhibiting moreover in the 2nd and 3rd pairs a very small dentiform prominence of the margin at about the middle of the joint Ovisacs narrow oblong and closely appressed to the sides of the tail, each sac containing only a single series of very large and pellucid ova.

Male closely resembling that of the preceding species, but of smaller size, and moreover differing somewhat in the armature of the natatory legs, the terminal joint of the outer ramus having only 2 spines outside.

Body in both sexes extremely pellucid, without any obvious pigment.

Length of adult female 0.70—0.90 mm.; of male 0.50—0.60 mm.

Remarks.—There cannot in my opinion be any doubt, that the form at first recorded by Claus as *O. helgolandica* is the present species. It has subsequently been redescribed by the same author from Mediterranean specimens, but under another specific name, viz., *similis*, and this name has been applied to the present species by most authors. According to the rules of priority, however, the first name under which a species has been recorded should in every case be retained. The 2 forms named by Boeck *O. spinifrons* and *O. pygmæa* are undoubtedly both referable to the present species, and this is also the case with the form described by Dr. Giesbrecht from the bay of Kiel as *O. spinirostris*. The present species is easily distinguishable from the preceding one by the rather different form of the rostrum, the less elongated anterior antennæ, and the very different manner in which the ovisacs are borne by the female. Also in the structure of the natatory legs some well-marked differences are found to exist, as shown in the above diagnosis.

Occurrence.—This form occurs very abundantly along the whole coast of Norway, both on the outer shores and in the fjords. In the Christiania Fjord I have often taken it in great numbers even close to the beach of the innermost shallow creeks. As with the preceding species, male specimens are much scarcer than females, and seem only to appear in certain seasons.

Distribution.—The distribution of this species seems to be very extensive. It has been noted as far north as in Mosel Bay, Spitsbergen, and southwards in the Mediterranean, off the Canary Islands, and even in the Indian Ocean. I have myself examined specimens taken off the coast of New Zealand, and have carefully compared them with northern specimens, without having been able to detect any difference whatever.

Fam. 2. Cyclopinidæ.

Characters.—Body of somewhat varying shape, but never so slender as in the *Oithonidæ*, the anterior division being, as a rule, considerably dilated. Head in most cases confluent with the 1st trunk-segment; rostral projection short and generally bent in against the ventral face. Anterior antennæ less elongated than in the Oithonidæ, tapered, and clothed with moderately long setæ; those in male strongly hinged. Posterior antennæ generally composed of 4 joints. Oral

parts well developed and on the whole built on the same type as in the *Calanoida*. Natatory legs comparatively short and stout, with both rami 3-articulate and subequal in length. Last pair of legs generally extended laterally and composed of 1—3 joints.

Remarks.—The type of this family is the genus *Cyclopina* of Claus, which has generally been considered as closely allied to *Cyclops*, but which in reality differs very essentially in the structure of the oral parts, which much more resembles that found in the *Calanoida*. 4 different genera referable to this family will be described in the sequel.

Gen. 2. **Cyclopina**, Claus 1863.

Generic Characters.—General form of body much resembling that in the genus *Cyclops*. Anterior antennæ more or less elongated and composed of a somewhat varying number of articulations; posterior antennæ distinctly 4-articulate. Mandibles with the cutting edge divided into a number of sharp claw-like denticles, palp comparatively large, biramous, inner ramus well developed, biarticulate, outer generally multiarticulate. Maxillæ with the masticatory lobe well defined and armed with several claw-like spines, palp lamellar, with both outer appendages sharply defined and carrying long plumose setæ. Anterior maxillipeds rather stout, with the 2nd basal joint clawed, and the terminal part well developed, consisting of 3 joints. Posterior maxillipeds more slender, with the terminal part generally divided into 3 or 4 setiferous joints. Natatory legs of normal structure. Last pair of legs extended laterally, and composed of 2 or 3 joints, none of which are lamellar.

Remarks.—This genus was established in the year 1863 by Claus, to include a species, *C. gracilis*, found by him at Messina. The genus is chiefly characterised by the Cyclops-like form of the body, and by the very full development of the mandibular and maxillary palps, which strongly recalls that in the *Calanoida*. Several species have been recorded by different authors; but some of these have turned out to be referable to other genera, not even belonging to the present family. In the succeeding pages 4 different species of this genus, belonging to the fauna of Norway, will be described, and I am much disposed to believe that their number will be considerably increased by a closer study of our Copepod-fauna. For instance, many years ago, off the Lofoten islands, I observed 2 peculiar forms, the one distinguished by the excessive prolongation of the

caudal rami, the other by the strong development of the spines on the legs. The specimens of these 2 forms, which I had noted with the provisory names, *C. longifurca* and *C. euacantha*, have, however, unfortunately been lost, and I am thus unable to give any closer description of them here. A small species of this genus has also been described by me from the Chatham Islands under the name of *C. pusilla*, and another species has recently been recorded by Th. Scott as *C. longicaudata*.

3. Cyclopina gracilis, Claus.

(Pl. IV).

Cyclopina gracilis, Claus, Die freilebenden Copepoden, p. 104, Pl. X, figs. 9—15.

Syn: *Cyclopina norvegica*, Boeck.
Cyclops salinus, Brady.

Specific Characters.—Female. Body moderately slender, with the anterior division oval in form, greatest width exceeding half the length and occurring about in the middle. Tail rather slender, with the genital segment about the length of the other 3 combined and gradually narrowed behind. Caudal rami of somewhat varying length, though scarcely longer than the last 2 segments combined, sublinear in form and only slightly diverging, seta of outer edge placed in front of the middle; apical setæ of moderate length, the inner medial one being, as usual, the longest and about equal to the tail in length; seta of inner corner scarcely longer than that of the outer. Anterior antennæ not much elongated, being considerably shorter than the cephalic segment, and composed of 10 joints, the 6th of which is much the longest and about equal in length to the 4 succeeding ones combined. Posterior antennæ with the last joint scarcely as long as the 2nd. Natatory legs with the spines outside the outer ramus of moderate size, 3 such spines being present on the terminal joint, except in 4th pair, where only 2 spines occur outside the apical spine. Last pair of legs biarticulate, proximal joint comparatively broad and finely ciliated inside, carrying outside the usual slender bristle, distal joint shorter and narrower than the proximal one, subquadrangular in form, and armed on the obtusely truncated extremity with 2 somewhat unequal lanceolate spines, between which a slender bristle is attached. Ovisacs of moderate size, oval in form, and carried closely appressed to the sides of the tail.

Male of much smaller size than female, and easily distinguished by the strongly hinged anterior antennæ and the distinctly 5-articulate tail, the 1st (genital) segment of which is considerably dilated. Last pair of legs of exactly the same appearance as in the female.

Body in both sexes of a whitish grey colour, with a faint yellow tinge. Length of adult female 0.43—0.57 mm.

Remarks.—This form was rather imperfectly described by Claus from Mediterranean specimens, and has subsequently been observed by other authors in different places of the northern Ocean. The form recorded by Boeck as *C. norvegica* can scarcely be regarded as specifically distinct, though it represents a strictly littoral variety, with the caudal rami comparatively shorter than in the typical form. Dr. Giesbrecht has also called attention to the variation in this respect both in the present and next species. The *Cyclops salinus* of Brady is unquestionably the present species, and belongs to its variety *norvegica*, Boeck. The specific name *gracilis* proposed by Claus for the present species, is somewhat inappropriate, since in reality this species is of less slender form of body than most of the other known species.

Occurrence.—I have taken this form in several places on the Norwegian coast, from the Christiania Fjord at least up to the Trondhjem Fjord. It is a strictly littoral form, being found close to the shore among algæ and scarcely ever, like the next species, at any considerable depth. The variety *norvegica* occurs rather frequently in shallow creeks and in pools left by the tide, both on the southern and western coasts.

Distribution.—British Isles (Brady), coast of France (Canu), bay of Kiel (Giesbrecht), Franz Josef Land (Scott), Polar Islands north of Grinnel Land (2nd Fram Expedition), Mediterranean (Claus), Black Sea (Czerniawsky).

4. Cyclopina longicornis, Boeck.

(Pl. V).

Cyclopina longicornis, Boeck, Nye Slægter og Arter af Saltvandscopepoder. Chr. Vid. Selsk. Forhandl. 1872, p. 41.

Syn: *Cyclopina littoralis*, Brady.

Specific Characters.—Female. Body comparatively more slender than in the preceding species, with the anterior division oblong oval in form, greatest width about equalling half the length and occurring in the middle, cephalic segment gradually tapered anteriorly, with the front narrowly rounded. Tail very slender, almost equalling in length the anterior division, genital segment sligthly dilated in front and shorter than the 3 succeeding segments combined. Caudal rami long and narrow, being generally longer than the 2 preceding segments combined, seta of outer edge rather slender and attached a little in front of the middle; apical setæ very unequal, the inner medial one equal to the whole tail in length and fully twice as long as the outer, seta of outer corner scarcely half as long

as the inner. Anterior antennæ much more elongated than in the preceding species, about equalling in length the cephalic segment, and composed of 18 well defined joints, 3rd joint much the largest, 6th joint exhibiting a slight indication to be subdivided into 3 joints. Posterior antennæ with the terminal joint fully as long as the 2 preceding joints combined. Natatory legs with the seta attached inside the 1st joint of the inner ramus remarkably strong, especially in the 2 posterior pairs; terminal joint of outer ramus in 4th pair with only a single spine outside, the distal spine being replaced by a thin bristle abruptly bent inwards. Last pair of legs of comparatively feeble structure, and composed each of 3 joints, the first 2 somewhat lamellar and finely ciliated inside, middle joint carrying outside the usual bristle, last joint comparatively small, and provided with 4 slender ciliated setæ, the innermost of which is the shortest. Ovisacs of moderate size and slightly divergent.

Male, as usual, smaller than female, and easily recognizable by the strongly hinged anterior antennæ. Last pair of legs differing from those in female in being 4-articulate, the last joint being subdivided into 2 well defined joints, the proximal of which carries on each side a seta, whereas the distal joint has 4 setæ on the tip.

Body semipellucid, with scattered opaque patches of a whitish or yellow colour, in some cases, moreover, exhibiting a fine rosy tinge on several parts of the body, as also partly on the anterior antennæ.

Length of adult female 0.70—0.90 mm.

Remarks.—This form has generally been recorded under the specific name *littoralis* proposed by Brady. As, however, the name *longicornis*, assigned to this species by Boeck, dates from the very same year, and is a much more adequate name, I have found it suitable to prefer that name to the one proposed by Brady. For the present species cannot in reality be said to be, like the preceding one, a strictly littoral form, as it more generally occurs in greater depths and is only quite occasionally met with in the littoral region. I have found that such specimens are of smaller size and have the caudal rami less elongated than in the typical form, thus more properly constituting a particular variety, for which the name *littoralis* may be retained.

The present species is easily distinguished from the preceding one by the more slender form of the body, the much more elongated anterior antennæ, and the somewhat different shape of the caudal rami. In the structural details also some well-marked differences are found, especially as regards the structure of the last pair of legs.

Occurrence.—I have found this form rather frequently in many places of

the Norwegian coast, from the Christiania Fjord at least up to the Trondhjem Fjord. It is generally met with in depths ranging from 10 to 60 fathoms, especially where the bottom consists of coarse sand; much more seldom it is found in shallower water among algæ. Like the other species of the present genus, it is a true bottom-form, keeping constantly close to the ground. When disturbed, it darts away with great rapidity, to settle again very soon in another place. I have never seen it moving freely for any length of time in the water.

Distribution.—British Isles (Brady), Cuxhaven (Timm), Mediterranean (Giesbrecht), Polar Islands north of Grinnel Land (2nd Fram Exped.).

5. Cyclopina brevifurca, G. O. Sars, n. sp.
(Pl. VI).

Specific Characters.—Female. Body moderately slender, with the anterior division oblong oval in form, greatest width scarcely exceeding half the length, front evenly rounded. Tail not attaining half the length of the anterior division, genital segment comparatively large, being fully as long as the 3 succeeding segments combined, anal segment shorter than the preceding one. Caudal rami very small, being scarcely longer than they are broad, seta of outer edge slender and attached about in the middle, apical setæ rather elongated, the inner medial one considerably exceeding the length of the tail and, like the outer, clothed in its proximal part with coarse distant hairs, seta of outer corner unusually slender, being fully as long as that of the inner corner. Anterior antennæ comparatively longer and more slender than in *C. gracilis*, though not quite attaining the length of the cephalic segment, and composed of 12 well-defined joints, the 6th of which is much the largest, the 6 outer joints short and all of equal size. Posterior antennæ with the terminal joint about the length of the antipenultimate one. Natatory legs about as in *C. gracilis*. Last pair of legs, as in that species, biarticulate, distal joint, however, comparatively larger, exceeding in length the proximal one, and narrow oblong in form, inner edge finely ciliated, tip armed with 2 slender and somewhat unequal spines, having between them a slender bristle. Ovisacs of moderate size, oval in form, and borne closely appressed to the sides of the tail.

Body rather pellucid, of a whitish gray colour, with light bluish transparent ovaria.

Length of adult female 0.60—0.70 mm.

Remarks.—This form is closely allied to *C. gracilis* Claus, but differs conspicuously in the shape of the anterior division of the body, the more slender

and distinctly 12-articulate anterior antennæ, and the remarkably short caudal rami, which latter character has given rise to the specific name here proposed.

Occurrence.—I have met with this form in several distant places on the Norwegian coast, for instance at Risør on the southern coast, at Skutesnæs on the south-western coast, and at Bejan outside the Trondhjem Fjord. A single well-marked ovigerous specimen was found, moreover, in a sample taken by Mr. Nordgaard in the Porsanger Fjord, Finmark. The specimens observed by me were taken in depths ranging from 10 to 30 fathoms, muddy bottom.

6. Cyclopina elegans, Scott.

(Pl. VII).

Cyclopina elegans, Th. Scott, Addition to the Fauna of the Firth of Forth. 12th Ann. Report of the Fishery Board of Scotland. Part. III, p. 237, Pl. V, figs. 9—19.

Specific Characters.—Female. Body very slender, with the anterior division narrow oblong in form, greatest width not attaining half the length and occurring in its anterior part, front evenly rounded. Tail almost as long as the anterior division and having the genital segment unusually large and tumid, clothed on each side with small spikes; anal segment fully as long as the preceding one. Caudal rami long and slender, equalling in length the last 2 segments combined; outer edge with 2 successive bristles, the smaller one occurring at a short distance form the base, the other attached nearer to the end and somewhat dorsally; apical setæ of moderate length, that of the outer corner shorter than that of the inner. Anterior antennæ moderately slender, though not attaining the length of the cephalic segment, and composed of 18 joints, the 4th and 5th joints exhibiting, however, a more or less distinct sub-division, so that the number of joints may be increased to 20—21. Posterior antennæ with the terminal joint scarcely longer than the antipenultimate one. Mandibular palp comparatively more slender than in the other species, with the outer ramus shorter. Posterior maxillipeds with the terminal part composed of 5 well-defined joints. 1st pair of legs, like the 3 succeeding ones, provided with 2 setæ inside the middle joint of the inner ramus, these setæ being in 4th pair very coarse, almost spiniform. Last pair of legs distinctly 3-articulate, 1st joint with a coarse ciliated seta inside, middle joint rather dilated and carrying outside the usual slender bristle; terminal joint narrow oblong in form, exceeding in length the other 2 combined, and provided outside with 2 setæ, at the tip with another very slender seta and a stout spine. Ovisacs of moderate size and somewhat divergent.

Colour whitish grey, with a slight yellow tinge.

Length of adult female about 0.80 mm.

Remarks.—This is a very distinct species, easily recognisable both by the general form of the body and by the structure of some of the appendages.

Occurrence.—The only place where I have observed this species, is at Farsund, south coast of Norway. It occurred here occasionally together with *C. longicornis* in a depth of about 20 fathoms, sandy bottom.

Distribution.—Firth of Forth (Scott), Gulf of Naples (Giesbrecht).

Gen. 3 **Cyclopinella**, G. O. Sars, n.

Generic Characters.—General appearance resembling that in the genus *Cyclopina*, the anterior division of the body being considerably dilated, the posterior narrow and attenuated. Head defined from the 1st pedigerous segment by a well-marked suture. Anterior antennæ comparatively short and composed of a limited number of articulations. Posterior antennæ with the first joint simple and quite smooth. Mandibles short and stout, with the palp less fully developed than in *Cyclopina*, being simple, without any outer ramus. Maxillæ likewise rather short, palp with the 2 outer appendages well developed and of about equal size, one of the apical spines, as also those of the masticatory lobe, unusually thick, almost digitiform. Anterior maxillipeds rather compact, with the claw of the 2nd basal joint scarcely different from the spines of the terminal part. Posterior maxillipeds much smaller, and of the usual structure. Natatory legs well developed differing somewhat in structure from those in *Cyclopina*. Last pair of legs less rudimentary than usual, being distinctly 3-articulate, with the terminal joint comparatively large and armed with strong lanceolate spines.

Remarks.—This new genus is somewhat allied to *Cyclopina*, though distinguished by certain apparently fundamental differences, of which may be named the distinct separation of the head from the 1st pedigerous segment, and the simple structure of the mandibular palp. Only a single species of this genus has hitherto come under my notice.

7. Cyclopinella tumidula, G. O. Sars, n. sp.

(Pl. VIII).

Specific Characters.—Female. Body comparatively short, with the anterior division greatly tumefied and almost pyriform in shape, the greatest width occurring

far in front and considerably exceeding half the length. Tail very narrow and tapered, with the genital segment only slightly dilated, anal segment fully as long as the preceding one. Caudal rami somewhat exceeding in length the anal segment and narrow linear in form, seta of outer edge attached about in the middle, apical setæ rather unequal, the inner medial one, as usual much the longest and about equalling in length the tail; seta of outer corner quite rudimentary, that of inner attaining the length of the corresponding ramus and very thin. Eye wholly absent. Anterior antennæ much shorter than the head, and composed of 12 well-defined joints, the 9th of which is somewhat longer than the others and carries a slender sensory filament. Posterior antennæ with the terminal joint unusually short, not even attaining the length of the preceding one. Mandibular palp forming a simple bi-articulate stem, the distal joint of which is very small and provided with 3 curved setæ. Natatory legs with no seta inside the 1st joint of the outer ramus; 1st pair with a strong spine outside the terminal joint of the inner ramus, replacing the usual seta; spines of outer ramus in this and the succeeding pairs slender, and edged with hyaline rims, 4 such spines being present on the terminal joint in the 3 anterior pairs, 3 in that of the 4th pair, inner ramus of the latter pair unusually narrow and, like that of the 2 preceding pairs, armed at the tip with 2 spines. Last pair of legs with the 1st joint quite unarmed, 2nd carrying outside a slender bristle, terminal joint much longer than the other 2 combined, oblong quadrangular in form, and much constricted at the base, carrying outside, somewhat in front of the middle, a strong lanceolate spine and at the transversely truncated end 2 similar spines and a very small bristle between them, inner edge of the joint straight and finely ciliated. Ovisacs small, and borne closely appressed to the sides of the tail, each containing, as a rule, only 3 ova arranged in a single row.

Male exhibiting the usual sexual characters. Last pair of legs of exactly the same appearance as in female.

Body of the usual whitish grey colour, but appearing darker on account of the translucent, very capacious anterior part of the intestine, which is generally filled with dark brown contents. A peculiar opaque body of a whitish or pale orange hue, and transversely oval or semilunar in form, is constantly found immediately inside the dorsal wall of the head, in front of the intestine, and is very conspicuous in the living animal.[1])

Length of adult female 0.68—0.75 mm.

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[1]) I am unable to say anything about the significance of this body. It cannot be the missing visual organ, as it does not occupy the usual place of the eye, being far remote from the front. As to structure, it seems to consist of a uniform granular matter.

Remarks.—In its general appearance this form is rather similar to certain species of the genus *Cyclopina*, and I was indeed at first inclined to refer it to that genus. The closer anatomical examination has, however, proved it to be in reality so different, that in my opinion it ought to be generically separated.

Occurrence.—I have met with this peculiar form in several distant places on the Norwegian coast, for instance at Risør and Lillesand on the southern coast, at Christiansund on the western coast, and in the Trondhjem Fjord. In all places it occurred on a muddy bottom, partly covered by decaying algæ, the depth ranging from 20 to 40 fathoms.

Gen. 4. **Cyclopetta**, G. O. Sars, n.

Generic Characters.—Body somewhat depressed, with the 2 chief divisions less sharply marked off from each other than in the 2 preceding genera. Head confluent with the 1st pedigerous segment, and conspicuously contracted in front. Tail comparatively short. Anterior antennæ of inconsiderable length, with the number of articulations reduced. Posterior antennæ likewise unusually short and stout, and clothed with strong plumose setæ. Mandibles with the palp distinctly biramous, outer ramus well developed, inner uniarticulate. Maxillæ and maxillipeds very small and difficult to examine, though apparently built on the same type as in the other *Cyclopinidæ*. Natatory legs well developed and of normal structure. Last pair of legs consisting each of a single lamellar joint edged with ciliated setæ.

Remarks.—This new genus in some respects differs rather conspicuously from the 2 preceding ones, and seems to exhibit a certain approach to the next anomalous genus, *Pterinopsyllus*, though it is distinguished also from this genus by several well-marked characters. The genus is only founded upon a single species, to be described below.

8. Cyclopetta difficilis, G. O. Sars, n. sp.

(Pl. IX).

Specific Characters.—Female. Body comparatively short and stout, and distinctly depressed, with the anterior division oblong fusiform in outline, greatest width scarcely exceeding half the length, and occurring about in the middle. Cephalic segment rather large and evenly contracted anteriorly, with

the front narrowly rounded. Tail not attaining half the length of the anterior division, and scarcely tapering behind; genital segment conspicuously constricted in the middle, anal segment equalling in length the 2 preceding ones combined. Caudal rami short, not nearly attaining the length of the anal segment, and quadrangular in shape, seta of outer edge attached about in the middle, apical setæ of moderate length, the inner medial one about twice as long as the outer, both coarsely ciliated, seta of outer corner much smaller than that of the inner. Anterior antennæ scarcely exceeding half the length of the cephalic segment, and each composed of only 9 joints clothed with strong partly ciliated setæ; 5th joint the longest, 6th about the length of the 3 outer joints combined. Posterior antennæ distinctly 4-articulate, 1st joint provided at the end on either side with a strong ciliated seta, 2nd joint with a similar seta in front, 3rd joint with 4 such setæ outside, last joint about the length of the 2 preceding ones combined, and carrying on the tip 6 anteriorly-curving and likewise densely ciliated setæ. Mandibular palp with the outer ramus composed of 4 well defined joints, inner ramus with 3 comparatively short apical setæ. Proximal outer lobe of the maxillary palp much larger than the distal one and carrying 4 unusually thick plumose setæ. Maxillipeds very small and densely crowded, the anterior ones apparently of normal structure, the posterior ones with the number of the terminal joints much reduced. Natatory legs not exhibiting any pronounced peculiarity in their structure. Last pair of legs consisting each of a rounded oval lamella attached outside the last trunk-segment and provided with 3 thick and curved ciliated setæ; just above this lamella a thin bristle is attached to a conical projection of the segment itself.

Colour not yet ascertained.

Length of adult female 0.60 mm.

Remarks.—The present form cannot be confounded with any of the other *Cyclopinidæ*, exhibiting, as it does, a most characteristic appearance, somewhat recalling that found in certain of the semi-parasitic forms, to which, indeed, I was at first inclined to refer it, before having made out its anatomy.

Occurrence.—Only 3 specimens of this remarkable form, all of the female sex, have hitherto come under my notice. They were picked up from a sample taken last summer at Risør, south coast of Norway, in a depth of about 40 fathoms, muddy sand. All 3 specimens have been sacrified for dissection, in order to get a satisfactory conception of the structure of the very small and densely crowded oral parts. The specific name here proposed alludes to the difficulty experienced in the examination of these parts.

Gen. 5. **Pterinopsyllus**, Brady, 1880.

Syn: Lophophorus, Brady (not Temminch).
Cyclopella, Claus.

Generic Characters.—Body robust and somewhat depressed, with the anterior division moderately dilated, the posterior less narrow than usual. Head coalesced with the 1st pedigerous segment, and terminating in a blunt rostrum projecting downwards. Caudal rami short, with the 2 middle apical setæ very strong and densely ciliated. Anterior antennæ short and stout, with the number of articulations reduced, and clothed with unusually strong pennate setæ; those of male of much larger size and strongly hinged. Posterior antennæ likewise short, and only 3-articulate, the last 2 joints being united. Mandibles with the cutting part considerably expanded and coarsely dentate; palp comparatively slender, with the outer ramus small and undivided, inner ramus biarticulate. Maxillæ with all the constituting parts well developed. Anterior maxillipeds very stout, with 3 well-defined terminal joints armed with strong spines. Posterior maxillipeds with the terminal part very fully developed and composed of 5 joints, the 1st much larger than the others. Natatory legs strongly built, with short and blunt spines outside the outer ramus; inner ramus of 1st pair in male prehensile, that of 4th pair more or less reduced in female, normal in male. Last pair of legs comparatively small and not extended laterally, being composed of 3 more or less lamellar joints, somewhat different in the two sexes.

Remarks.—This genus was established in the year 1878 by Prof. Brady, to comprise a peculiar Copepod found by him off the British coast. As, however, the generic name he proposed, *Lophophorus*, had been preoccupied for a genus of birds, he changed it in the year 1880 to *Pterinopsyllus*. The name *Cyclopella* proposed by Claus is of later date, and must yield to that given to the genus by Brady.

The systematic position of the present genus has remained somewhat doubtful. In some respects it recalls certain genera among the *Harpacticoida*, and, indeed, it has been placed within that group in the list of Crustacea from Northumberland and Durham published by Norman and Brady. I think, however, that its place within the group *Cyclopoida* cannot at present be disputed. On the other hand, owing to the peculiarities observed in this genus, it might be thought necessary to establish for its reception a distinct family, *Pterinopsyllidæ*. Indeed, I was at first much inclined to do so; but after having become acquainted with the preceding genus, *Cyclopetta*, which in some respects exhibits an evident

approach to the one here under consideration, I find that, without any serious scruple, it may be included in the family *Cyclopinidæ*, as here defined.

In addition to the typical species described below, 2 closely-allied species, *P. egregius* and *P. illustris*, have been recorded by Dr. Giesbrecht from the gulf of Naples.

9. Pterinopsyllus insignis, Brady.

(Pl. X & XI).

Lophophorus insignis, Brady, Monograph of British Copepoda, Vol. I, p. 122, Pl. XIII, figs. 1—10, Pl. XV, fig. 10.

Specific Characters.—Female. Body rather stout, with the anterior division ovate in outline, greatest width exceeding half the length and occurring about in the middle. Cephalic segment large and narrowly produced in front. Last trunk-segment sharply defined from the preceding one, and projecting laterally in a small dentiform process. Tail about half the length of the anterior division, and nearly of uniform width throughout; genital segment about as long as the 3 succeeding ones combined, and scarcely at all dilated in front; anal segment shorter than the preceding one. Caudal rami quadrangular in shape, being scarcely longer than they are broad, seta of outer edge obsolete, the 2 middle apical setæ very strong and divergent, with coarser and more scattered hairs on their proximal parts, seta of outer corner much smaller than that of the inner, both very thin and naked. Anterior antennæ scarcely more than half as long as the cephalic segment and rather broad at the base, being composed of 8 joints, the 2nd of which is the largest, 5th joint very small. Posterior antennæ clothed along the outer edge and at the tip with coarsely hairy setæ, inner edge without any setæ. 4th pair of natatory legs with the inner ramus much shorter than the outer, middle joint imperfectly defined from the terminal one and without any setæ inside, the latter joint having inside 2 short blunt spines replacing the usual setæ. Last pair of legs with the 1st joint imperfectly defined at the base, but carrying inside a well-developed ciliated seta, 2nd joint conically produced outside and carrying the usual thin bristle, last joint much larger than the other 2 combined, and forming a rounded oval lamella coarsely ciliated inside and provided with 4 slender setæ, 3 of which are ciliated, the 4th, issuing from the tip, very thin and smooth. Ovisacs, according to Brady, short pyriform, with a limited number of ova.

Male of smaller size than female, and easily recognisable by the very coarse structure of the anterior antennæ, which are powerful prehensile organs divided into 12 joints. Inner ramus of 1st pair of legs with the apical spine

peculiarly transformed, being abruptly bent, so as to form a claw-like prehensile appendage. Inner ramus of 4th pair of quite normal structure. Last pair of legs as in the female, 3-articulate; the 1st joint does not, however, answer to the 1st joint in the female, but to the 2nd, as is clearly shown by the bristle issuing from its outer side. Of the other 2 joints, which accordingly answer to the terminal joint in the female, the proximal one is much the larger and carries at the end on each side a seta, whereas the distal joint is quite short with 4 diverging setæ on the end.

Body in both sexes of a whitish grey colour, with a slight violaceous tinge. Eye in living specimens very conspicuous and of light red colour.

Remarks.—The present form may be easily recognised from any of our indigenous Cyclopoida, both by its characteristic outward appearance and by the rich ornament of coarsely-ciliated setæ, which clothes most of the appendages. Especially are these setæ very conspicuous on the anterior antennæ, where they partly assume a pennate or pectinate character, giving these appendages a peculiar shruppy appearance. It was indeed to this peculiarity that the generic name, *Lophophorus*, at first proposed by Brady, alluded. From the 2 Mediterranean species recorded by Dr. Giesbrecht the present form cannot be distinguished without a very close anatomical examination.

Occurrence.—I have met with this pretty form occasionally in 3 different places on the Norwegian coast, viz., in the inner part of the Christiania Fjord, at Risør, and at Flekkerø, outside Christiansand. The specimens were taken in depths ranging from 20 to 40 fathoms, muddy sand. Canon Norman has taken this form also in the Trondhjem Fjord, at Rødberget, where it occurred in the considerable depth of 150 fathoms.

Distribution.—Coast of England and Scotland (Brady, Scott), Gulf of Naples (Giesbrecht).

Fam. 3. Cyclopidæ.

Characters.—General form of the body resembling that in the typical *Cyclopinidæ*, the anterior division being more or less dilated, the posterior much narrower and attenuated. Head in all the known forms confluent with the 1st pedigerous segment, and having the rostrum bent in against the ventral face. Anterior antennæ more or less elongated and strongly hinged in male. Posterior antennæ generally 4-articulate, with an elongated seta at the end of the 1st joint

posteriorly. Anterior lip with the terminal edge finely denticulate. Mandibles with the palp quite rudimentary, being reduced to a small knob-like process carrying 2 or 3 ciliated setæ. Maxillæ with the palp likewise imperfectly developed and without any distinctly-defined outer appendages. Maxillipeds built on the same type as in the *Cyclopinidæ*, but of comparatively simpler structure. Natatory legs, as a rule, well developed, with subequal triarticulate rami, though in some instances the number of joints in the rami may be reduced. Last pair of legs generally small and of the same appearance in the two sexes.

Remarks.—This family, in the restriction here adopted, is chiefly distinguished from the 2 preceding ones by the rudimentary condition of both the mandibular and the maxillary palps. This character is invariably found in all the forms, and must be regarded as of fundamental significance. In other respects this family exhibits a close resemblance to the *Cyclopinidæ*.

Only a limited number of species, belonging to 2 genera, are strictly marine, whereas in fresh water we find a great number of forms, all generally referred to a single genus, viz., *Cyclops*. I have, however, found it appropriate to divide this extensive genus into a number of closely-allied genera (or subgenera), which will be characterised in the next parts of the present Volume.

Gen. 10. **Euryte**, Philippi, 1843.

Syn: *Thorellia*, Boeck.

Generic Characters.—Body, as a rule, rather robust, the anterior division being considerably tumefied, and sharply marked off from the slender and attenuated tail. Anterior antennæ in female divided into a great number of short, but well-defined joints; those in male much more strongly built, and hinged in the usual manner. Posterior antennæ rather stout, 4-articulate, with the last 2 joints comparatively short. Mandibles with the cutting edge divided into several sharp claw-like teeth, setæ on the rudimentary palp not much elongated. Maxillæ with the masticatory lobe well developed and armed with strong dentiform spines, palp forming an oblong lamella projecting beyond the masticatory lobe and terminating in a serrated edge, being moreover provided on each side with 2 juxtaposed setæ. Anterior maxillipeds rather stout, with the digitiform lobe, issuing from the end of the 1st basal joint anteriorly, comparatively strong and, like the 2nd basal joint, projecting in a claw-like spine accompanied by a much

thinner seta; terminal part composed of only a single joint armed with short curved spines. Posterior maxillipeds of a somewhat unusual appearance and apparently sub-prehensile, the terminal part being abruptly bent and terminating in 2 short claw-like spines. Natatory legs powerfully developed with broad flattened basal part and the joints of the rami partly conspicuously expanded; spines of outer ramus lanceolate, bordered by broad hyaline rims finely serrated at the edges; several of the setæ, both of this and the inner ramus, transformed to similar, though more delicate spines. Last pair of legs less rudimentary than usual, and resembling in structure those in the genus *Cyclopinella*.

Remarks.—This genus was established by Philippi as early as in the year 1843, but was not recognised by Boeck, who records it under another name, viz., *Thorellia*. The genus is especially characterised by the peculiar structure of the maxillary palp and that of the posterior maxillipeds, as also by the transformation of several of the natatory setæ on the legs to lanceolate spines. Two species of this genus have hitherto been described, both occurring off the Norwegian coast, and a 3rd new species is here added. All 3 species are exclusively marine.

10. Euryte longicauda, Philippi.

(Pl. XII).

Euryte longicauda, Philippi, Fernere Beobachtungen über die Copepoden des Mittelmeeres. Arch. f. Naturg. 1843, p. 63, Pl. 3, fig. *a—d*.

Syn: *Thorellia brunnea*, Boeck.
Cyclops, nigricauda, Norman.
Cyclopina Clausi, Czerniawsky.

Specific Characters.—Female. Anterior division of body rounded oval in outline, greatest width almost equalling $^2/_3$ of the length, and occurring somewhat behind the middle. Cephalic segment very large, considerably longer than all the free trunk-segments combined, and evenly rounded in front. Last trunk-segment somewhat produced on each side. Tail very slender, almost attaining the length of the anterior division; genital segment imperfectly subdivided in the middle, and exhibiting on each side a dentiform posteriorly-pointing projection; anal segment longer than the preceding one. Caudal rami very slender and elongated, equalling in length the last 3 segments combined, and sublinear in form, diverging a little in their distal parts, which appear slightly thickened; seta of outer edge attached near the extremity; apical setæ not much elongated, the inner medial one not nearly attaining the length of the tail, that of the outer corner shorter than that of the inner. Anterior antennæ rather slender, though

not quite attaining the length of the cephalic segment, and composed of 21 joints, the 1st of which is much the largest; 2nd joint faintly subdivided in the middle. Posterior antennæ rather strongly built, 2nd joint angularly produced at the end inside, and almost as long as the outer 2 joints combined, some of the apical setæ rather strong, almost spiniform. 1st pair of natatory legs with the inner corner of the 2nd basal joint considerably produced and carrying a strong deflexed spine; middle joint of inner ramus very broad and, like that of the succeeding pairs, provided inside with 2 setæ, terminal joint with all the setæ transformed to spines. Setæ of terminal joint of outer ramus in 2nd to 4th pairs likewise transformed. Last pair of legs with the 1st joint very small and imperfectly defined at the base, 2nd joint likewise rather small, and carrying outside the usual bristle, last joint comparatively large, oblong quadrangular in shape and somewhat curved at the narrowed base, being armed with 3 strong lanceolate spines, one of which issues a little beyond the middle of the outer edge, the other 2 from the transversely truncated extremity; between the latter, moreover, a thin bristle is attached. Ovisacs narrow oblong in form and greatly diverging.

Male, as usual, smaller than female and of somewhat more slender form of body, being moreover easily recognised by the strongly hinged anterior antennæ and the distinctly 5-articulate tail.

Colour yellowish brown, with scattered patches of a darker hue; proximal part of the caudal rami and the middle part of the anterior antennæ generally of a similar dark hue.

Length of adult female about 1.30 mm., that of male 0.90 mm.

Remarks.—The identity of the above-described form with Philippi's *Euryte longicauda* has been sufficiently proved by Dr. Giesbrecht, who observed the species in about the same place, that Philippi had made his investigations in. The name *Thorellia brunnea*, under which this species has been recorded by most authors, is of much later date than that given to this form by Philippi, and cannot therefore be retained. It is also beyond doubt that both *Cyclops nigricauda* Norman and *Cyclopina Clausi* Czerniawsky are referable to the same species. From the 2 next species the present one may be easily distinguished by the very long and slender caudal rami, as also by the manner in which the ovisacs are borne in the female.

Occurrence.—I have found this form rather plentifully along the whole Norwegian coast, from the Christiania Fjord to Vadsø in moderate depths among algæ. More particularly it seems to haunt places where the great Laminariæ grow, to the leaves of which it is often found clinging rather firmly, probably by the aid of the clawed posterior maxillipeds. It moves through the water

in the usual jumping manner, and has on the whole in its behaviour much the appearance of an ordinary Cyclops. Dr. Scott records a smaller form of this species, which he designates as *varietas minor*. I have also myself in the inner part of the Christiania Fjord observed such small, though fully adult specimens, but have failed to detect any other differences from the typical form.

Distribution.—British Isles (Brady), coast of France (Canu), Gulf of Naples (Philippi), Black Sea (Czerniawsky), eastern coast of Greenland (Buchholtz), Franz Josef Land (Scott), Polar Islands north of Grinnel Land (2nd Fram Expedition).

11. Euryte robusta, Giesbrecht.

(Pl. XIII).

Euryte robusta, Giesbrecht, Mittheilungen über Copepoden, 12—14, p. 58, Pl. 4, figs. 1—18.

Specific Characters.—Female. Body comparatively more robust than in the preceding species, with the anterior division more regularly oval in outline. Tail comparatively shorter and broader at the base; genital segment exhibiting in the middle quite similar dentiform projections to those in *E. longicauda*. Caudal rami rather shorter than in that species, scarcely exceeding in length the last 2 segments combined, and slightly diverging at the end; apical setæ more evenly ciliated, Anterior antennæ, as in that species, rather slender and composed of 20 joints. Posterior antennæ somewhat less robust, with the 2nd joint scarcely angular behind and the apical setæ thinner. Posterior maxillipeds with the apical claws more slender and accompanied by 2 thin bristles. Structure of the legs almost exactly as in *E. longicauda*, though having the spines comparatively shorter and stouter. Ovisacs small and of irregularly rounded form, each containing a very limited number of ova.

Male resembling that of the preceding species, but of somewhat more robust form.

Body of a dark ochraceous colour, the caudal rami being tinged with deep chestnut and the anterior antennæ with bands of a similar hue.

Length of adult female 1.20—1.40 mm., of male about 1.00 mm.

Remarks.—I cannot doubt that the above-described form is identical with that recorded by Dr. Giesbrecht from the gulf of Naples, though there are a few points of disagreement. Thus Dr. Giesbrecht counts 21 joints in the anterior antennæ, whereas I have never found more than 20 such joints, some of which even are imperfectly defined. The figure given by him of the posterior antennæ also differs somewhat, and more agrees with those antennæ in *E. longicauda*. Otherwise, however, the two forms seem to agree perfectly.

The present species is closely allied to *E. longicauda,* but is easily distinguished by the comparatively more robust form of the body, and more particularly by the considerably shorter caudal rami.

Occurrence.—I have found this form not unfrequently in several places of the Norwegian coast, for instance at Kleven and Korshavn on the southern coast, and at Aalesund and Christiansund on the western coast. It is a more pronounced deep-water form than the preceding one, being generally found in depths ranging from 20 to 60 fathoms, especially where the bottom consist of coarse sand intermingled with mud. It is very perplexing, that this form has not yet been observed off the British Isles, the Copepod-fauna of which has been so thoroughly studied, especially by Th. Scott.

Distribution.—Gulf of Naples (Giesbrecht).

12. Euryte curticornis, G. O. Sars, n. sp.

(Pl. XIV).

Specific Characters.—Female. Body somewhat less robust than in the preceding species, with the anterior division ovate in outline, the cephalic segment being somewhat contracted in front. Last trunk-segment less produced laterally than in the other 2 species. Tail exceeding somewhat half the length of the anterior division, genital segment with only a slight rudiment of the lateral denticles so conspicuous in the 2 preceding species. Caudal rami about equalling in length the last 2 segments combined, and not at all diverging, tapering slightly distally; apical setæ of moderate length, the 2 middle ones clothed in their proximal part with rather coarse and distant hairs. Anterior antennæ much shorter and thicker than in the 2 preceding species, though composed of a similar great number of joints (20), most of the setæ rather coarse and finely ciliated. Posterior antennæ of a similar structure to that in *E. robusta.* Posterior maxillipeds less abruptly curved and having the terminal part much shorter, with the apical claws extremely minute. Natatory legs built in the same manner as in the 2 preceding species, though having the rami somewhat less broad and the spines more slender. Last pair of legs likewise of a very similar structure, last joint, however, comparatively shorter. Ovisacs rather large, and borne closely appressed to the sides of the tail.

Colour not yet ascertained.

Length of adult female 1.30 mm.

Remarks.—This new species may be at once distinguished from the 2 preceding ones by the much shorter an stouter anterior antennæ, which character

indeed has given rise to the specific name here proposed. In the structural detail also some minor differences are found to be present, especially as regards the posterior maxillipeds and the caudal rami.

Occurrence.—Several specimens of this form were collected, many years ago, at Skraaven, Lofoten islands. They occurred in a depth of about 6 fathoms, on a sandy bottom partly overgrown with algæ.

Gen. 11. **Halicyclops,** Norman, 1903.

Syn: *Hemicyclops* Claus (not Boeck).

Generic Characters.—Body of the usual cyclopoid shape, and somewhat depressed in its anterior part. Head confluent with the 1st pedigerous segment, and having the rostrum bent in against the ventral face. Anterior antennæ short, with the number of joints greatly reduced; those in male strongly hinged. Posterior antennæ with the outer 2 joints confluent. Mandibles with one of the cutting teeth much larger than the others, setæ of rudimentary palp comparatively short. Maxillary palp forming a small lamella not extending beyond the masticatory lobe, and terminating in a short spine accompanied by one or two setæ. Anterior maxillipeds with the digitiform lobe, issuing from the end of the 1st basal joint anteriorly, rather small and terminating in 2 unequal setæ. Posterior maxillipeds imperfectly developed, being composed of 2 or 3 joints only. Natatory legs built upon the usual cyclopoid type, but having the rami not nearly so broad as in *Eurytе.* Last pair of legs with the proximal joint more or less completely coalesced with the corresponding segment, distal joint broad lamelliform and edged with partly ciliated setæ.

Remarks.—This genus was established in the year 1893 by Claus, to include the form generally recorded as *Cyclops æqvoreus* Fischer. As, however, the name he proposed, *Hemicyclops*, had been preoccupied by Boeck, to designate another very different genus, not even belonging to the same section, it has been changed by Norman to *Halicyclops*. The genus is nearly allied to *Cyclops*, but differs in the imperfect development of the posterior antennæ and of the posterior maxillipeds, as also in the peculiar structure of the last pair of legs. In addition to the typical form, to be described below, another nearly-allied species has been recorded by the present author from the Chatam islands as *H. propinqvus*, and a 3rd species, not yet described, occurs, as a true planktonic form, in the Caspian

Sea. All the species are inhabitants of more or less brackish water, though they may be of marine origin, as they are never found in purely fresh water.

13. Halicyclops magniceps (Lilljeborg).

(Pl. XV).

Cyclops magniceps, Lilljeborg. De crustaceis ex ordinibus tribus, etc. p. 204, Pl. XXII, fig. 1.

Syn: *Cyclops œqvoreus*, Fischer.
„ *christianiensis*, Boeck.

Specific Characters.—Female. Body moderately stout, with the anterior division oblong oval in outline, greatest width about equalling half the length and occurring somewhat in front of the middle. Cephalic segment very large and broadly rounded in front; last trunk-segment only slightly produced laterally. Tail scarcely more than half as long as the anterior division, genital segment nearly of equal width throughout, anal segment shorter than the preceding one, and deeply cleft at the end. Caudal rami about twice as long as they are broad and somewhat divergent; seta of outer edge attached about in the middle; apical setæ rather slender, the inner medial one attaining half the length of the body; seta of outer corner shorter than that of the inner. Anterior antennæ comparatively short and stout, being composed of only 6 distinctly defined joints, the first 2 rather dilated, the 3rd quite short, the 4th nearly as long as the outer 2 joints combined. Posterior antennæ with the terminal joint sub-fusiform in shape, and provided in the middle outside with a well-marked notch, indicating the place where the 2 outer joints have been coalesced. Posterior maxillipeds very small and only composed of 2 joints, the distal one much the smaller. Natatory legs with the terminal joint of the inner ramus not much larger than the middle one, and provided in the 1st pair with 2, in the other pairs with 3 spines in addition to the setæ; terminal joint of outer ramus having 3 spines outside in the 3 anterior pairs, 2 in the 4th pair. Last pair of legs with the proximal joint imperfectly defined from the segment, distal joint much expanded, spatulate in form, terminal edge obliquely truncated and carrying 4 comparatively short setæ, the innermost but one simple, the others ciliated. Ovisacs oblong oval in form and borne closely appressed to the sides of the tail, each containing only a limited number of ova.

Male much smaller than female, and having the anterior antennæ very strongly built, being composed of 11 more or less distinctly defined joints, the last consituting the terminal section and produced in a sharp point. Last pair of legs with the proximal joint more distinctly defined, distal joint only differing

from that in female by the presence of an additional seta attached inside the others.

Body semipellucid, of a whitish colour, with a very faint yellowish or greenish tinge. Ovaria and ova in the ovisacs generally of a dark blue colour.

Length of adult female 0.75 mm.

Remarks.—This form was first recorded by Lilljeborg under the name of *Cyclops magniceps*, but was rather imperfectly described, and, as moreover the number of joints in the anterior antennæ were erroneously indicated to 8, instead of 6, the species was not recognised by subsequent authors, who generally recorded it under the specific name *æqvoreus* proposed by Fischer several years afterwards. The form named by Boeck *Cyclop christianiensis* is also unquestionably the same species. It is distinguished from the nearly-allied form *H. propinqvus* G. O. Sars by the more produced caudal rami, as also by its larger size.

Occurrence.—I have found this form not unfrequently in the uppermost part of the Christiania Fjord, where it occurs close to the border of the shallow creeks in the immediate neighbourhood of the town. It also occurs in other places, both of the south and west coasts of Norway, partly in more or less brackish water.

Distribution.—Kullaberg, coast of Sweden (Lilljeborg), British Isles (Brady), coast of France (Canu), Algeria (Richard), Madeira (Fischer).

Gen. 12. **Cyclops,** Müller, 1776 (ex parte).

Generic Characters.—Anterior division of body moderately tumid, and generally more tapered behind than in front; lateral parts of the 3 anterior trunk-segments well defined and sub-angular behind; last trunk-segment more or less produced laterally. Tail slender and attenuated, with the genital segment in female more or less dilated in front. Anterior antennæ of varying length, and more generally composed of 17 well defined joints, though in some cases, by concrescence, their number may be considerably reduced; those in male strongly hinged, with the terminal section distinctly biarticulate. Posterior antennæ with all 4 joints well defined, the 1st carrying at the end posteriorly a long ciliated seta. Rudimentary palp of the mandibles carrying 2 very long and densely plumose setæ accompanied by a short bristle. Maxillary palp scarcely extending beyond the masticatory lobe, and provided outside near the base with 4 ciliated setæ, 3 of which issue from a slight expansion of the margin. Anterior maxilli-

peds moderately strong, with the 1st basal joint generally subdivided in the middle, and provided anteriorly with a small rounded lobe carrying 2 plumose setæ; digitiform lobe issuing from the end of this joint anteriorly comparatively small, with none of the setæ unguiform. Posterior maxillipeds much more slender, and composed of 4 well-defined joints. Natatory legs with both rami generally 3-articulate, though in some cases, by an imperfect separation of the 2 outer joints, one or other of them, or all, may be only biarticulate; inner ramus of 4th pair with 2 apical spines. Last pair of legs very small and generally not extended laterally, being composed of 2 joints, the proximal of which in some cases may be coalesced with the corresponding segment, distal joint not expanded, and carrying a slender apical seta and a short lateral spine. Seminal receptacle in female of comparatively simple structure, being generally transversely oval in shape.

Remarks.—This genus is here taken in a much more restricted sense than done by other authors. Owing to the great number of species referred to this genus, it has long appeared very desirable to group them according to their mutual relationship, in order to get a clear survey on them. A such grouping of the European species has indeed been effected by Dr. Schmeil in his very valuable work on the fresh water Copepoda of Germany. I think, however that we may be justified to take a further step, and to subdivide the old genus Cyclops into a number of nearly-allied genera, each being designated by a particular name. In the present work I have attempted to do so, distinguishing 5 different genera, the name *Cyclops* being restricted to one of them, which comprises the greater bulk of the hitherto known species. In this genus I have included 4 of the 8 groups of Cyclopses distinguished by Dr. Schmeil, having not found sufficient reason for a generic separation of these groups; the 4 other genera answer to as many groups distinguished by Dr. Schmeil.

In the restriction here adopted, the present genus is, among other things, characterised by the well defined and angular epimeral parts of the segments composing the anterior division of the body, giving to the sides of that division a more or less jagged appearance. Of the structural details, it is especially the rudimentary last pair of legs which exhibits a very characteristic appearance, conspicuously differing from that in any of the other 4 genera.

A considerable number of species referable to the present genus will be described in the sequel, some of them being, however, so closely allied, that their specific distinctness has not generally been recognised. They all, like the species of the 4 succeeding genera, are exclusive inhabitants of fresh water.

The diagnoses here given of the several species have chiefly been drawn up from adult female specimens, the males affording, as a rule, no particular characters availble for the specific distinction.

14. Cyclops strenuus, Fischer.

(Pl. XVI).

Cyclops strenuus, Fischer, Bulletin de la Societé Impér. d. Nat. de Moscow, Vol. XXIV, p 419 Pl. IX, figs. 12—21.

Syn.[1]) ? *Monoculus qvadricornis rubens*, Jurine.
? *Cyclops pictus*, Koch.
„ *qvadricornis*, Lilljeborg.
„ *brevicaudatus*, Claus.
„ *Clausi*, Lubbock.

Specific Characters.—Female. Body moderately slender, with the anterior division oblong oval in form, greatest width about equal to half the length and occurring in the middle. Cephalic segment only slightly longer than the 4 succeeding segments combined, and narrowly rounded in front. Lateral parts of penultimate trunk-segment terminating in a short tooth-like projection turned somewhat outwards. Last trunk-segment angularly produced laterally. Tail somewhat exceeding half the length of the anterior division; genital segment conspicuously dilated in front, though the width is somewhat less than the length. Caudal rami moderately slender, exceeding in length a little the last 2 segments combined, and slightly divergent, being linear in form, and each provided dorsally with a distinct longitudinal keel, inner edge finely ciliated; seta of outer edge rather small and not much remote from the end; apical setæ comparatively short, the inner medial one only very little longer than the outer and scarcely twice as long as the corresponding ramus, seta of inner corner not much longer than that of the outer. Anterior antennæ of moderate length, reaching, when reflexed, to the middle of the 2nd segment, and composed of 17 joints. Natatory legs with 3 spines outside the terminal joint of the outer ramus of 1st and 2nd pairs; inner edge of same joint carrying in 1st pair 3, in the succeeding pairs 4 setæ. Inner ramus of 4th pair moderately slender, with the outer apical spine somewhat exceeding half the length of the inner. Last pair of legs with the distal joint not twice as long as it is broad, lateral spine rather strong and attached about in the middle of the inner edge. Ovisacs comparatively large, oval in form, and borne closely appressed to the sides of the tail. Seminal receptacle transversely truncated in front.

[1]) Many other synonyms have been given in the work of Dr. Schmeil. But as he evidently has combined several species under the name *strenuus*, only those synonymes are here quoted, which more strictly may refer to the species here under consideration.

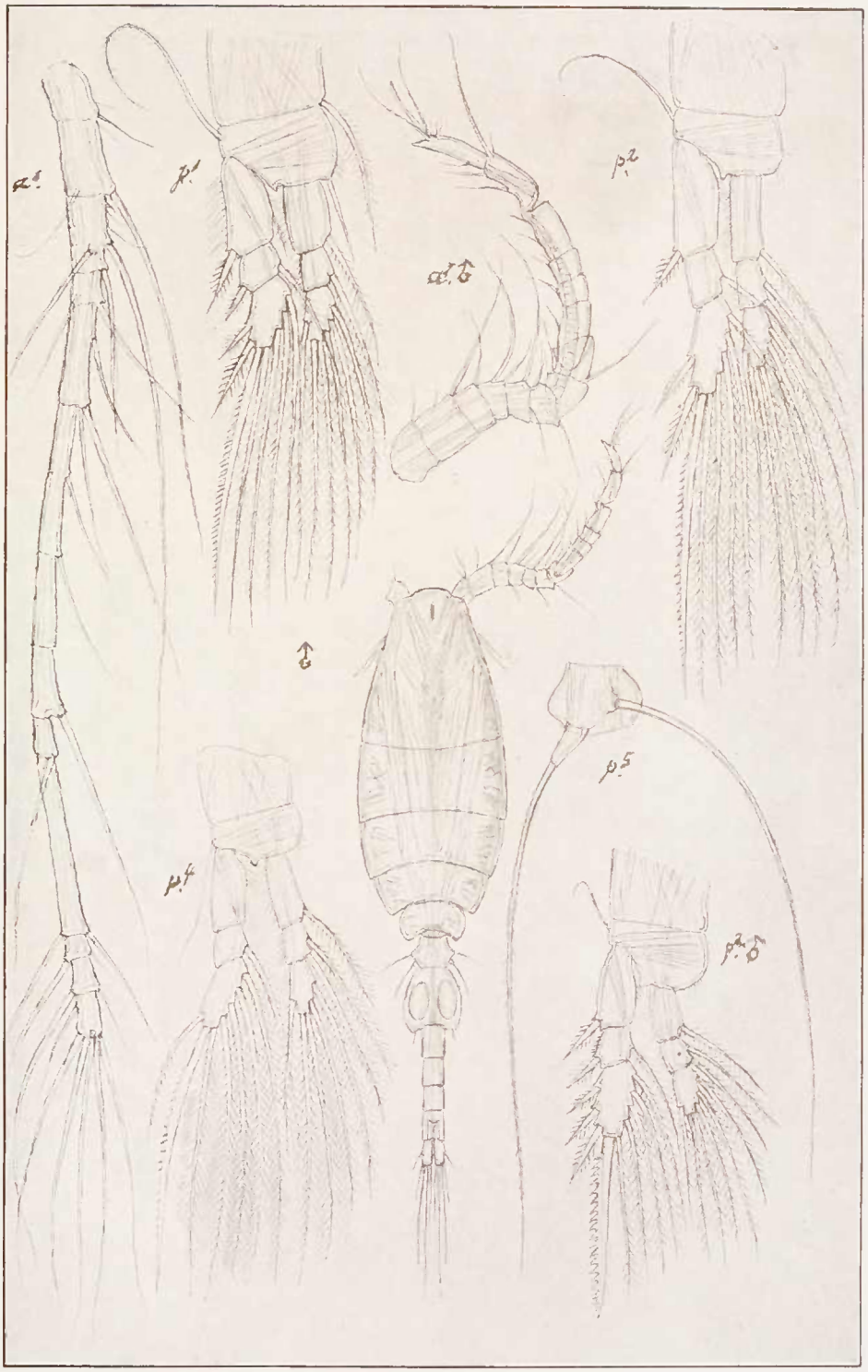
Copepoda



G. O. Sars, del.

Oithona spinirostris, Claus.

Copepoda

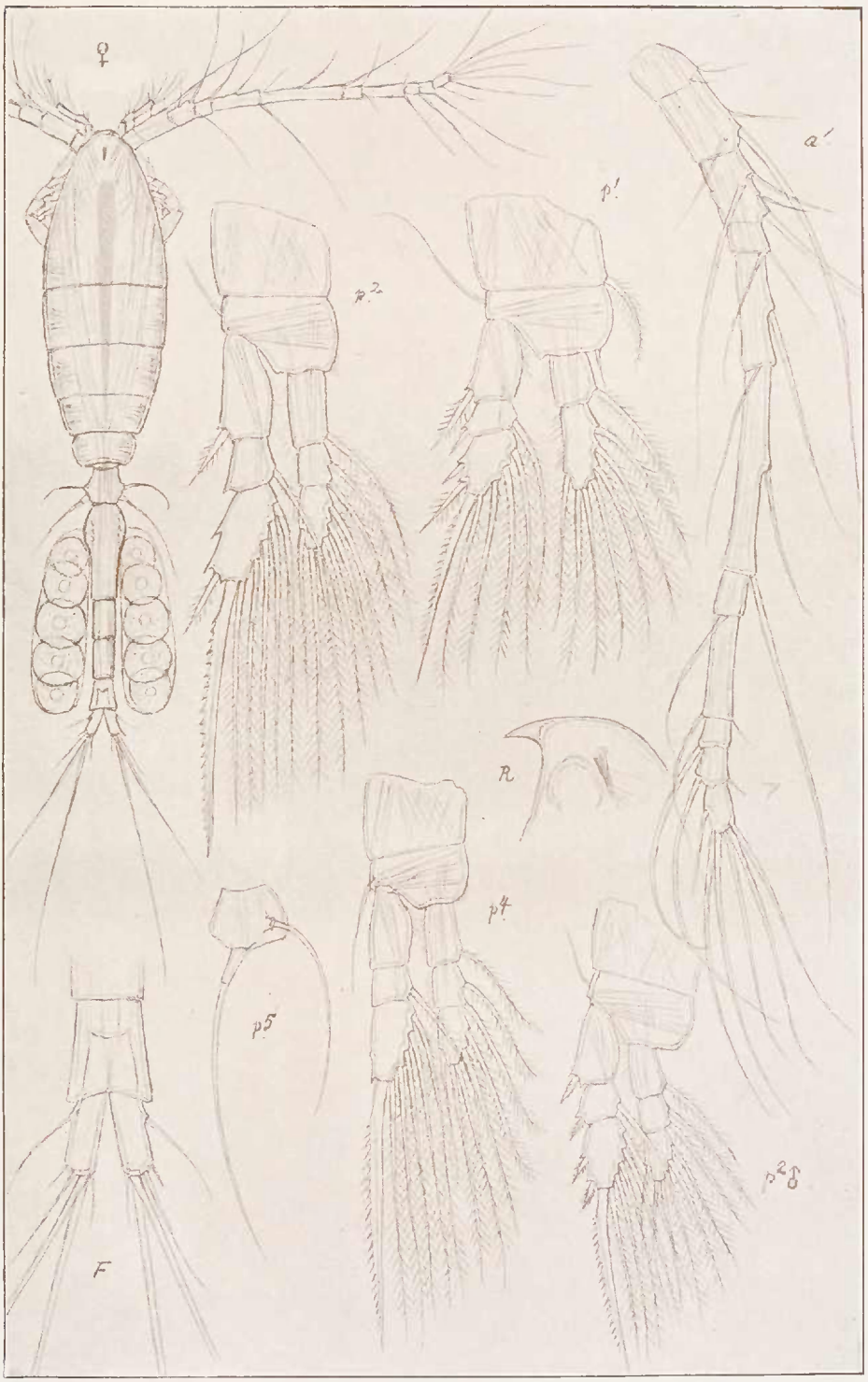


G. O. Sars, del.

Oithona spinirostris, Claus.

(Continued).

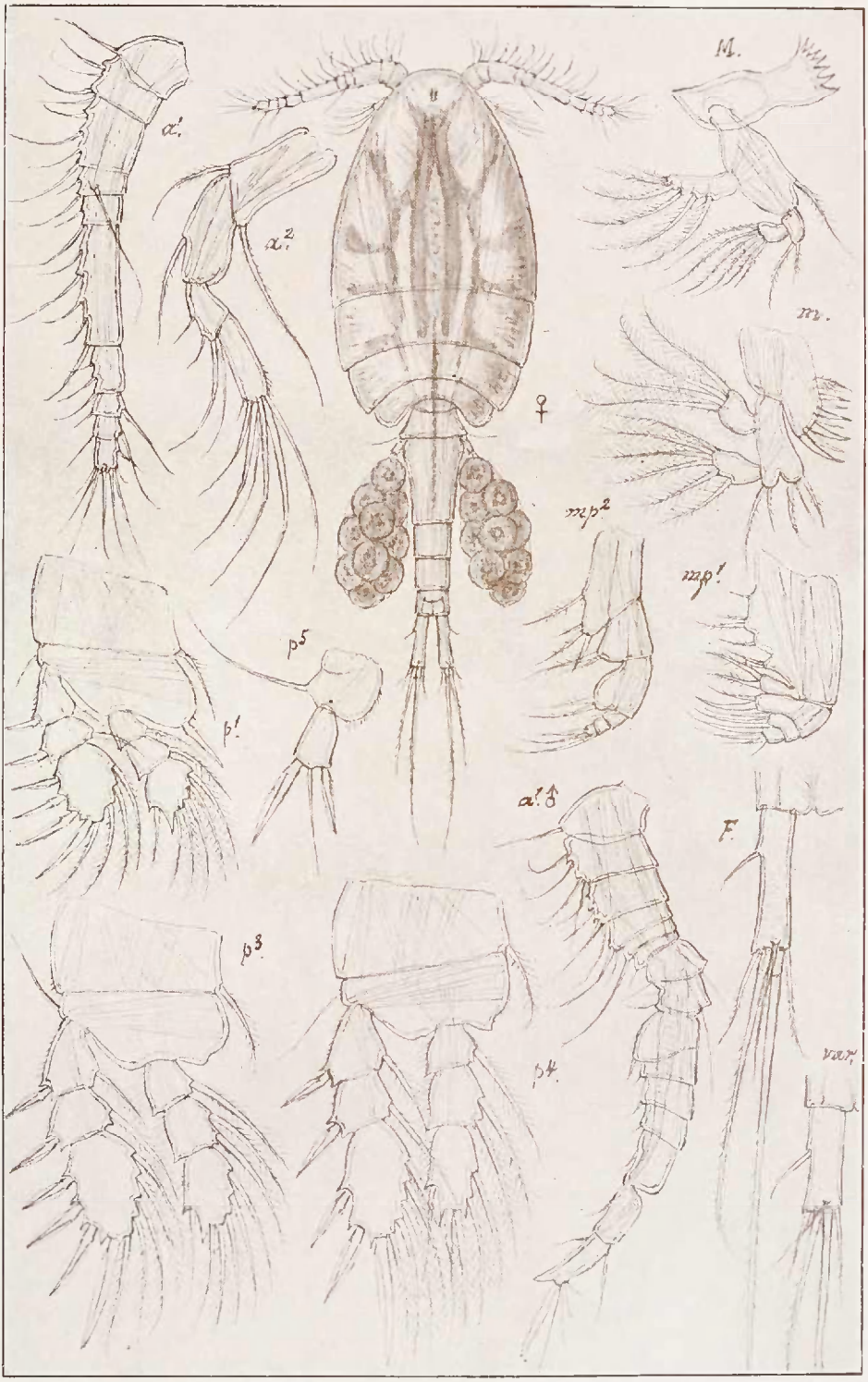
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G. O. Sars, del.

Oithona helgolandica, Claus.

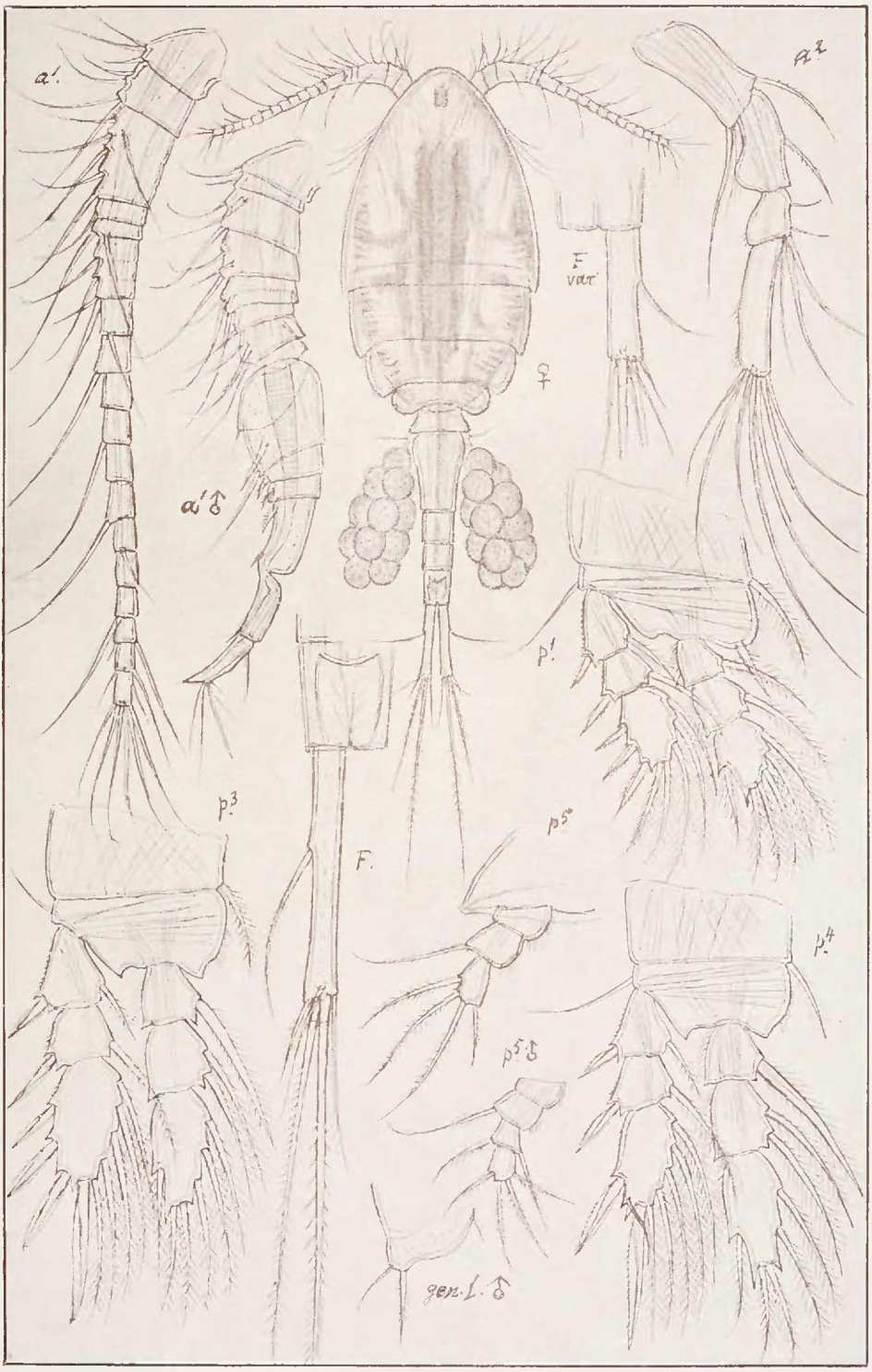
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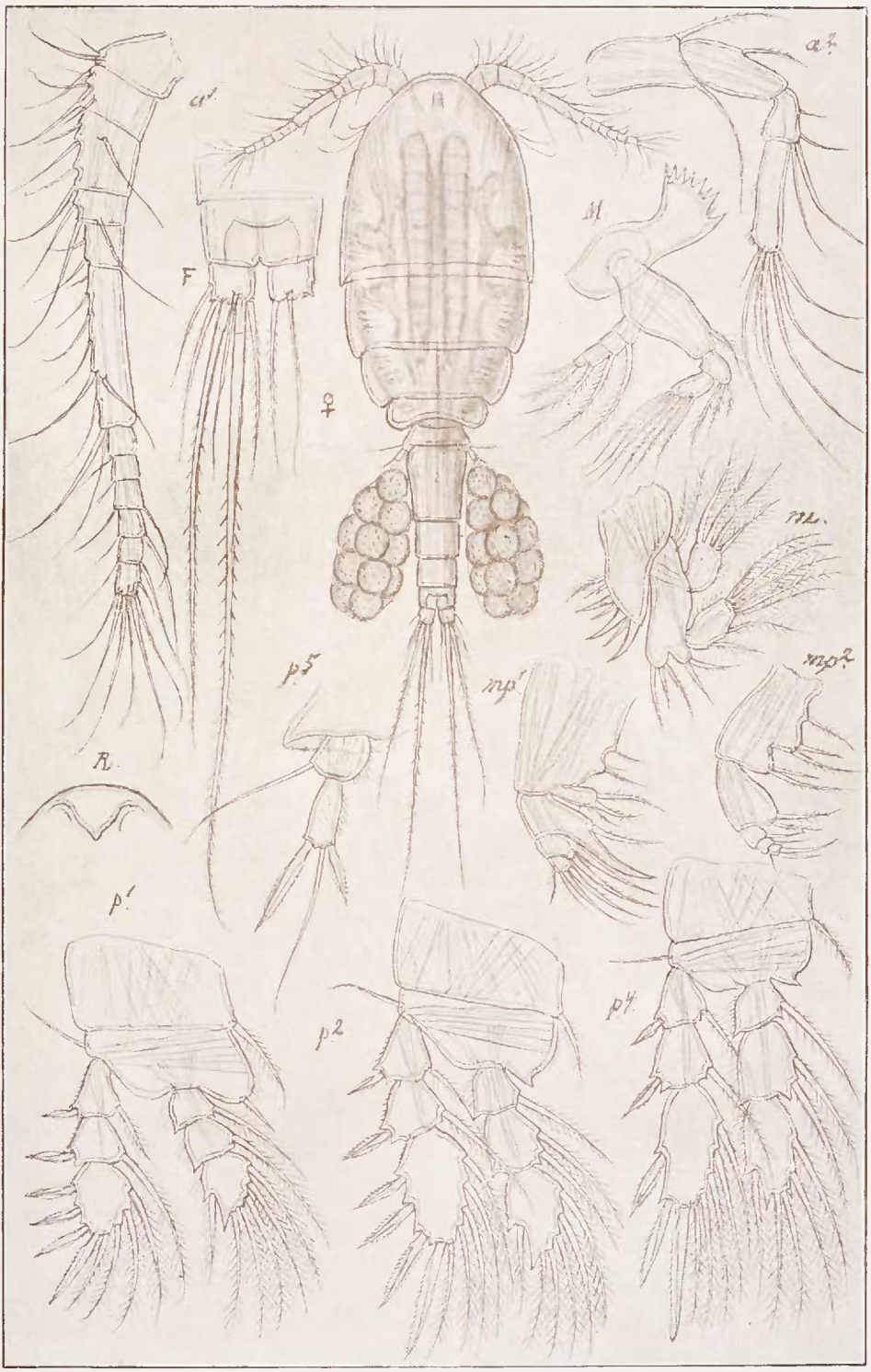
Cyclopina gracilis, Claus.

Copepoda



G. O. Sars, del.

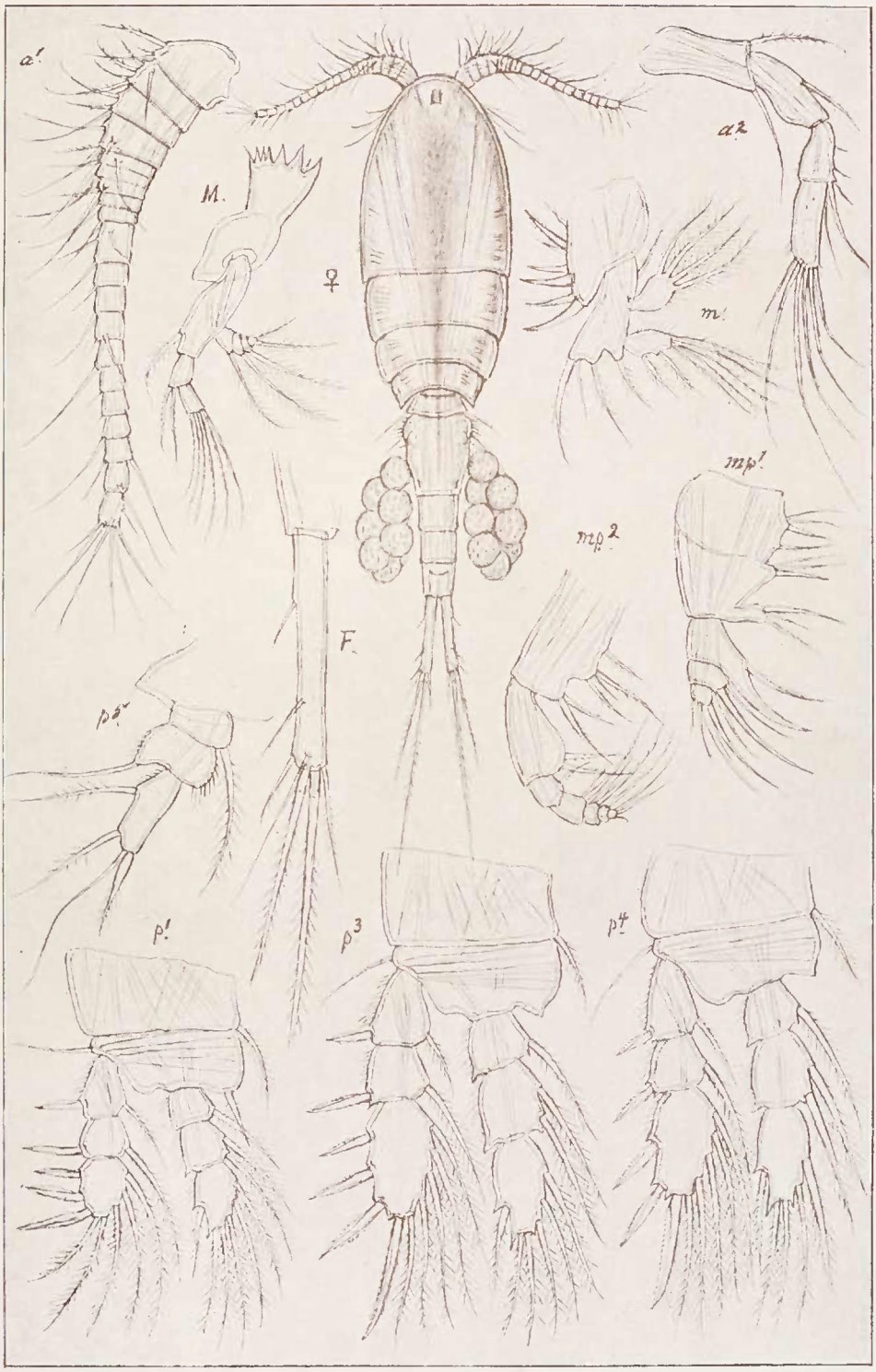
Cyclopina longicornis, Boeck.



G. O. Sars, del.

Cyclopina brevifurea, G. O. Sars.

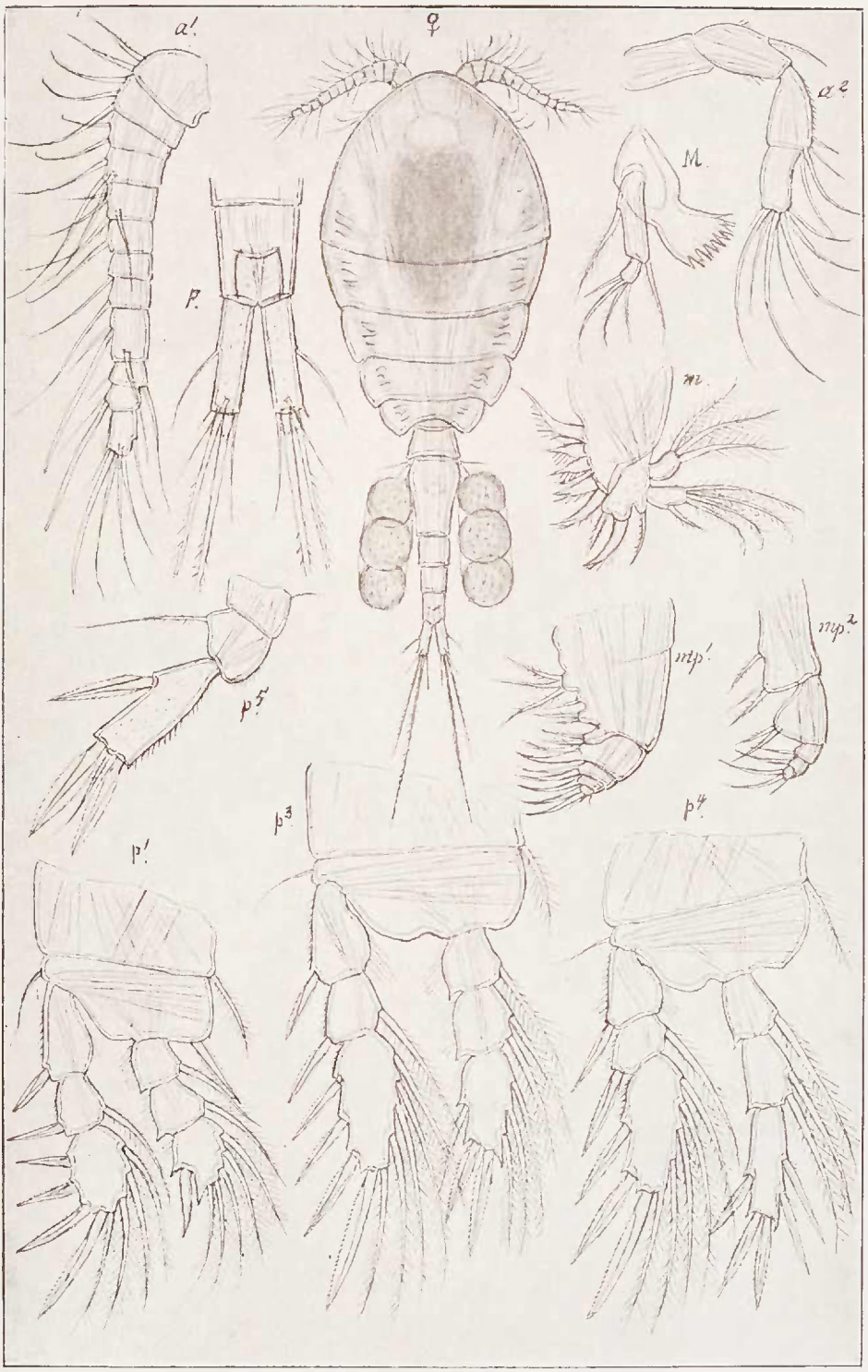
Copepoda



G. O. Sars, del.

Cyclopina elegans, Scott.

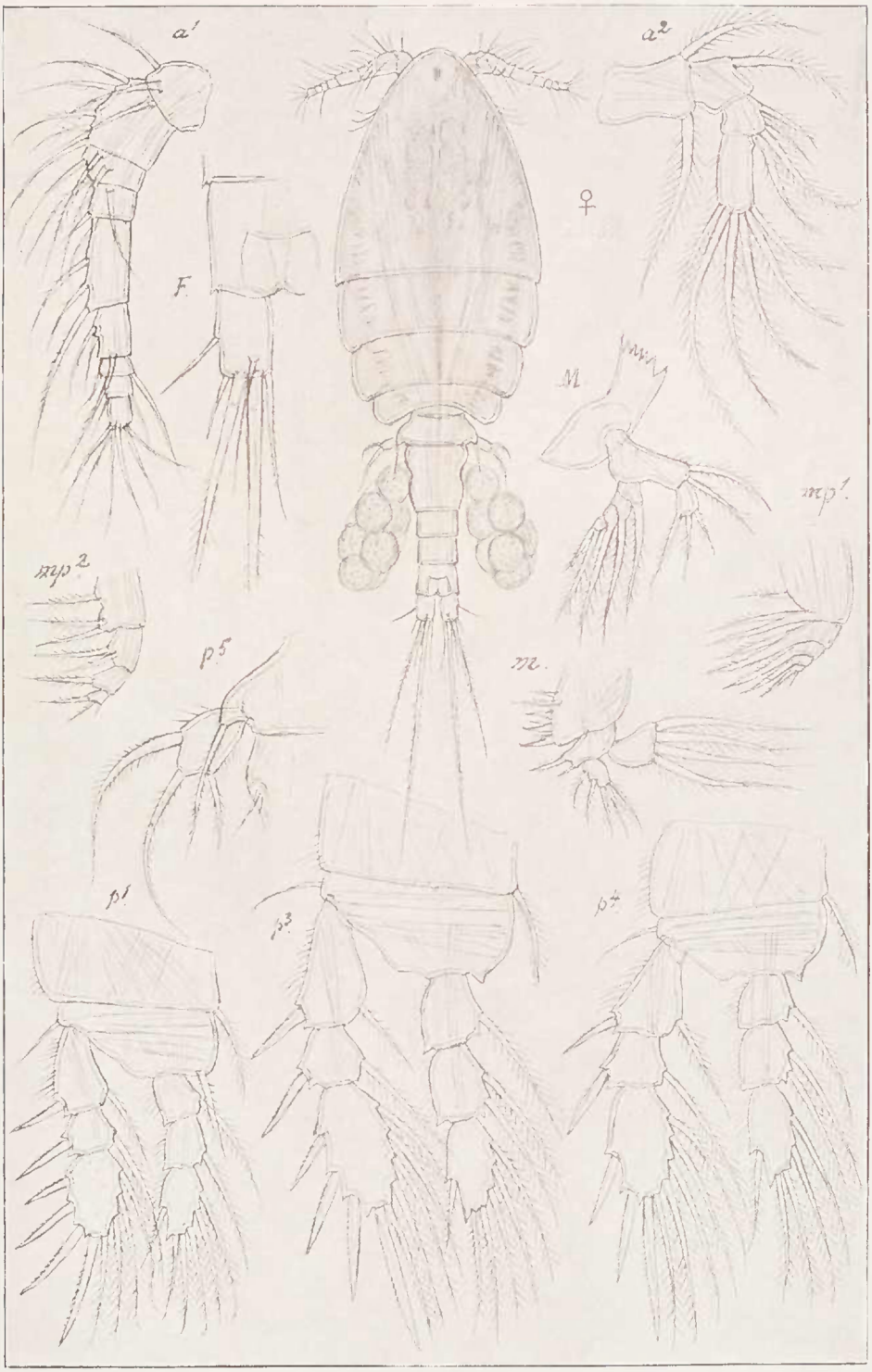
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G. O. Sars, del.

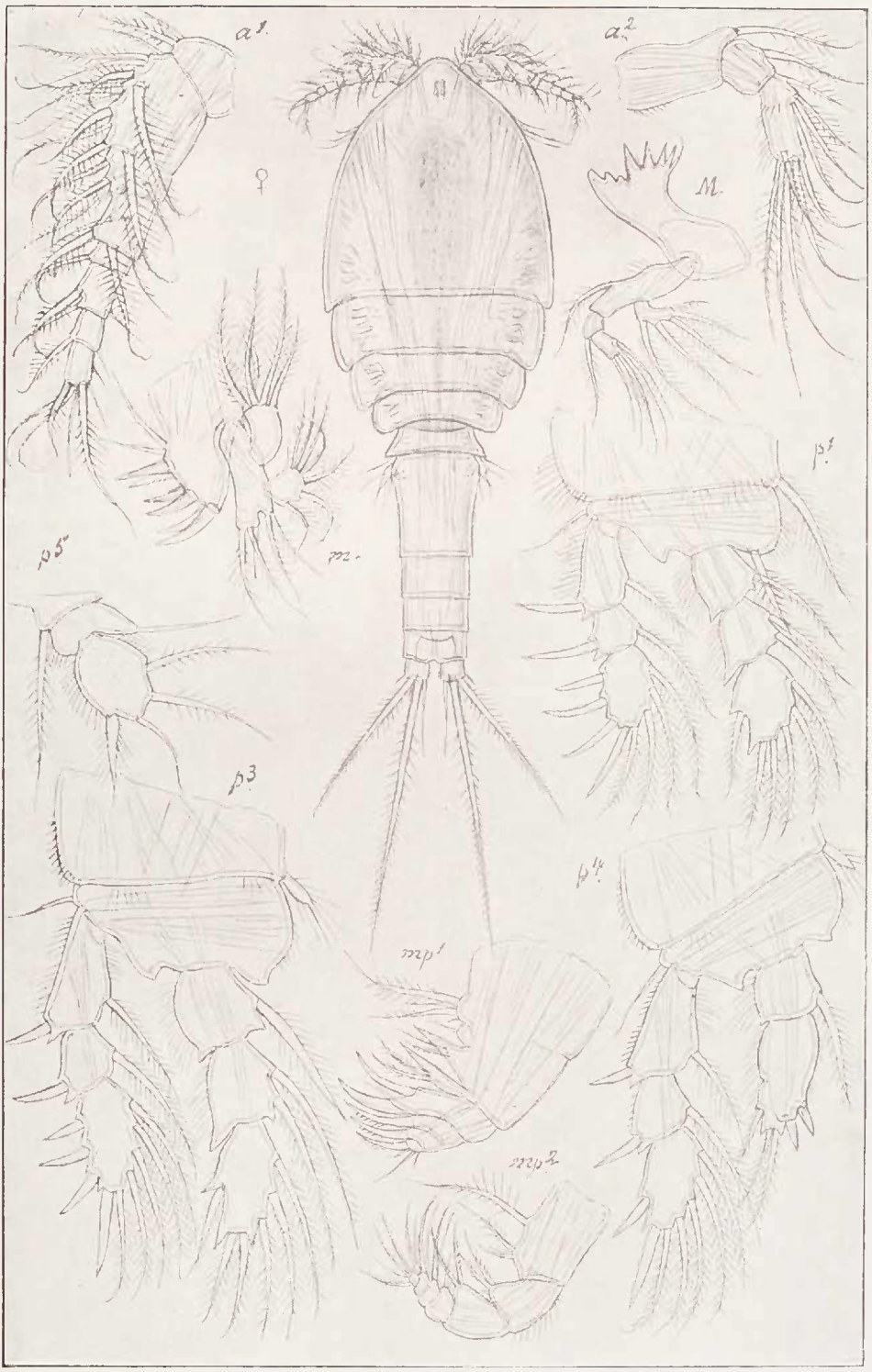
Cyclopinella tumidula, G. O. Sars.

Copepoda



G. O. Sars, del.

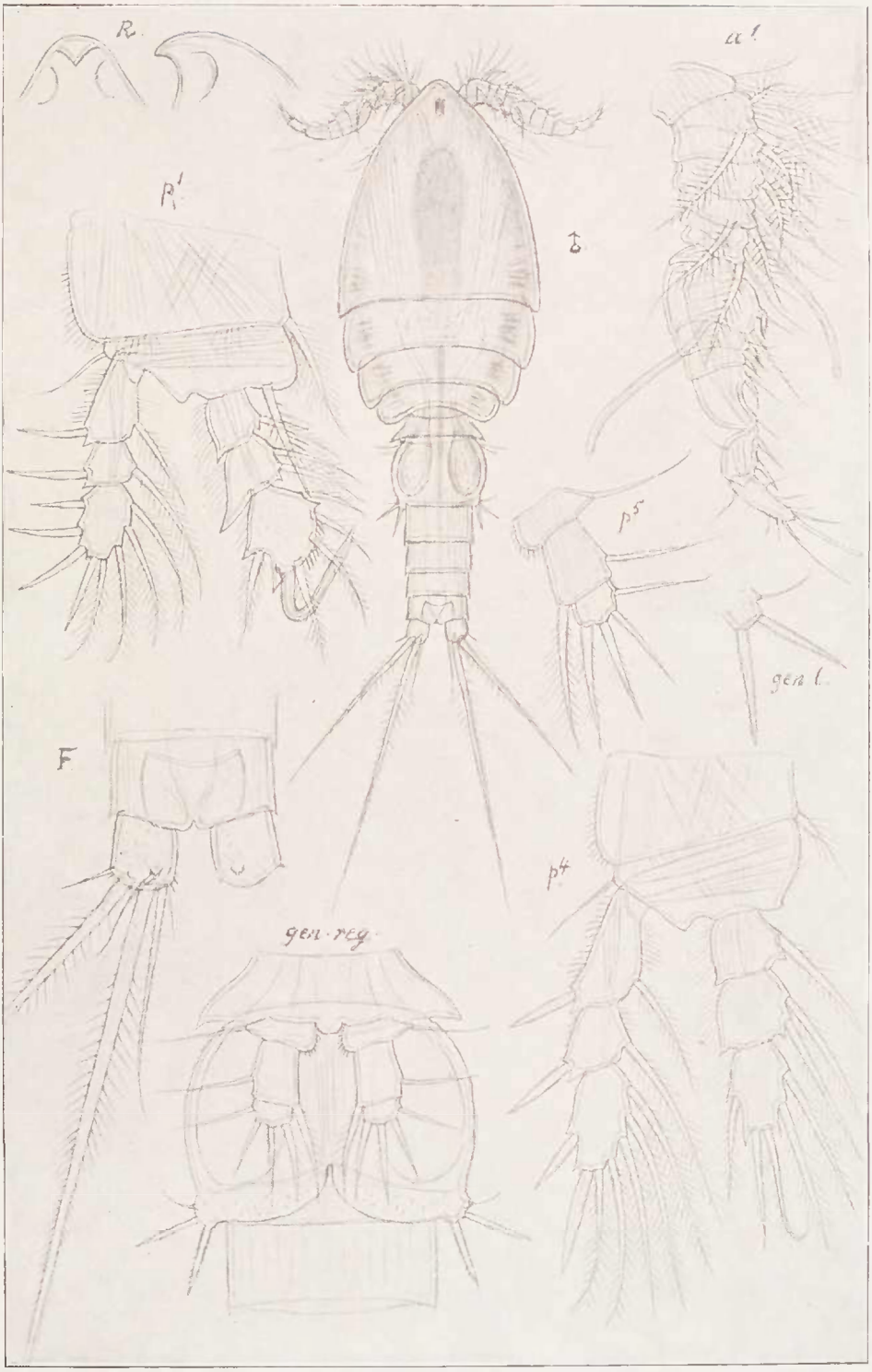
Cyclopetta difficilis, G. O. Sars.



G. O. Sars, del.

Pterinopsyllus insignis, Brady.

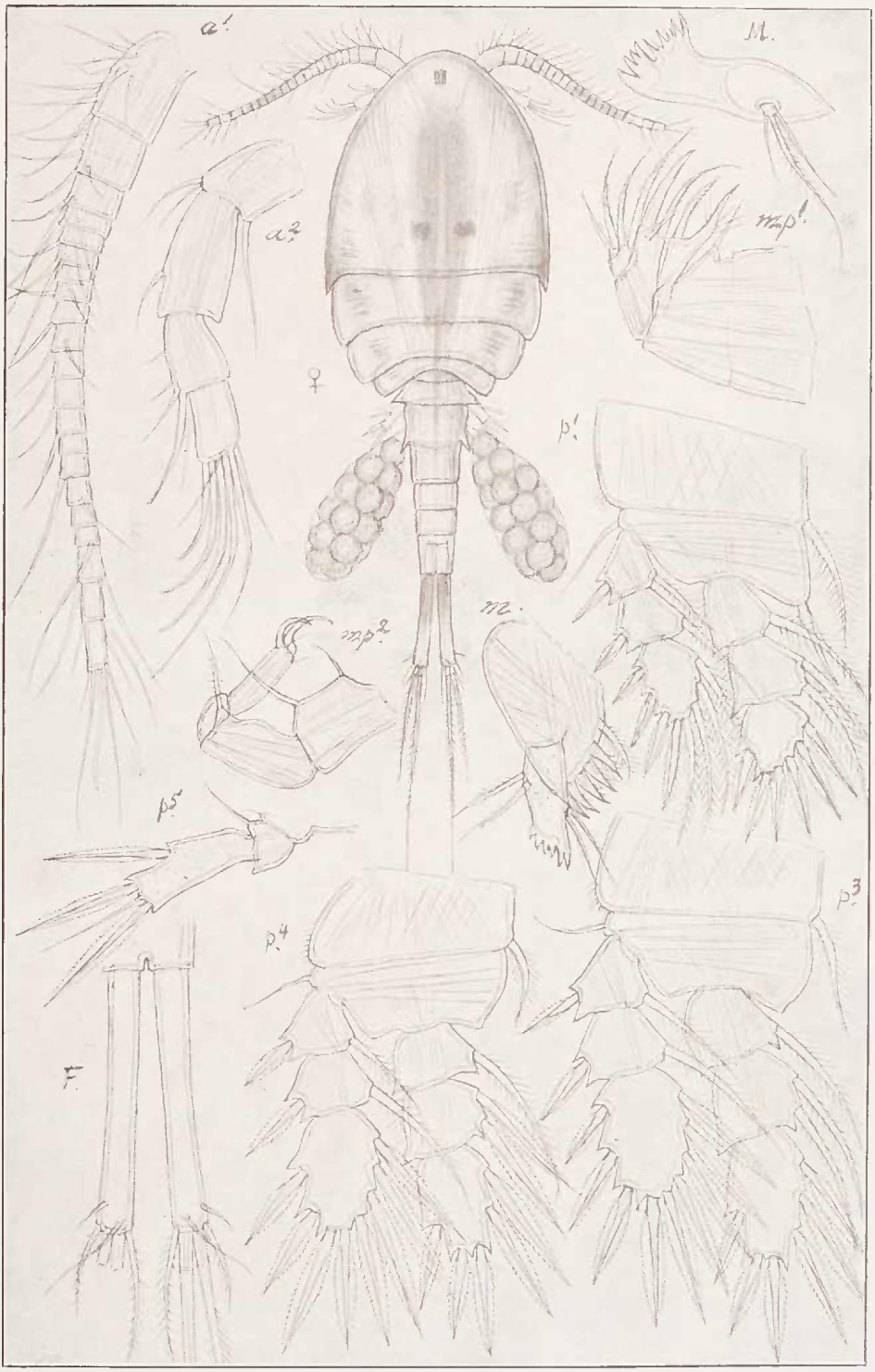
Copepoda



G. O. Sars, del.

Pterinopsyllus insignis, Brady.
(Male)

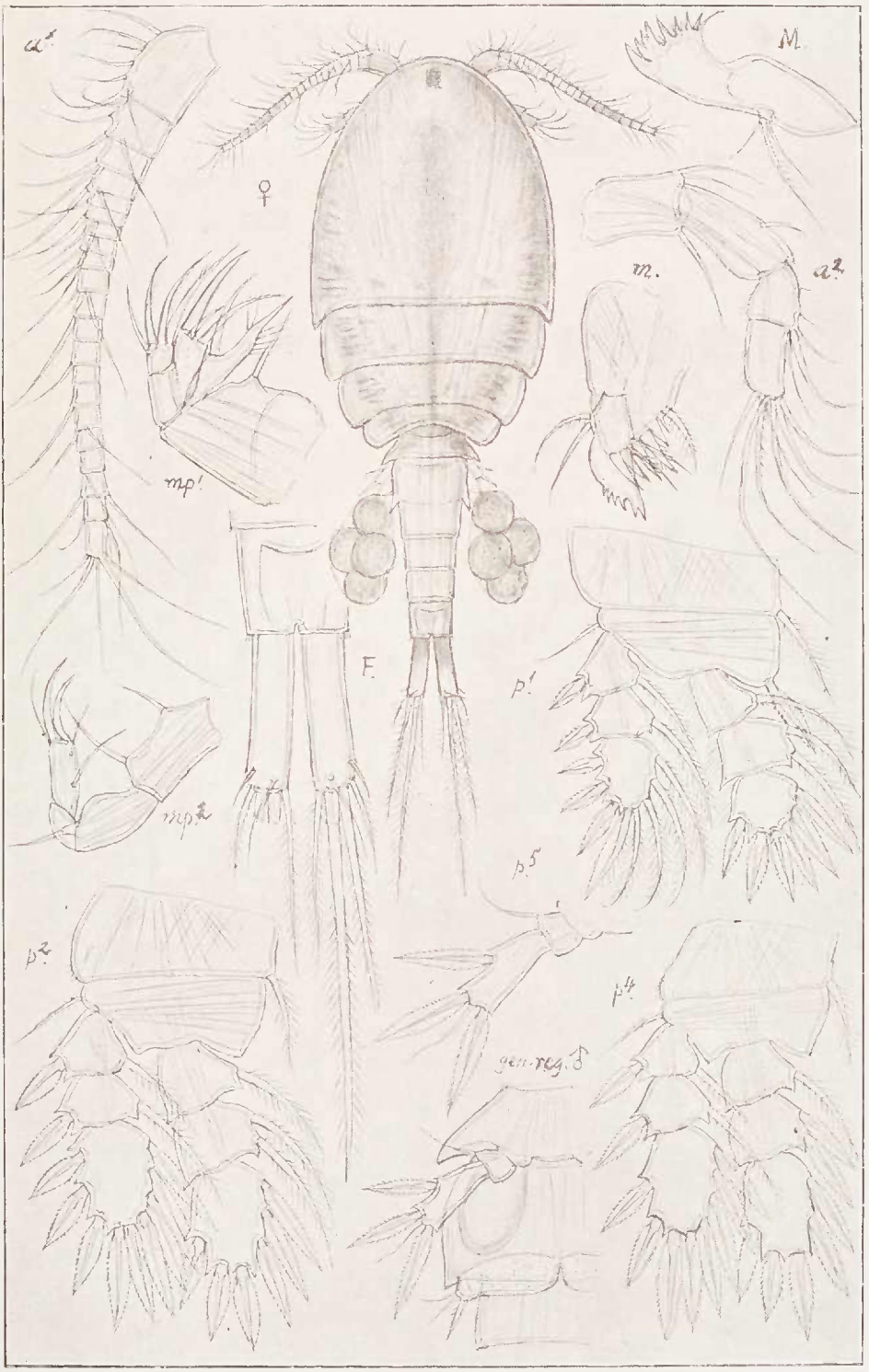
Copepoda



G. O. Sars, del.

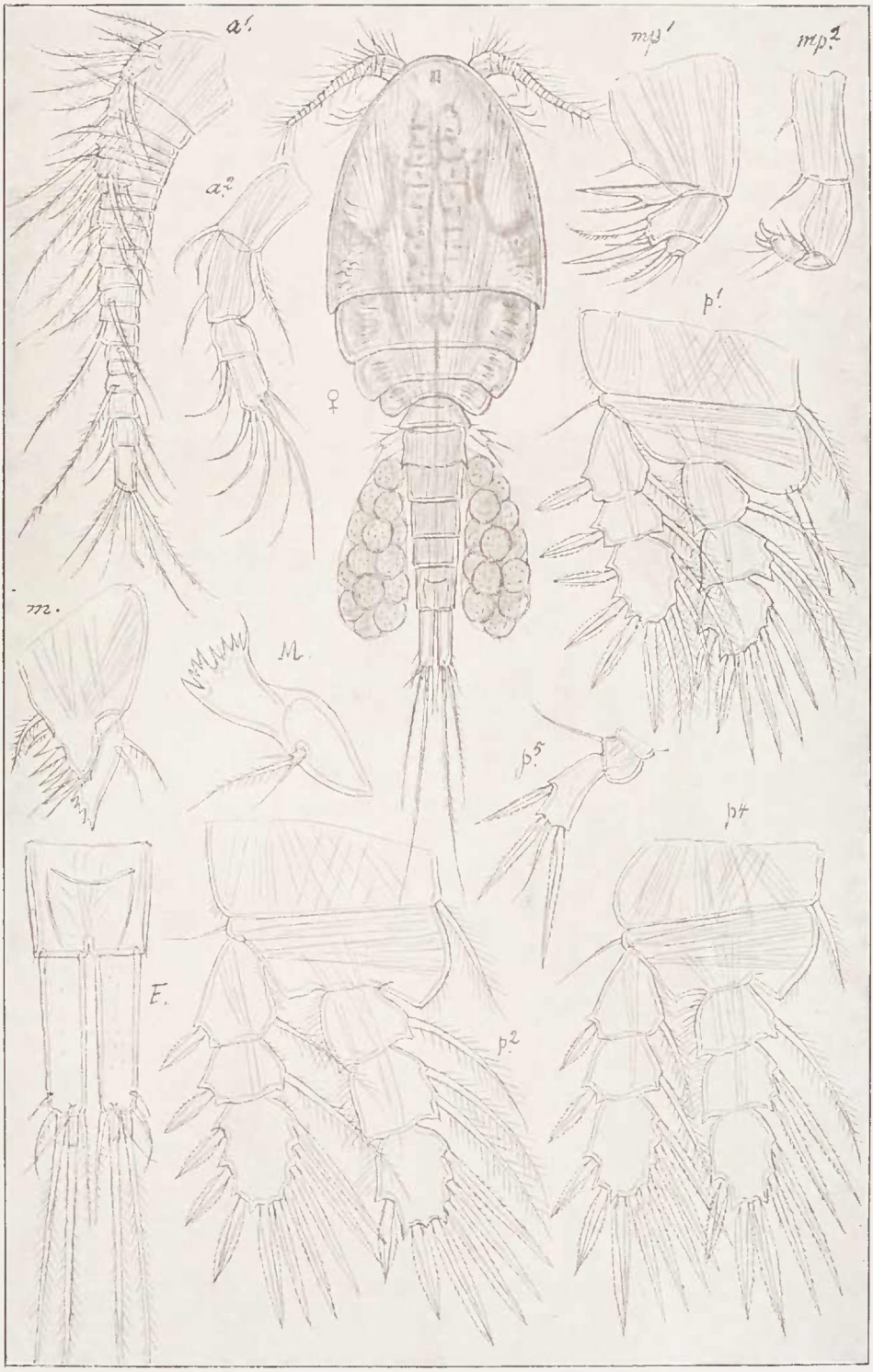
Euryte longicauda, Philippi.

Copepoda



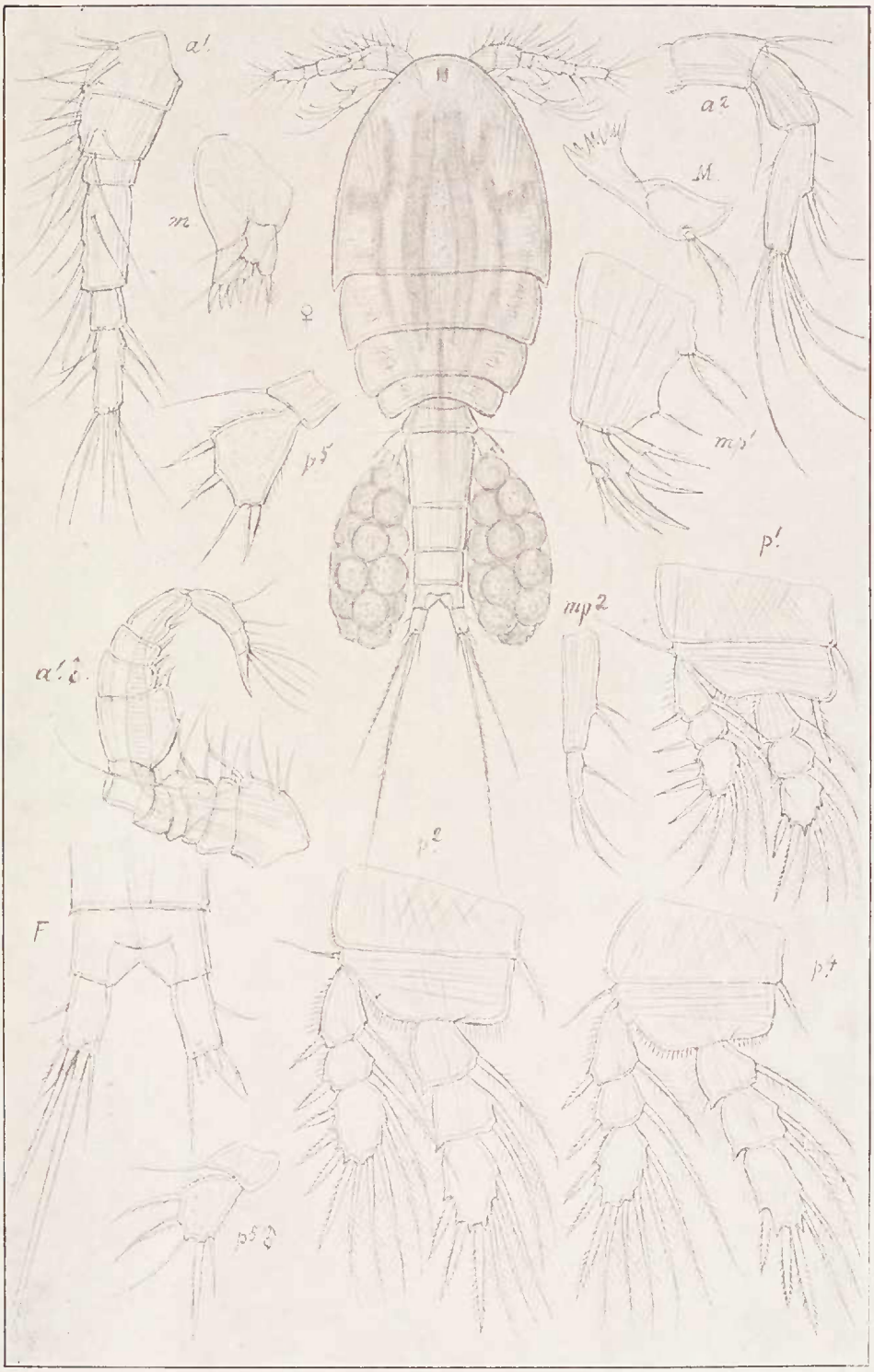
G. O. Sars, del.

Euryte robusta, Giesbr.



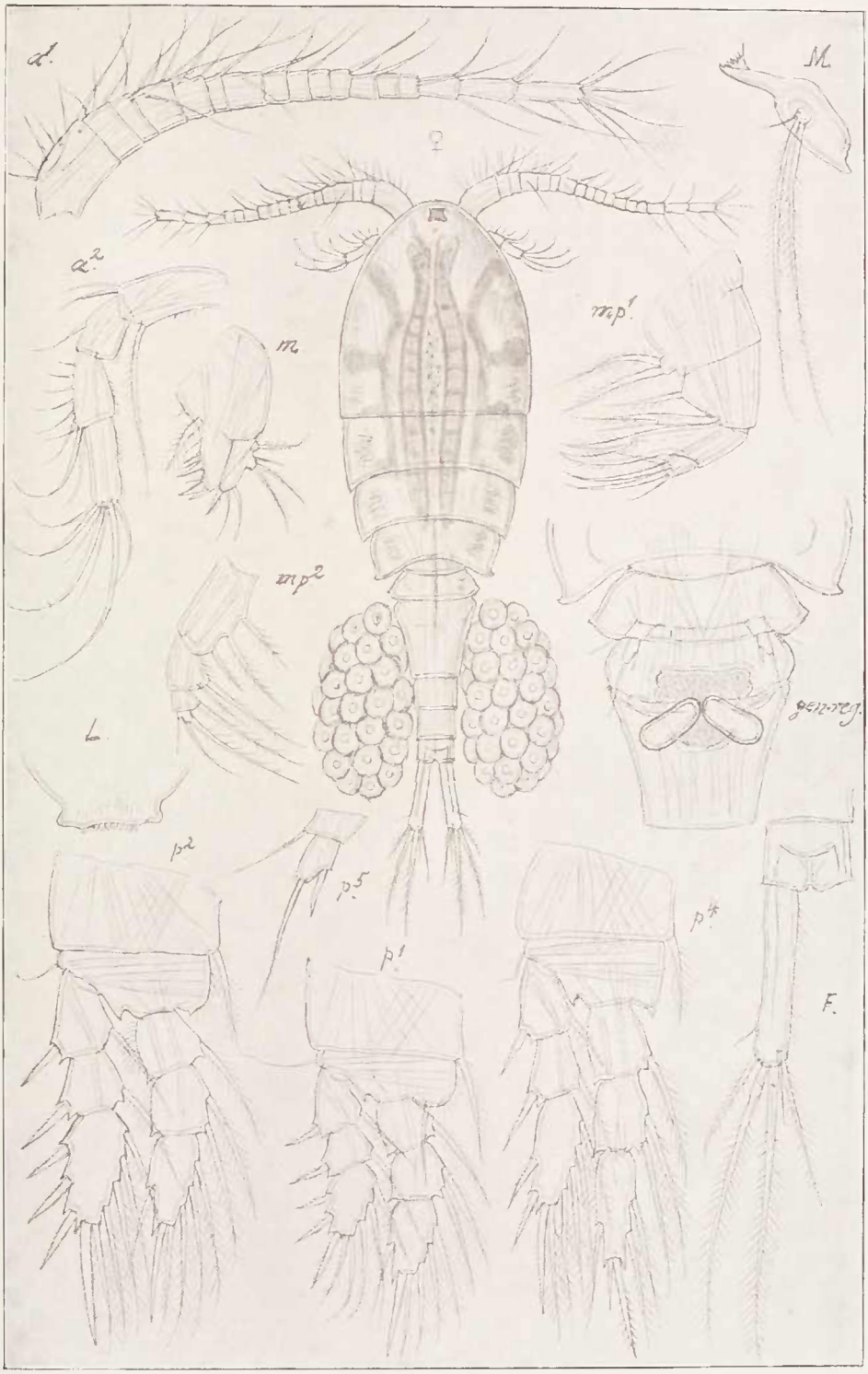
G. O. Sars, del.

Euryte curticornis, G. O. Sars.



G. O. Sars, del.

Halicyclops magniceps (Lilljeb.).



G. O. Sars, del.

Cyclops strenuus, Fischer.

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

PUBLISHED BY THE BERGEN MUSEUM

SOLD BY

ALB. CAMMERMEYER'S FORLAG, CHRISTIANIA

1913

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.

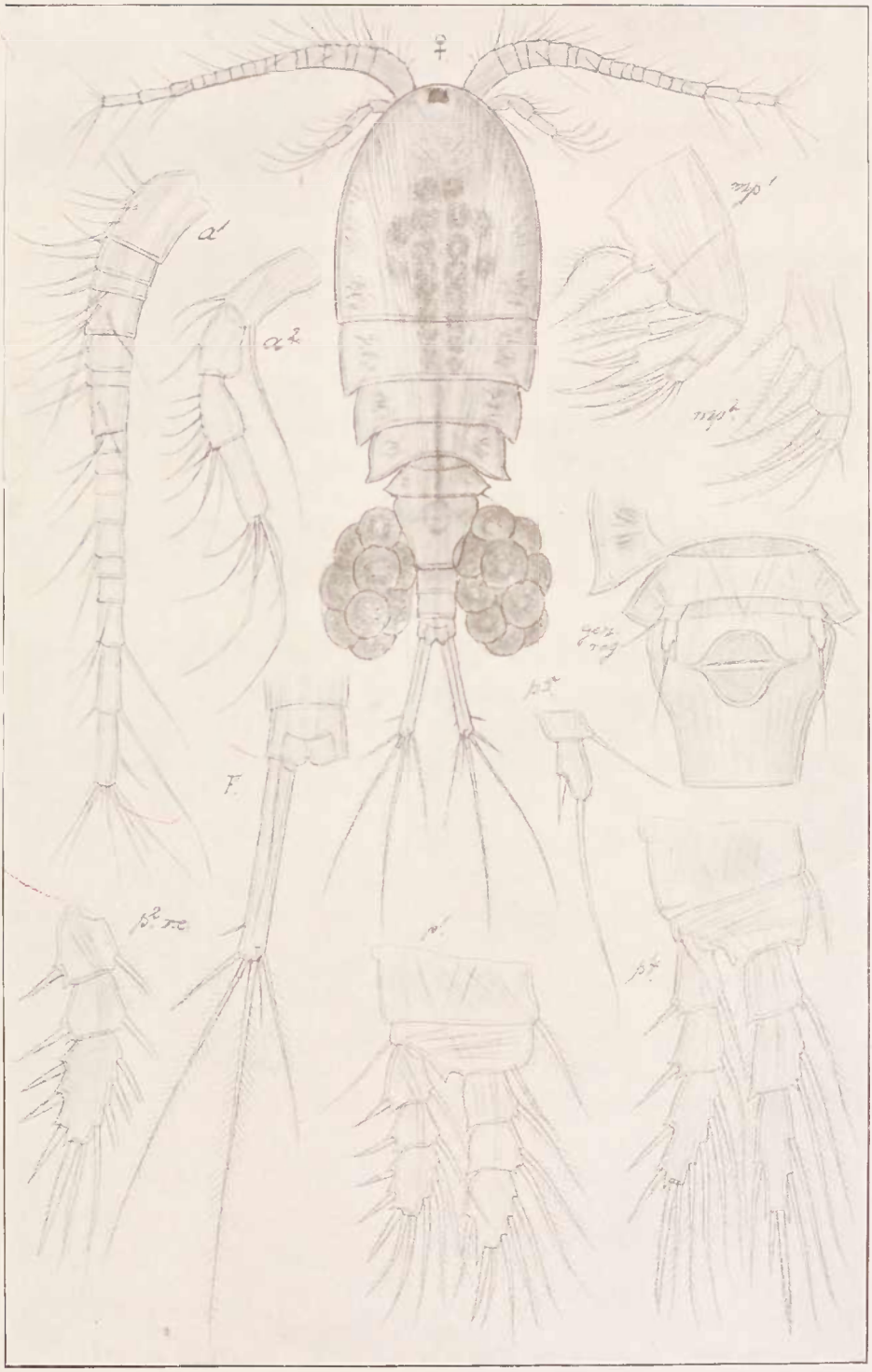
Syn.: *Cyclops diaphanus*, Rehberg (not Fischer).

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.

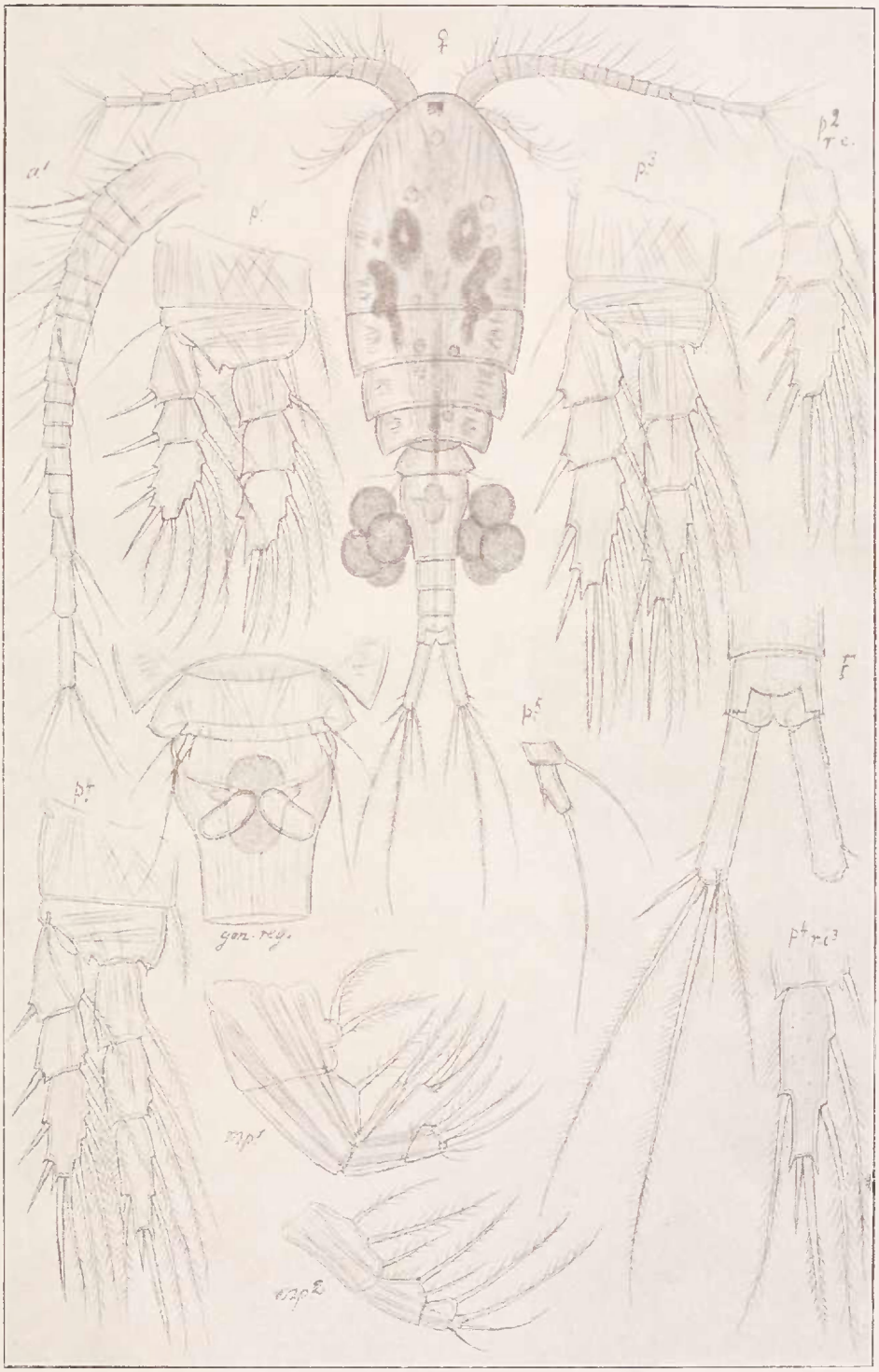
Copepoda



G. O. Sars, del.

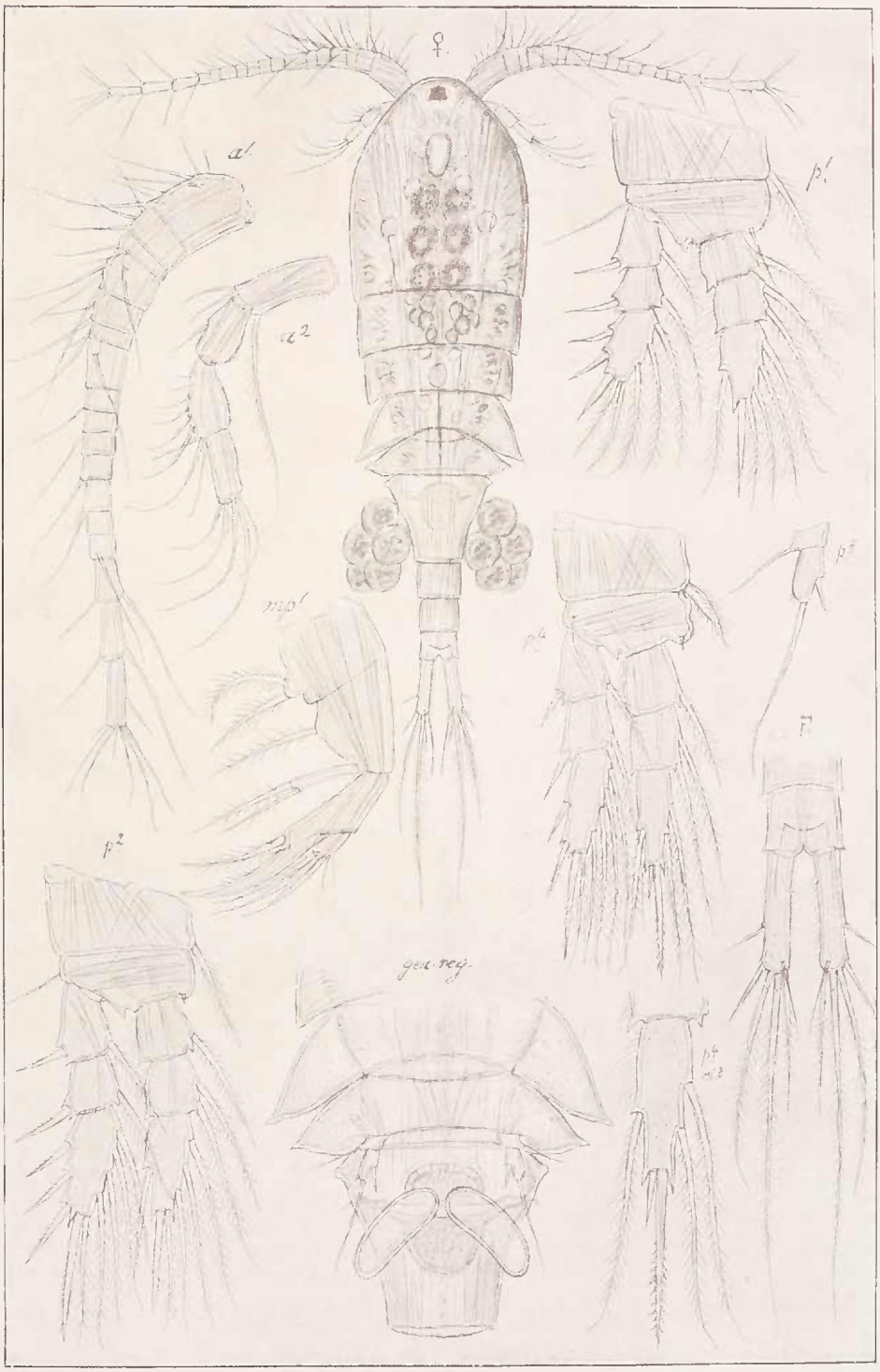
Cyclops abyssorum, G. O. Sars.

Copepoda



G. O. Sars, del.

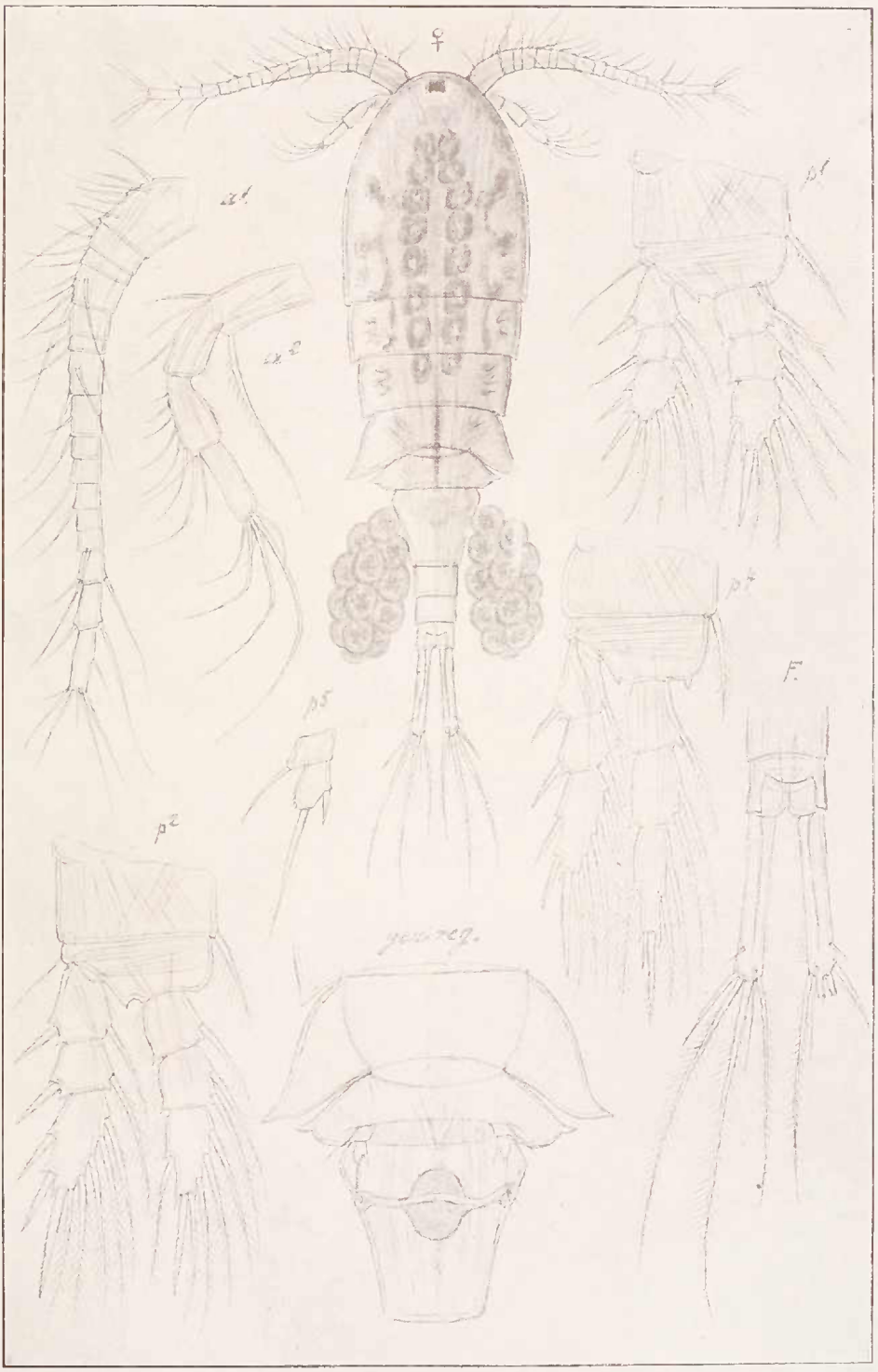
Cyclops lacustris, G. O. Sars.



G. O. Sars, del.

Cyclops scutifer, G. O. Sars.

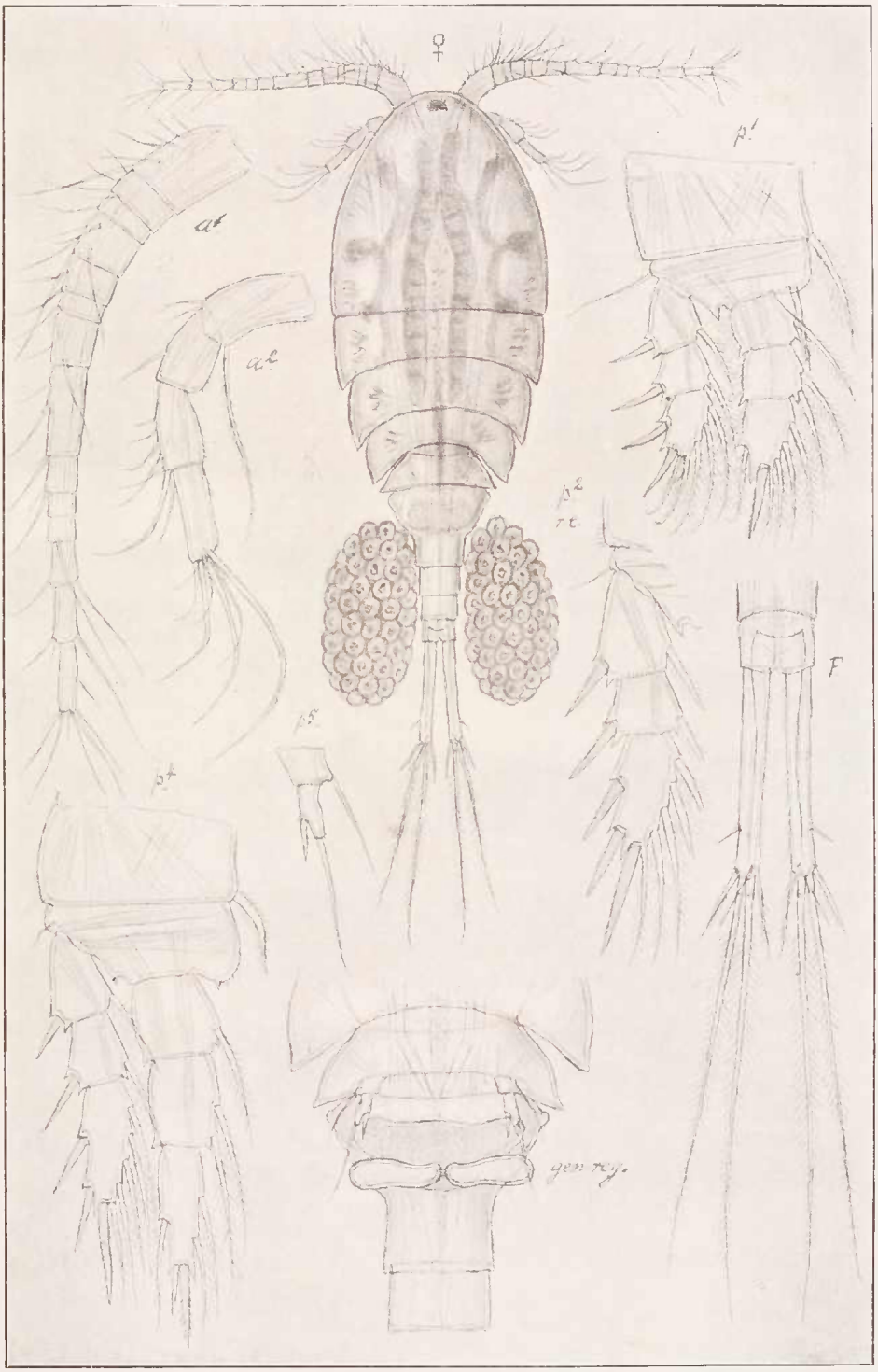
Copepoda



G. O. Sars, del.

Cyclops vicinus, Uljanin.

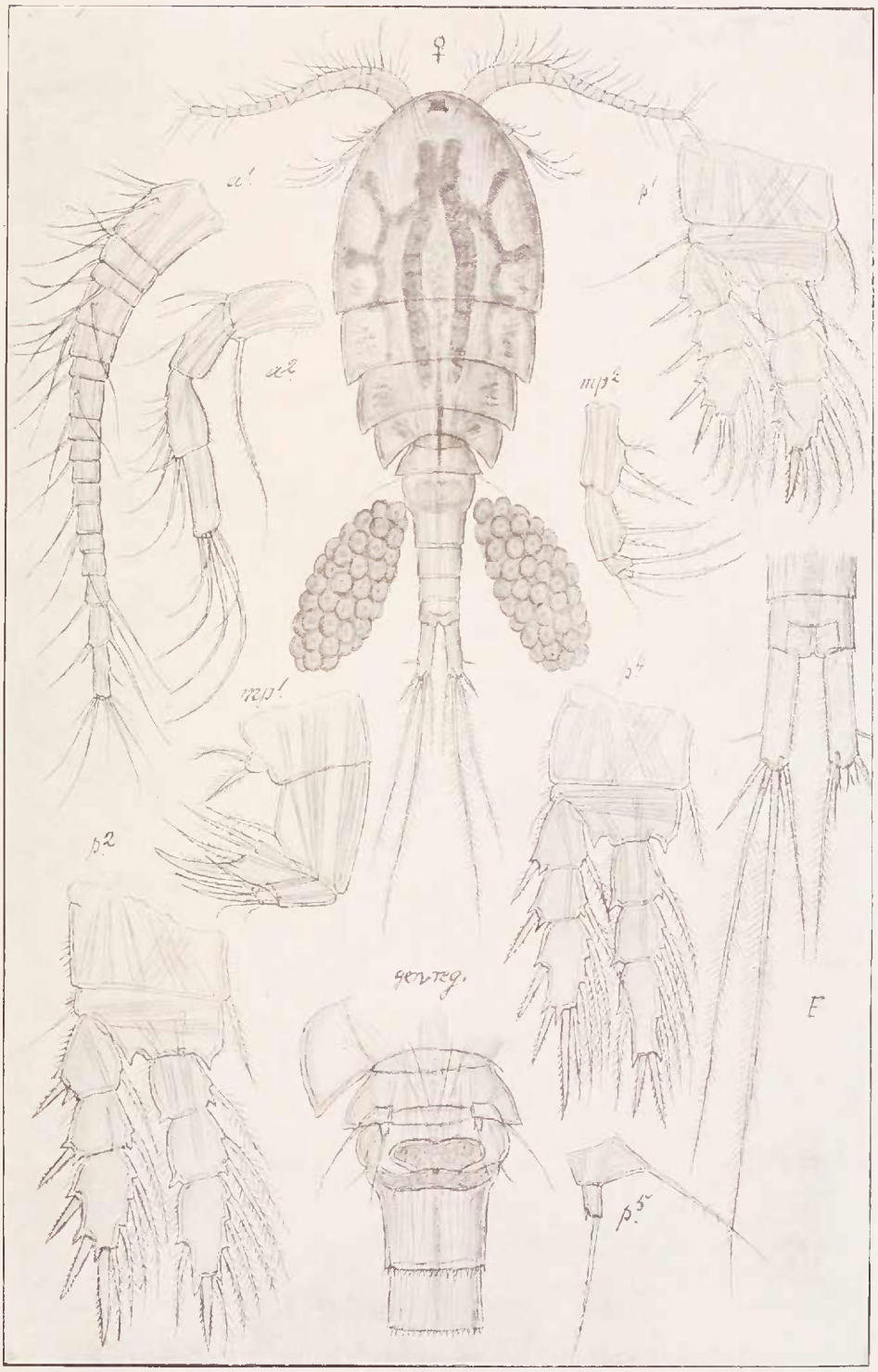
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G. O. Sars, del.

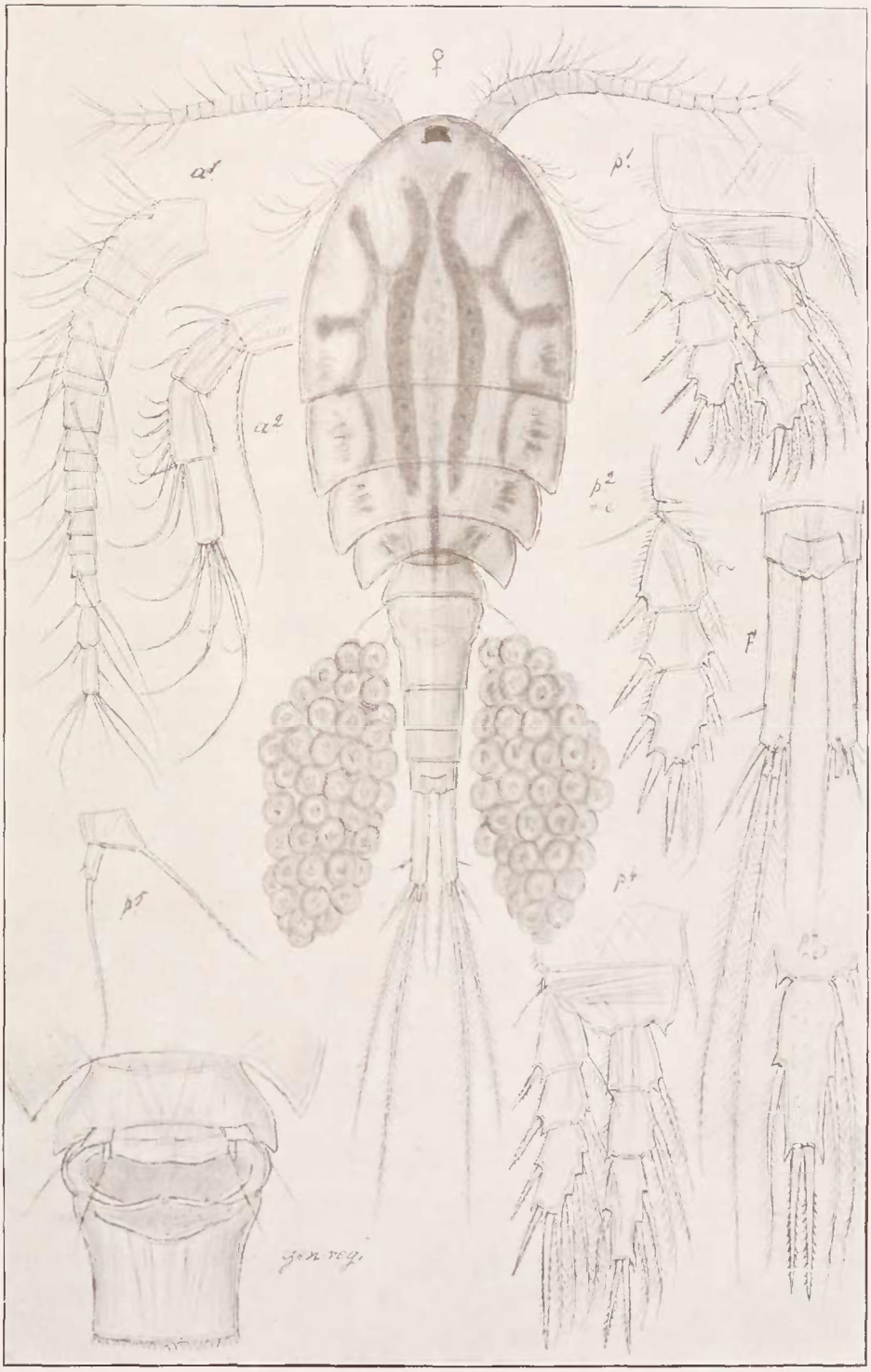
Cyclops insignis, Claus.

Copepoda



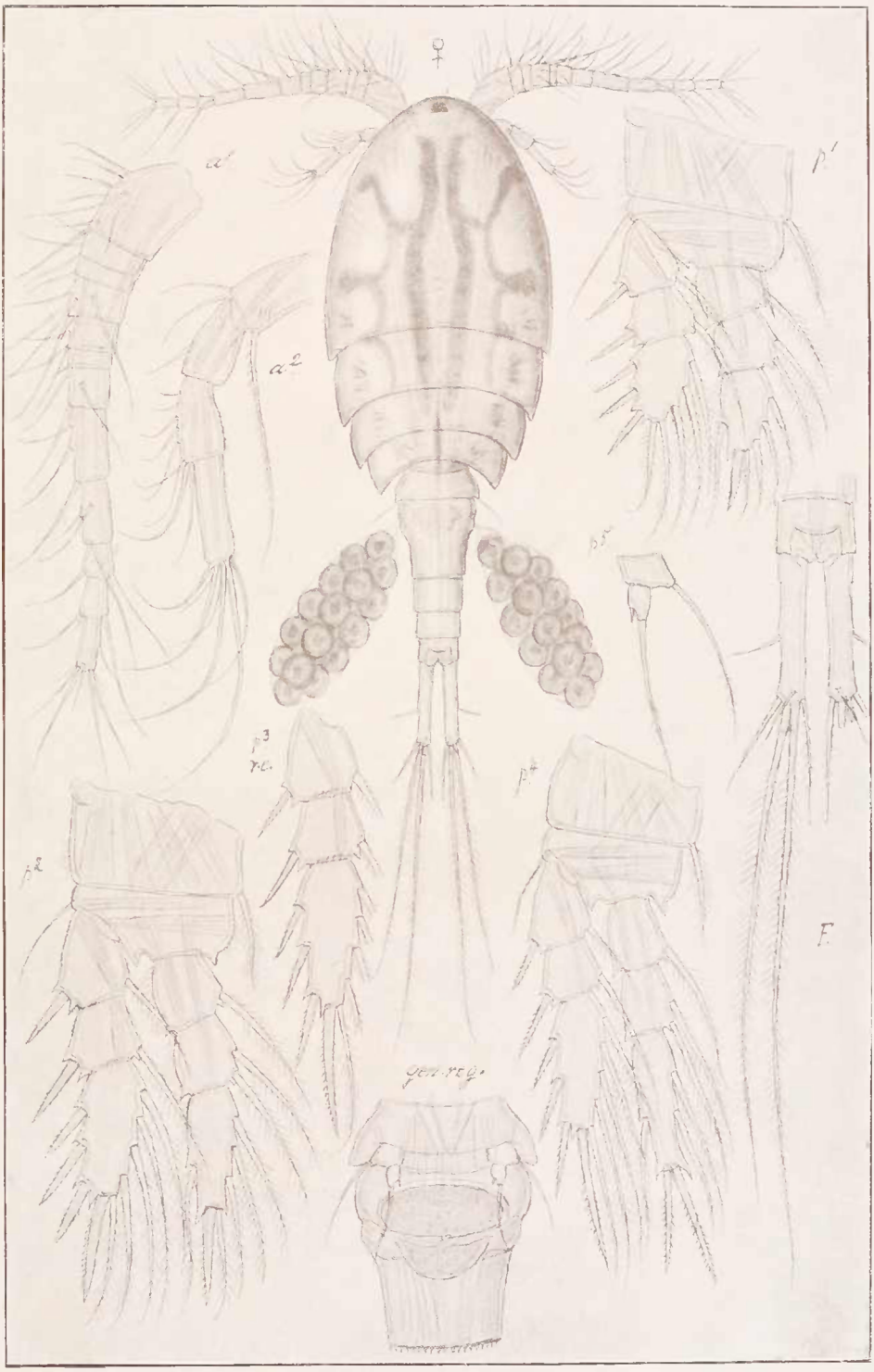
G. O. Sars, del.

Cyclops vulgaris, Koch.



G. O. Sars, del.

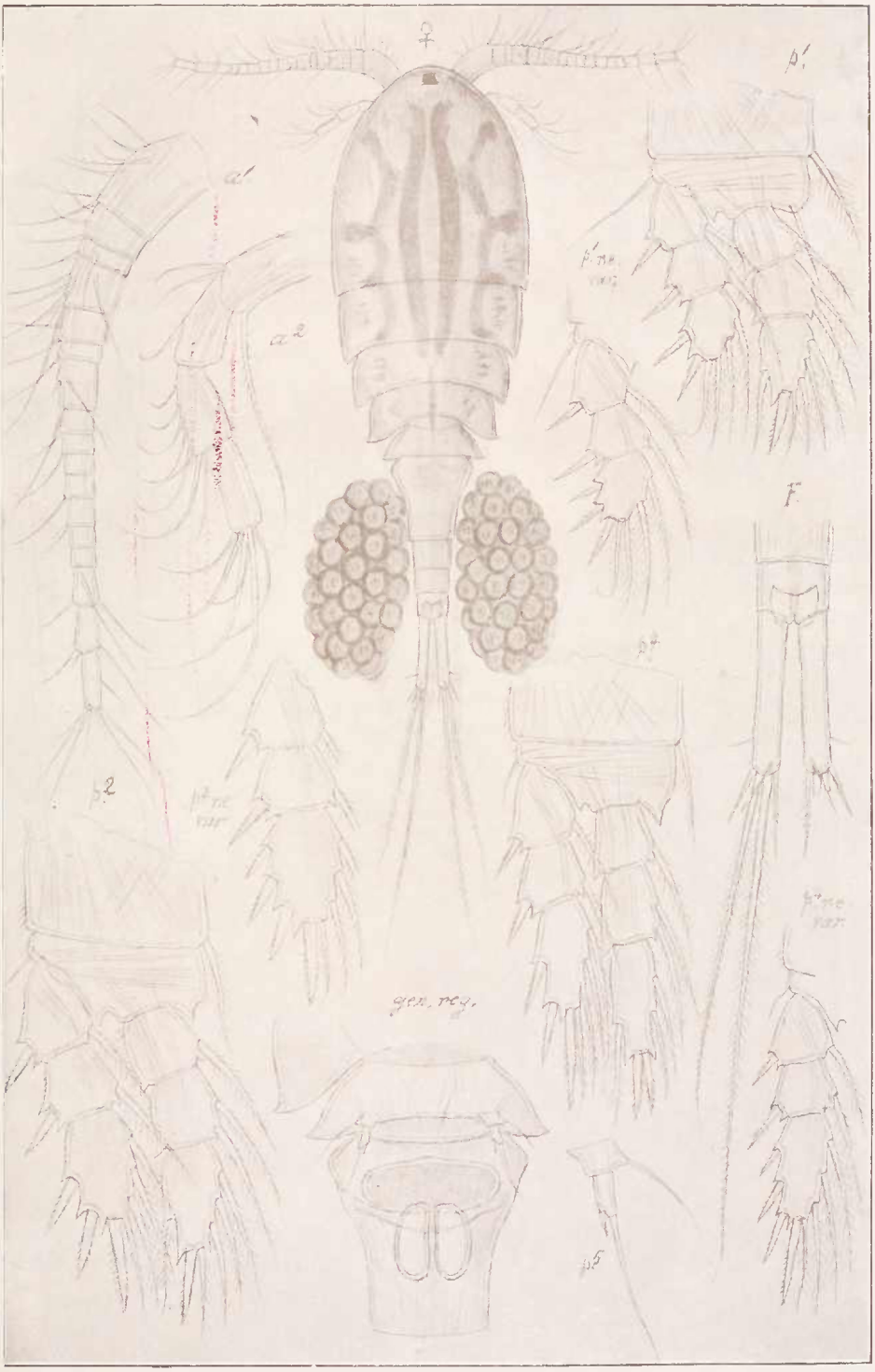
Cyclops gigas, Claus.



G. O. Sars, del.

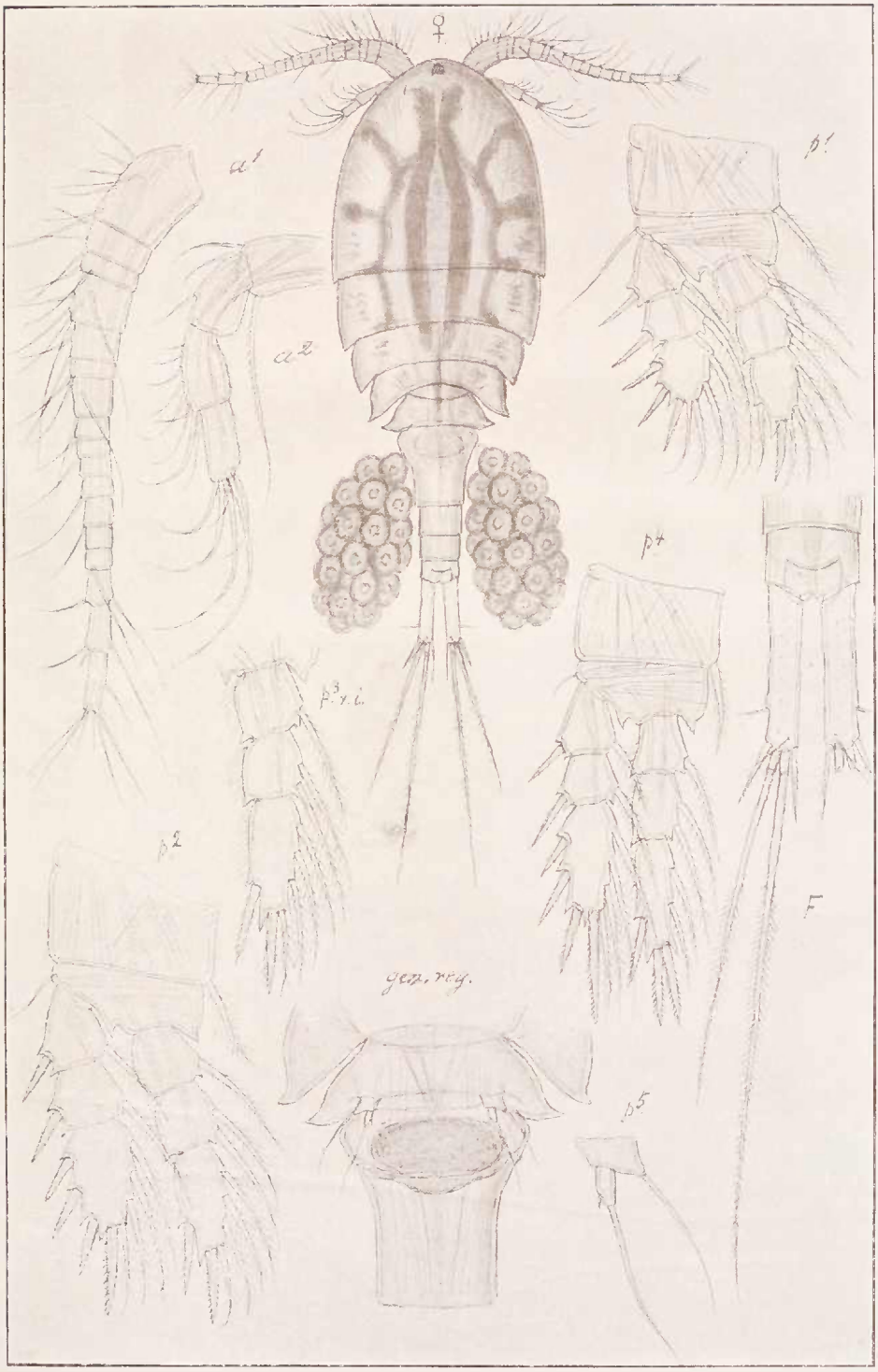
Cyclops capillatus, G. O. Sars.

Copepoda



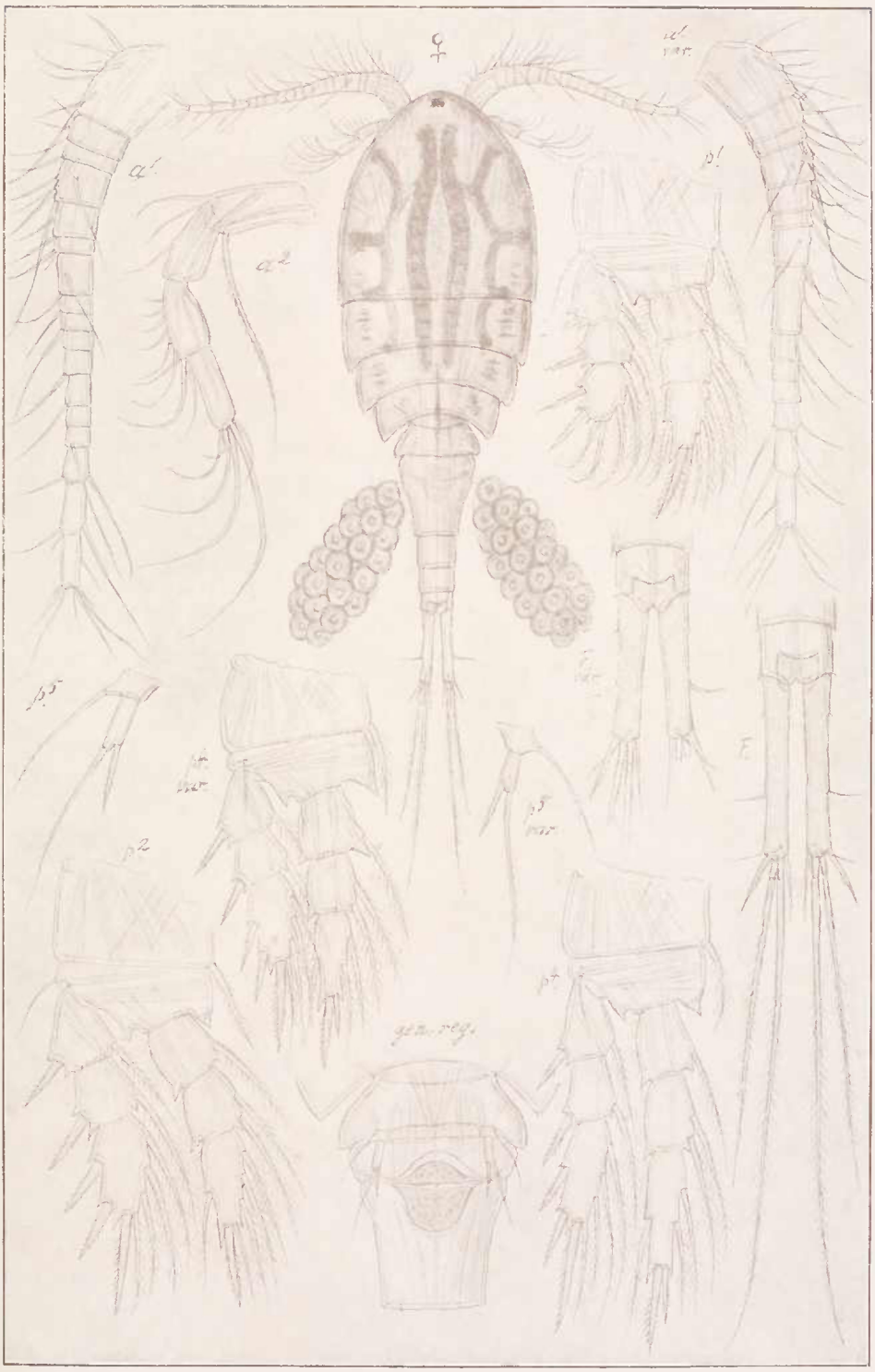
G. O. Sars, del.

Cyclops lucidulus. Koch.



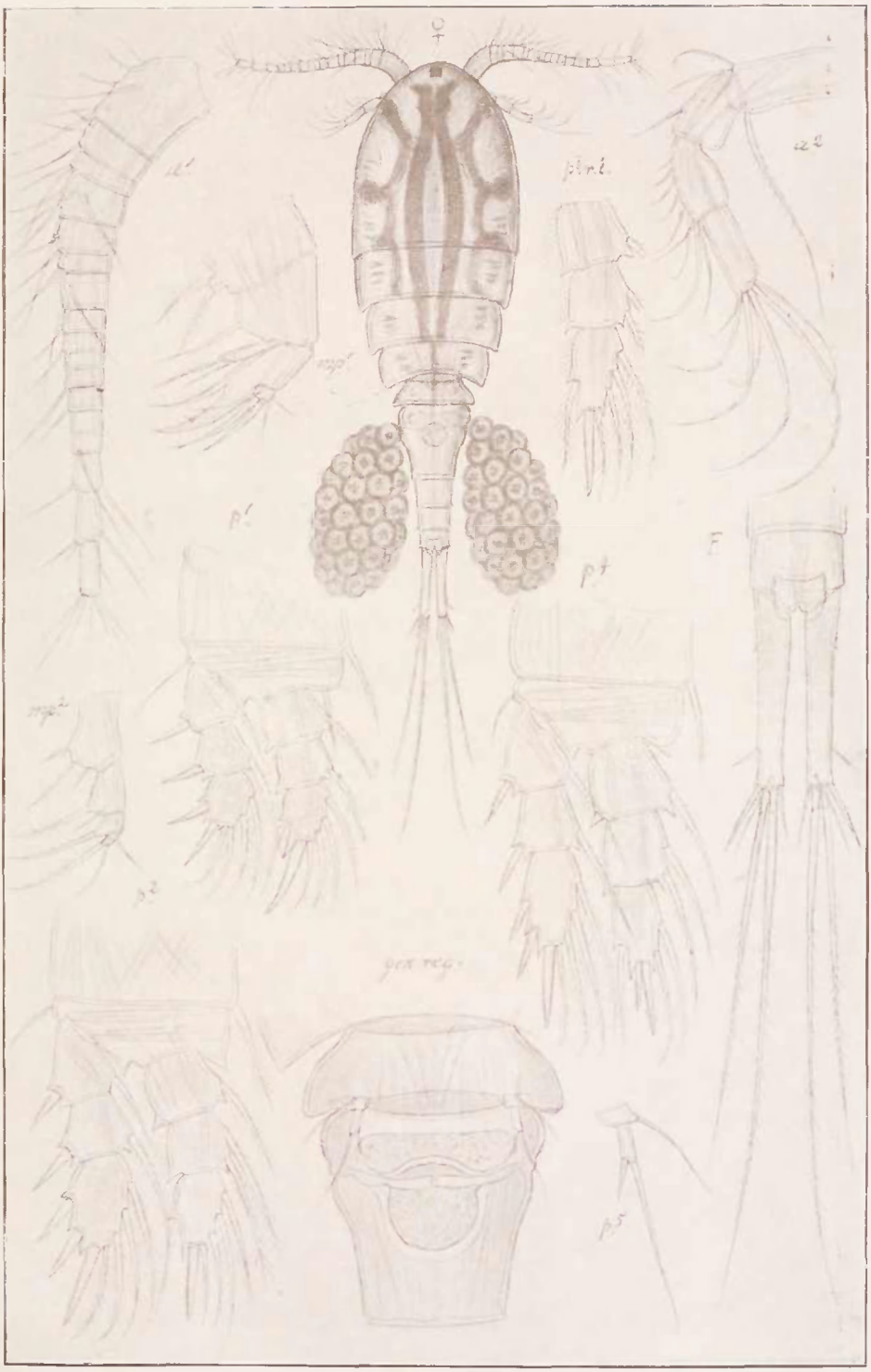
G. O. Sars, del.

Cyclops robustus, G. O. Sars.



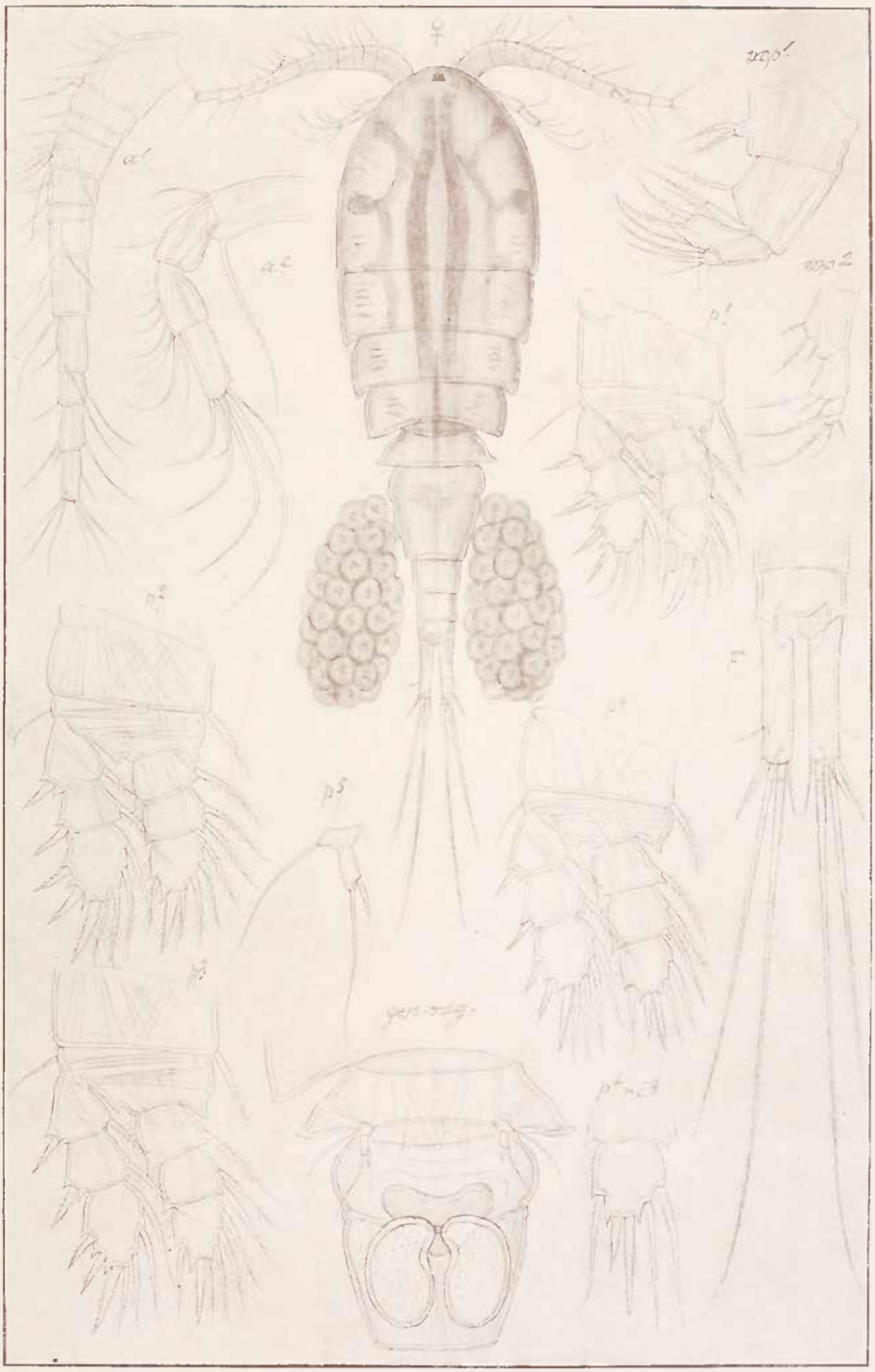
G. O. Sars, del.

Cyclops pulchellus, Koch.



G. O. Sars, del.

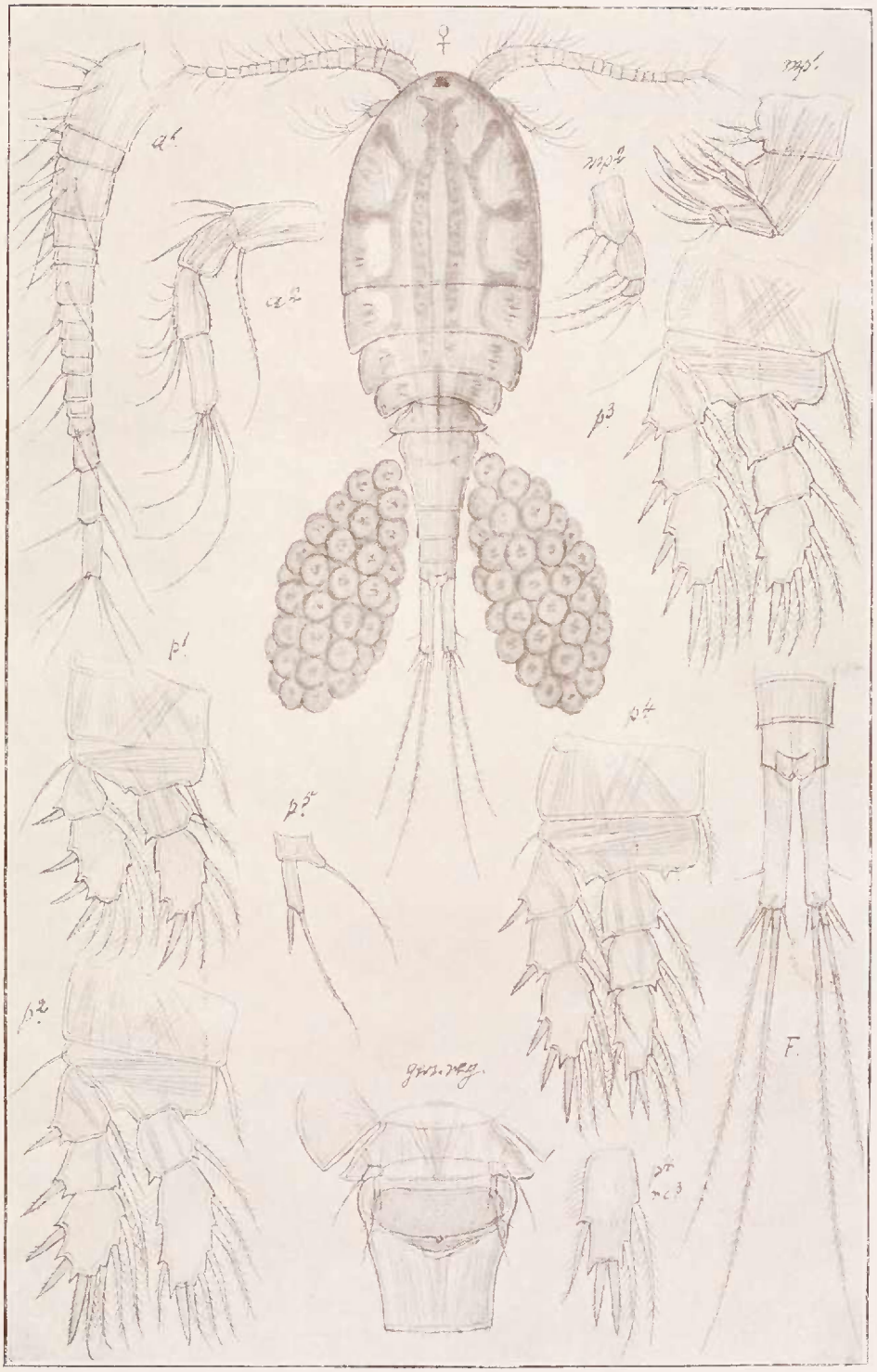
Cyclops bisetosus, Rehberg.



G. O. Sars, del.

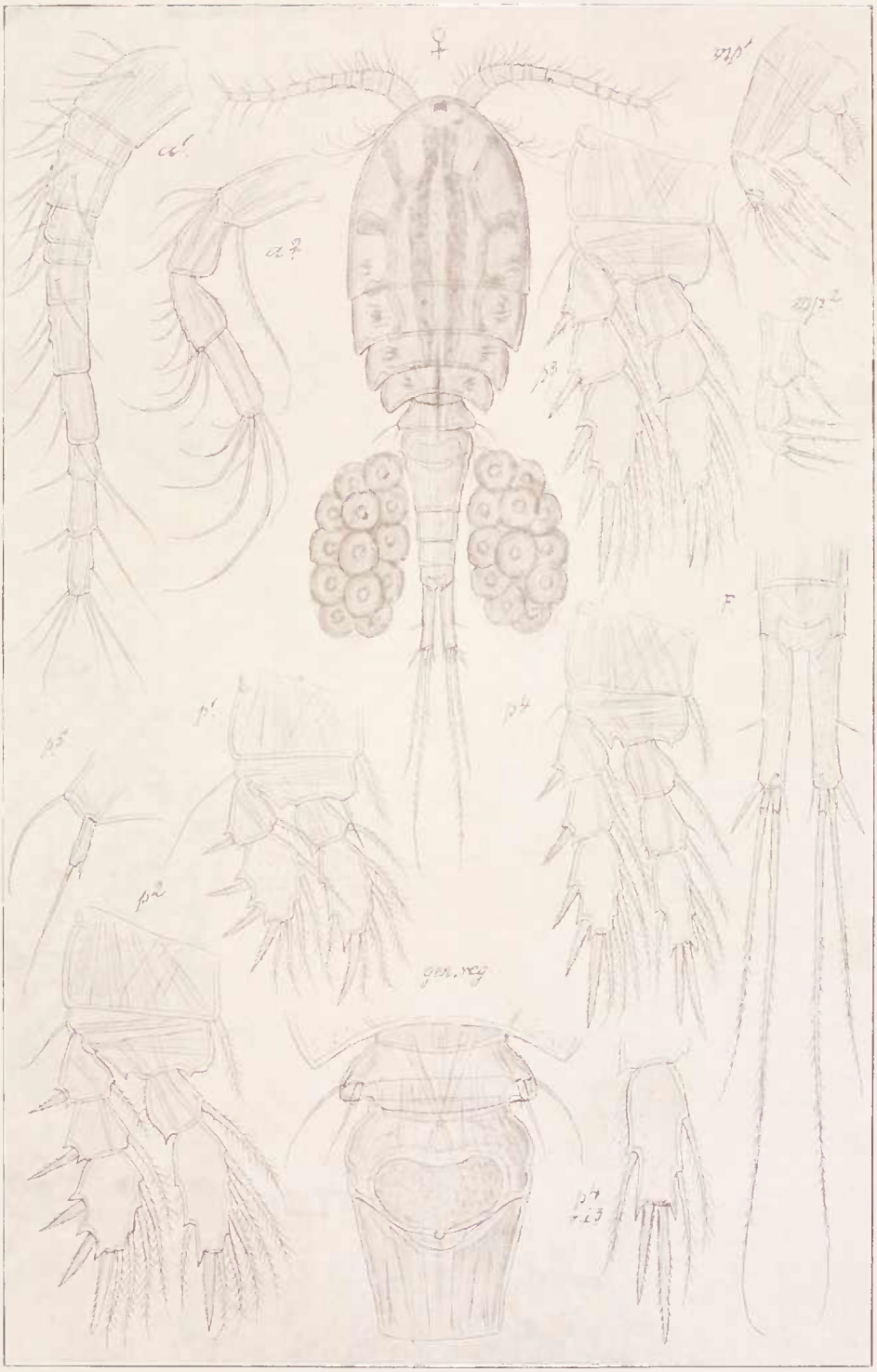
Cyclops crassicaudis, G. O. Sars.

Copepoda



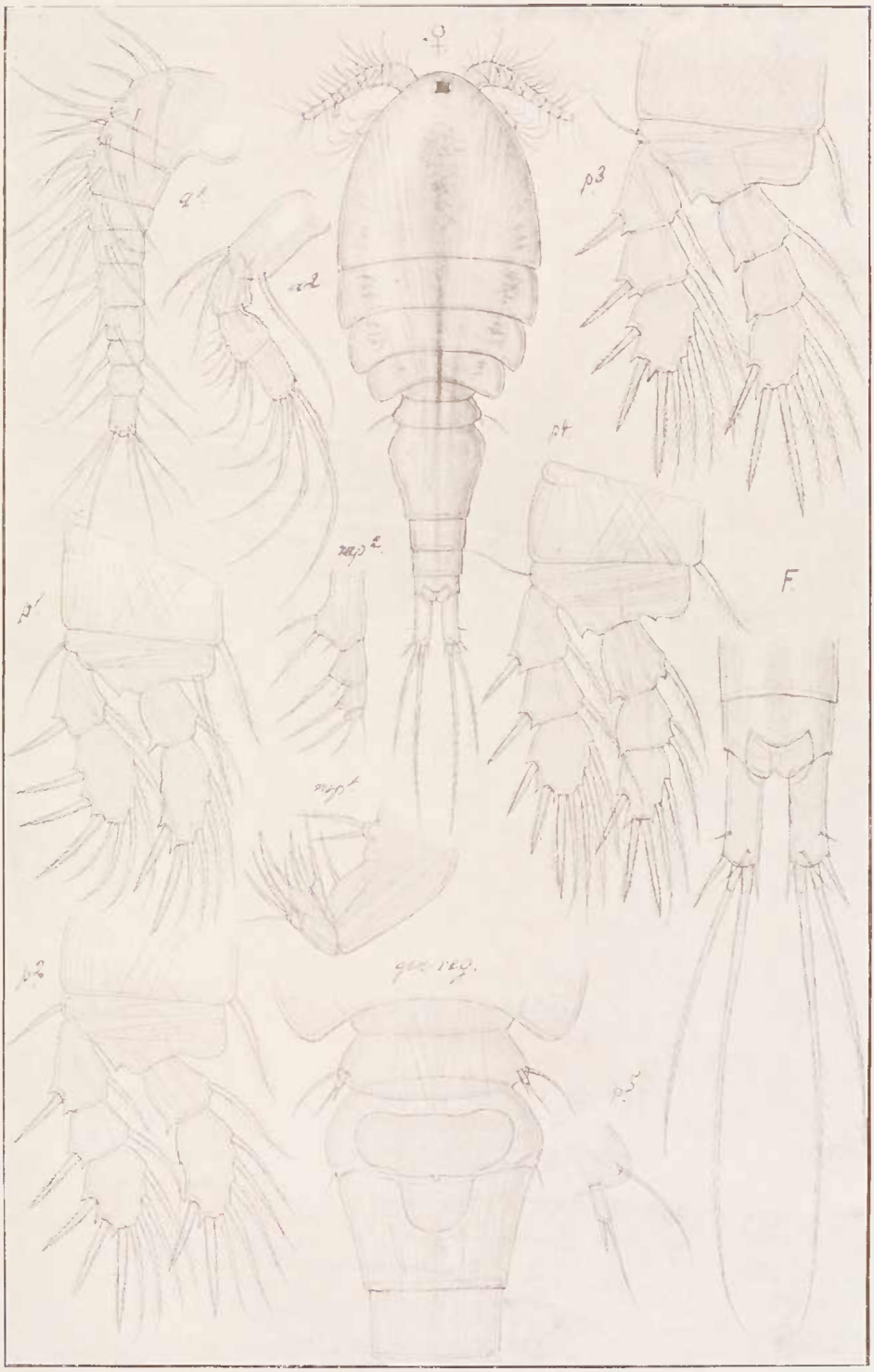
G. O. Sars, del.

Cyclops langvidus, G. O. Sars.



G. O. Sars, del.

Cyclops diaphanus, Fischer.



G. O. Sars, del.

Cyclops abyssicola, Lilljeb.

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 V & VI

CYCLOPIDÆ (continued)

WITH 16 AUTOTYPIC PLATES



BERGEN

PUBLISHED BY THE BERGEN MUSEUM

SOLD BY

ALB. CAMMERMEYER'S FORLAG, CHRISTIANIA

1914

Remarks.—This form, the smallest of all our Cyclopses, has been confounded by several authors (Rehberg, Daday, Lande, Richard) with *C. diaphanus* Fischer, from which it differs in many essential points, being much more nearly related to *C. varicans*. From this latter species it may be easily recognised by its much smaller size, the shorter and only 11-articulate anterior antennæ, and the different structure of the caudal setæ, finally by the peculiar colouring of the body when alive.

Occurrence.—I have only found this form quite occasionally in small grassy ponds near Christiania. In spite of its small size, it may be readily detected, owing to its peculiar and beautiful colour, which character indeed has given rise to the specific name proposed.

Distribution.—Sweden (Lilljeborg), Germany (Schmeil), Hungary (Daday), Poland (Lande), France (Richard).

Gen. 13. **Mesocyclops**, G. O. Sars, n.

Generic Characters.—Body more or less slender, with the anterior division generally rather tumid, the posterior very slender. Epimeral parts of the trunk-segments scarcely prominent laterally and, as a rule, not visible in the dorsal aspect of the animal. Last trunk-segment very small, not produced laterally. Genital segment in female rather elongated and very little dilated in front. Caudal rami of moderate length or very short, with all the apical setæ generally well developed. Anterior antennæ slender and elongated, generally 17-articulate. Posterior antennæ likewise slender, with the apical setæ long and curved. Maxillipeds rather fully developed. Natatory legs, as a rule, with both rami 3-articulate; terminal joint of outer ramus in all pairs with only 2 spines outside, its inner edge carrying in the 1st pair 2, in the other pairs 3 setæ; terminal joint of inner ramus unusually prolonged, especially in the posterior pairs. Last pair of legs very small and generally biarticulate, distal joint carrying 2 slender subequal setæ. Seminal receptacle in all the species of a very characteristic form, anterior part short, bilobular, posterior greatly prolonged, tongue-shaped.

Remarks.—This new genus answers to the group of Cyclopses distinguished by Dr. Schmeil as the "*Leuckarti* group". The species included in this group differ conspicuously in their external appearance from the more typical Cyclopses described in the preceding pages, and more resemble those belonging to the next genus, *Pachycyclops*, with which they also agree in the unusually slender form of

both pairs of antennæ. In the structure of the natatory legs, the unusual prolongation of the terminal joint of the inner ramus is rather characteristic. The last pair of legs are also distinguished by the presence on the distal joint of 2 slender, subequal setæ, the inner one replacing the short lateral spine found in the species of Cyclops (sens. strict.). Finally, the very characteristic form of the seminal receptacle may be here mentioned.

To the fauna of Norway belong 4 well-defined species, to be described below, and also a number of exotic species may be adduced to the same genus. Thus it is evident that the 2 African species, *C. emini* Mràzek and *C. neglectus* G. O. Sars, recorded by the present author in his paper on the Copepoda of the Tanganyika Expedition, are referable to this genus, as is unquestionably the case with the North American species, *C. edax* Forbes, perhaps also with the South American species, *C. spinifer* Daday. I am likewise of opinion that *C. gracilis* Lilljeborg must be placed within the present genus, in spite of the reduction of the number of joints in the anterior antennæ, and the imperfect development of the legs, as this form otherwise has an unmistakable resemblance to the species here under consideration.

33. Mesocyclops obsoletus (Koch).

(Pl. XXXV).

Cyclops obsoletus, Koch, l. c. Heft 21, Tab. 5.

Syn: *Cyclops Leuckarti*, Claus.
„ „ *simplex*, Poggenpol.
„ „ *Scourfieldi*, Brady.

Specific Characters.—Female. Body moderately slender, with the anterior division regularly elliptical in outline, greatest width slightly exceeding half the length and occurring about in the middle. Cephalic segment very large, almost twice the length of the 4 succeeding segments combined. Last trunk-segment very small. Tail slender, exceeding in length $^2/_3$ of the anterior division; genital segment long and narrow, fully attaining the length of the 3 succeeding segments combined, and almost cylindrical in form. Caudal rami of moderate length, though scarcely as long as the last 2 segments combined, and only slightly divergent; seta of outer edge rather far from the apex, being attached a little behind the middle; apical setæ comparatively slender and elongated, the inner mediate one attaining the length of the tail, seta of outer corner rather produced, though scarcely half as long as that of the inner. Anterior antennæ long and slender, reaching, when reflexed, almost to the end of the 3rd segment, outer joints rather narrow and bordered by a delicate hyaline rib, which on the last joint, at some

distance from the end, exhibits a very conspicuous semilunar incision. Posterior antennæ likewise unusually slender, with the terminal joint long and narrow. Anterior maxillipeds with the posterior edge of the basal part distinctly crenulated. Posterior pair of maxillipeds of the usual structure. Natatory legs comparatively slender, spines of outer ramus rather coarse, the distal outer spine of the terminal joint apparently issuing from the tip itself, outer edge of the joints very finely spinulose; terminal joint of inner ramus in all pairs unusually prolonged, being fully as long as the other 2 joints combined, setæ of inner edge in the 3 posterior pairs rather far from the apex and some of them reduced in size; apical spines of this ramus in 4th pair almost equal-sized; connecting plate of same pair produced behind, on each side, to an acute projection. Last pair of legs with the distal joint rather narrow, both setæ very slender and elongated, the inner one somewhat remote from the tip. Ovisacs of moderate size and somewhat diverging. Seminal receptacle exhibiting the form characteristic of the genus, anterior lobes somewhat exserted at the ends, posterior part extending almost to the end of the genital segment.

Colour generally pale yellow, with a more or less distinct bluish green tinge.

Length of adult female 1.00—1.30 mm.

Remarks.—I have no doubt that the *C. obsoletus* of Koch is in reality this species. The figure he gives is rather characteristic, and cannot properly be adduced to any other species. As the specific name proposed by Koch is much older than that given to the species by Claus, it must be retained for the present form. The *C. Scourfieldi* of Brady is the same species, and according to Dr. Schmeil, *C. simplex* Poggenpol also is to be regarded as a synonym.

Occurrence.—This is one of our commonest Cyclopids, occurring very abundantly both in small ponds and ditches and in larger lakes. In the latter it lives as a true limnetic form, being found everywhere near the surface of the water together with other limnetic animals.

Distribution.—Throughout Europe, central and northern parts of Asia, Ceylon, central and southern parts of Africa, North America, Brazil, Patagonia, Australia. The cosmopolitan distribution of this species is very remarkable.

34. Mesocyclops oithonoides, G. O. Sars.

(Pl. XXXVI).

Cyclops oithonoides, G. O. Sars, l. c. p. 32.

Syn: *Cyclops hyalinus*, Rehberg.

Specific Characters.—Female. Body very slender, with the anterior division narrow oblong in outline, greatest width not nearly attaining half the length and

occurring somewhat in front of the middle. Cephalic segment somewhat longer than the 4 succeeding segments combined. Last trunk-segment very small, with the lateral parts obtusely rounded. Tail attaining $^2/_3$ of the length of the anterior division: genital segment about equalling in length the 2 succeeding segments combined, and almost cylindrical in form. Caudal rami of moderate length and somewhat diverging, seta of outer edge placed almost in the middle; apical setæ comparatively shorter than in the preceding species, the inner mediate one scarcely exceeding half the length of the tail; seta of inner corner fully 3 times as long as that of the outer, and only slightly shorter than the outer mediate one; dorsal bristle unusually slender. Anterior antennæ much elongated, reaching, when reflexed, even somewhat beyond the 3rd segment, and clothed with rather slender setæ, lateral ribs of outer joints very slight and quite simple. Posterior antennæ with the terminal joint less narrow than in *M. obsoletus*, and scarcely longer than the penultimate one. Both pairs of maxillipeds largely developed, the anterior ones without any crenulation of the hind edge. Natatory legs with the rami very slender: apical spine of outer ramus in 2nd to 4th pairs much elongated and coarsely denticulated; terminal joint of inner ramus shorter than the other 2 combined; apical spines of this ramus in 4th pair very unequal, the outer one being extremely small, the inner very much elongated and generally somewhat bent inwards: connecting lamella of same pair with the projections of the hind edge obtuse at the tip. Last pair of legs resembling in shape those in *M. obsoletus*, but having the apical setæ comparatively shorter. Ovisacs, as a rule, small, rounded, and containing only a very limited number of ova. Seminal receptacle resembling that of the preceding species, though having the anterior lobes more obtuse and the posterior part narrower.

Body highly pellucid, with a very faint yellow tinge.

Length of adult female scarcely exceeding 0.90 mm.

Remarks.—This form is easily recognisable by its very slender and narrow body and the long spreading setæ clothing the anterior antennæ, these characters, as also its habits, somewhat recalling the slender pelagic species of the marine genus *Oithona*. It was indeed in allusion to this resemblance that the specific name, *oithonoides*, was proposed by the present author. The *Cyclops hyalinus* of Rehberg is unquestionably this species, as is easily seen from the figure he gives of the furca.

Occurrence.—I have found this form not infrequently in several of our larger lakes, more rarely in small tarns. In habits it is a true limnetic form, keeping itself always freely suspended in the water, and generally near the surface.

Distribution.—Sweden (Lilljeborg), Germany (Schmeil), central part of Asia (G. O. Sars), North America (Herrick).

35. Mesocyclops crassus (Fischer).

(Pl. XXXVII).

Cyclops crassus, Fischer, Beiträge zur Kenntniss der Cyclopiden (Fortsetzung). Bulletin Soc. Imp. Nat. Moscou, Tome XXVI, Part 1, p. 92, Pl. III, figs. 13—18.

Syn: *Cyclops oithonoides*, var. *hyalina*, Schmeil.
„ „ *hyalinus*, Lande, Richard, Lilljeborg (not Rehberg).

Specific Characters.—Female. Body rather short and stout, with the anterior division oval in form, greatest width attaining fully half the length and occurring in the middle. Last trunk-segment small, though somewhat broader than in the 2 preceding species. Tail scarcely exceeding half the length of the anterior division; genital segment about the length of the 3 succeeding segments combined, and somewhat tapered behind. Caudal rami unusually short and thick, scarcely exceeding in length the anal segment, and somewhat divergent; seta of outer edge very small and attached not far from the apex; apical setæ of moderate length, the inner mediate one almost as long as the tail; seta of inner corner more than 3 times as long as that of the outer, and not much shorter than the outer mediate one. Anterior antennæ somewhat less slender than in the 2 preceding species, reaching, when reflexed, about to the end of the 2nd segment, lateral rib of the outer joints very slight. Posterior antennæ nearly as in *M. oithonoides*. Maxillipeds, however, comparatively smaller. Natatory legs with the rami less slender and the apical spines shorter; those of inner ramus in 4th pair less unequal, the inner one being scarcely more than twice as long as the outer and much shorter than the terminal joint of the ramus; connecting lamella of this pair with the projections of the hind edge coarsely dentate. Last pair of legs resembling in shape those in *M. oithonoides*, though having the distal joint somewhat smaller and the apical setæ comparatively shorter. Ovisacs rounded oval in form and generally containing only a limited number of ova. Seminal receptacle about as in *M. oithonoides*.

Body very pellucid, with a faint yellowish tinge.

Length of adult female about 0.80 mm.

Remarks.—The identity of the above-described form with Fischer's *Cyclops crassus* seems to me evident. It has erroneously been identified by Dr. Schmeil and several other authors with *C. hyalinus* Rehberg, which, as stated above, is unquestionably a typical *M. oithonoides*. From the latter species it is at once distinguished by its much shorter and stouter body, and by the unusually short and thick caudal rami, thus fully deserving the specific name proposed for it by Fischer. In these respects it much more resembles the African species, *M. neglectus* G. O. Sars, which however differs in the much shorter innermost caudal seta.

Occurrence.—I have met with this species not unfrequently in the lake Vansjø near Moss, where it lives as a true limnetic form. I have also found it occasionally in wide expanses of the river Glommen, at Nipen.

Distribution.—Sweden (Lilljeborg), Germany (Schmeil), Poland (Lande), France (Richard), Russia (Fischer), Cape of Good Hope (G. O. Sars).

36. Mesocyclops Dybowskyi (Lande).

(Pl. XXXVIII).

Cyclops Dybowskyi, A. Lande, Materyały do Fauny Skorupiaków Widłonogich, Copepoda, p. 57, Pl. XVII, figs. 51—59.

Syn: *Cyclops crassus*, Lilljeborg (not Fischer).

Specific Characters.—Female. Body somewhat less robust than in *M. crassus*, with the anterior division regularly oval in outline, greatest width about half the length and occurring somewhat in front of the middle. Last trunk-segment about as in the preceding species. Tail considerably exceeding half the length of the anterior division: genital segment about the length of the 3 succeeding ones combined, and gradually tapered behind. Caudal rami more produced than in *M. crassus*, considerably exceeding in length the anal segment, and only slightly divergent; seta of outer edge comparatively small and attached at a short distance from the end; apical setæ not much elongated, the inner mediate one not nearly attaining the length of the tail; seta of inner corner much shorter than in the 3 preceding species, being only slightly longer than that of the outer corner and scarcely half as long as the outer mediate one, dorsal bristle not particularly slender. Anterior antennæ of moderate length, reaching, when reflexed, about to the end of the 2nd segment. Posterior antennæ and maxillipeds about as in *M. crassus*. Natatory legs also on the whole rather similar; apical spines of inner ramus in 4th pair, however, distinctly different, the outer spine being considerably larger than the inner. Last pair of legs with the distal joint comparatively thicker than in the other species and having the apical setæ rather short. Ovisacs of moderate size, oval in shape, and rather divergent. Seminal receptacle with the anterior lobes distinctly recurved. Spermatophores attached to the genital opening narrow oblong in form and diverging obliquely behind.

Colour rather peculiar, the body being, as a rule, tinged with a dark bluish or brownish violet hue.

Length of adult female about 0.90 mm.

Remarks.—This form, first described by A. Lande under the above specific name, has been erroneously identified by Lilljeborg with *Cyclops crassus*

Fischer, which, as stated above, is the form described by him as *C. hyalinus*. Though nearly allied to that species, it may easily be distinguished by the somewhat different shape of the caudal rami, and more particularly by the comparatively short innermost apical seta. In the living state it is moreover at once recognised by the peculiar colour of the body.

Occurrence.—I have met with this form only quite occasionally in some small lagunes at the border of the lake Østensjø near Christiania, and also in wide expanses of the river Glommen, at Nipen.

Distribution.—Sweden (Lilljeborg), Germany (Schmeil), Poland (Lande).

37. Mesocyclops gracilis (Lilljeborg).

(Pl. XXXIX).

Cyclops gracilis. Lilljeborg, De crustaceis ex ordinibus tribus in Scania occurrentibus, Appendix, p. 208.

Specific Characters.—Female. Body very slender, resembling in outward appearance that of *M. oithonoides*, the anterior division being narrow oblong in outline and contracted behind, with the greatest width quite in front. Last trunk-segment very small, with the lateral parts rounded off. Tail slender, equalling in length about $^2/_3$ of the anterior division; genital segment attaining the length of the 3 remaining segments combined, and slightly tapered behind. Caudal rami somewhat longer than the anal segment and slightly divergent; seta of outer edge attached in the middle; apical setæ comparatively short, the inner mediate one scarcely exceeding half the length of the tail; seta of inner corner only slightly longer than that of the outer, and scarcely half as long as the outer mediate one; dorsal bristle of moderate length. Anterior antennæ long and slender, reaching, when reflexed, to about the middle of the 3rd segment, and composed of only 11 joints clothed with very long, diverging, partly ciliated setæ. Posterior antennæ likewise comparatively slender, with the terminal joint longer than the penultimate one, lateral bristles of the latter joint reduced in number. Maxillipeds rather fully developed resembling in structure those in the other species of the present genus. Natatory legs, on the other hand, imperfectly developed, the rami in all of them being composed of only 2 joints; 1st joint of outer ramus in 4th pair without any seta inside; apical spines of inner ramus in same pair very unequal, the outer one being quite rudimentary, the inner long and slender. Last pair of legs likewise imperfectly developed, the proximal joint being quite confluent with the segment, distal joint extremely small, rod-like, and carrying on the tip 2 very unequal setæ, the inner one being quite rudimentary. Ovisacs comparatively small and rounded oval in shape, each con-

taining only a very limited number of ova. Seminal receptacle of quite a similar shape to that in the other species of the present genus, the anterior part being bilobular, the posterior greatly produced tongue-shaped.

Colour, according to Lilljeborg, dark brownish, or light greyish brown.

Length of adult female about 0.80 mm.

Remarks.—Through the kindness of Prof. Wirén of the Upsala University I have had the opportunity of examining this interesting species, and have thereby found my above-indicated suggestion about the systematic position of this form fully confirmed. In spite of the reduction of the number of joints in the anterior antennæ and the imperfect development of the legs, it must, in reality, be referred to the present genus, with which it otherwise agrees perfectly. Its resemblance, indeed, both as regards size and general appearance, to one of the above-described species, viz., *M. oithonoides*, is so perplexing, that at first sight it might even easily be confounded with that form. It will be found that the above-mentioned differences in the structure of the anterior antennæ and the legs are quite analogous to those observed in certain species of the genus *Cyclops* (sens. strict.), and are merely due to a retarded development of these appendages.

Occurrence.—This form, it is true, has not yet been observed within the limits of our country; but, as it occurs in the neighbouring parts of Sweden, it is very probable that, on a closer investigation, it will in reality be found in some place or other in the south-eastern part of the country.

Distribution.—Sweden (Lilljeborg), Germany (Schmeil), Poland (Lande).

Gen. **Pachycyclops**, G. O. Sars, n.

Generic Characters.—Body robust, with the anterior division much dilated and boldly vaulted above. Epimeral parts of the trunk-segments not produced laterally; last segment very small. Tail not very slender, with the genital segment of moderate size and only slightly dilated in front. Caudal rami comparatively short, but with the apical setæ well developed. Anterior antennæ long and slender, 17-articulate. Posterior antennæ likewise slender, with long curved apical setæ. Maxillipeds comparatively shorter and stouter than in *Mesocyclops*. Natatory legs normally developed, with both rami 3-articulate, terminal joint of outer ramus in 1st to 3rd pairs with 3 spines outside, in 4th pair with only 2 such spines, inner edge of this joint carrying in 1st pair 3, in the succeeding pairs 4 setæ. Last pair of legs biarticulate, proximal joint more or less pro-

longed and carrying at the outer distal corner the usual slender bristle, distal joint short, lamelliform, constricted at the base and trilobate at the end, carrying 2 unequal spines and an intermediate slender seta attached to a conical prominence of the joint. Seminal receptacle with the posterior part more or less distinctly bipartite.

Remarks.—This genus answers to the "*fuscus-albidus* group" of Dr. Schmeil, and comprises a limited number of species, which are all distinguished by their robust body, the tumid and boldly vaulted anterior division, and the very slender and elongated anterior antennæ. Of anatomical details may be particularly mentioned the characteristic structure of the last pair of legs, which is very unlike that in any of the other known groups of Cyclopses. 3 species belonging to this genus will be described below, and I am inclined to believe, that also the North-American species, *Cyclops ater* Herrick, may be referable to this genus, though the last pair of legs are said to be uniarticulate.

38. Pachycyclops signatus (Koch).

(Pl. XL).

Cyclops signatus, Koch, l. c. Heft 21. Tab. 8.

Syn: *Cyclops quadricornis fuscus*, Jurine.
„ „ *coronatus*, Claus.
„ „ *fuscus*, Schmeil.

Specific Characters.—Female: Anterior division of body broadly ovate in outline, greatest width about equalling half the length and occurring in front of the middle. Cephalic segment large and tumid, with the frontal edge narrowly truncated. Last trunk-segment very small and sharply defined from the preceding one. Tail comparatively short, scarcely attaining half the length of the anterior division; genital segment about the length of the 3 succeeding segments combined, and almost cylindrical in form. Caudal rami rather short, though somewhat longer than the anal segment, and slightly divergent, inner edge finely ciliated; seta of outer edge very small and attached close to the end; apical setæ densely plumose and rather spreading, the inner mediate one exceeding the tail in length; seta of outer corner rather elongate, though shorter than that of the inner corner. Anterior antennæ very slender and attenuated, reaching, when reflexed, to the end of the 3rd segment, distal edge of the 8th, 9th, 11th, 12th and 13th joints distinctly denticulated, the 3 outermost joints very narrow and exhibiting along the upper face a delicate hyaline rib, which on the proximal part of the last joint is divided into 8 strong serrations. Posterior antennæ unusually slender, with the penultimate joint long and narrow, attaining fully the length of the

terminal one, antepenultimate joint comparatively short and broad, oval in form, and coarsely denticulated on the hind edge; 2 of the apical setæ much more elongated than the others. Anterior maxillipeds strongly built, with the claw and spines issuing from the distal part very coarse and denticulated inside. Posterior maxillipeds, on the other hand, comparatively slender, with the first 2 joints narrower than usual. Natatory legs exhibiting the structure characteristic of the genus, rami comparatively slender, especially those of 4th pair; apical spines of inner ramus in this pair rather unequal, the outer one being much the larger. Last pair of legs with the proximal joint oblong quadrangular in form, and densely clothed inside with small spikes, distal joint somewhat shorter and much narrower, spine of inner edge almost twice as long as that of the outer, both being comparatively slender and finely denticulated; apical seta still longer and clothed with scattered cilia. Ovisacs comparatively large and borne closely appressed to the body, so as partly to obtect the dorsal face of the tail. Seminal receptacle with the posterior part rather produced and narrowly cleft in the middle.

Body of a more or less dark fuscous colour, with a greenish or bluish tinge and variegated with still darker irregular shadows; caudal rami and adjoining part of tail bluish green, and also the anterior antennæ and the legs tinged with the same colour, ova in the ovisacs generally of a very dark brown hue.

Length of adult female amounting to 2.50 mm.

Remarks.—This is one of our largest and most beautiful Cyclopids, being easily recognisable from most other species. The *Cyclops quadricornis fuscus* of Jurine is in all probability referable to the present species; but, as noted before, I find it scarcely admissible to appropriate the varietal names appended by that author to his species *C. quadricornis* as true specific designations. That the *Cyclops signatus* of Koch is this species, is quite certain, and this has also been admitted by all authors. The name *C. coronatus* proposed by Claus for this species is of much later date, and must of course cede to that of Koch.

Occurrence.—I have met with this handsome species chiefly at the borders of large lakes or in lagunes and ponds left by the reflux of the water in these lakes. In habits, like the other species of the present genus, it is a true bottom-form, being frequently seen clinging to some object on the ground or to the plants growing upon it. When disturbed it darts away with a sudden bound, and so rapidly that it becomes a matter of great difficulty to catch it by the aid of an ordinary dipping-tube.

Distribution.—Sweden (Lilljeborg), British Isles (Brady), Germany (Schmeil), Poland (Lande), France (Richard), Central Asia (G. O. Sars), North America (Herrick).

39. Pachycyclops bistriatus (Koch).

(Pl. XLI).

Cyclops bistriatus, Koch, l. c. Heft 21, Tab. 7.

Syn: *Cyclops distinctus*, Richard.

„ „ *gracilicornis*, Lande.

Specific Characters.—Female. Anterior division of body regularly oval in outline, greatest width somewhat exceeding half the length and occurring about in the middle. Tail comparatively short, scarcely attaining half the length of the anterior division; genital segment somewhat shorter and broader than in *P. signatus*. Caudal rami a little more produced, though scarcely attaining the length of the last 2 segments combined; apical setæ rather spreading and exhibiting nearly the same mutual relation in length as in the preceding species. Anterior antennæ still more slender and elongated than in that species, reaching, when reflexed, even to the end of the 4th segment, lateral rib of the outer joints inconspicuous. Posterior antennæ of normal structure, the penultimate joint being much shorter than the terminal one and also distinctly thicker; apical setæ, as usual, gradually increasing in length inwards. Both pairs of maxillipeds conspicuously smaller than in the preceding species. Natatory legs with the rami comparatively broader; terminal joint of inner ramus in 4th pair somewhat curved in the middle, and having the apical spines less unequal, the inner one conspicuously bent inwards. Last pair of legs resembling in structure those in the preceding species, though having the distal joint comparatively larger in proportion to the proximal one. Ovisacs rather large and slightly divergent. Seminal receptacle with the posterior part rather produced and very conspicuously bipartite.

Body of a dark blue colour, with the anterior part of the cephalic segment somewhat lighter.

Length of adult female about 2.20 mm.

Remarks.—I think I am right in identifying the above-described form with *Cyclops bistriatus* of Koch. The figure given by Koch applies fairly well to the present form, and also his notes about the colour agree. In any case it is evident that the figure represents a true *Pachycyclops*, and as the 2 other species are both very recognisably figured by that author, the said figure cannot refer to any other species than the one here under discussion. As Koch's name has the precedence both to that given to the species by Dr. Richard, and to that proposed by A. Lande, it ought to be retained for the present species, though it is somewhat inappropriate, being apparently derived from the anteriorly somewhat divergent dark ovarial tubes shining through the body. Dr. Schmeil at first opined that this form was merely a hybrid between the 2 other species; but

he has subsequently recognised its specific distinctness. As to its relation to the 2 other species, I think that it comes nearer to *P. signatus* than to *P. annulicornis*.

Occurrence.—The only place where I have as yet met with this form, is in a small tarn near Christiansand. It occurred here, together with other Entomostraca, near the bank on a muddy bottom covered with coarse gravel. All the specimens observed were of a very dark bluish colour and in their whole behaviour exhibited so great a resemblance to *P. signatus*, that at that time I regarded them as merely belonging to a variety of that species, for which reason I only made a coloured drawing of one of them, omitting to preserve the specimens for further examination. The figures here given are from Swedish specimens kindly sent to me by Prof. Wirén of the Upsala University.

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

40. Pachycyclops annulicornis (Koch).

(Pl. XLII).

Cyclops annulicornis, Koch, l. c. Heft 21, Tab. 6.

Syn: *Cyclops quadricornis albidus*, Jurine.
" " *tenuicornis*, Claus.
" " *albidus*, Schmeil.
" " *gyrinus*, Forbes.

Specific Characters.—Female. Anterior division of body broadly oval in outline, greatest width exceeding half the length and occurring somewhat in front of the middle. Tail comparatively more slender than in the 2 preceding species, somewhat exceeding half the length of the anterior division; genital segment of about the same shape as in *P. signatus*. Caudal rami comparatively short and only slightly diverging, inner edge scarcely ciliated; apical setæ less densely plumose and less spreading than in the 2 preceding species, the inner mediate one almost attaining half the length of the body; seta of outer corner comparatively short, scarcely exceeding in length $^1/_3$ of that of the inner corner. Anterior antennæ long and slender, reaching, when reflexed, beyond the 3rd segment, outer joints very narrow and exhibiting a well-defined lateral rib, which is quite smooth throughout, and projects at the end in a small lappet. Posterior antennæ with the terminal joint much longer and narrower than the penultimate one. Maxillipeds about as in *P. bistriatus*. Natatory legs likewise very similar; terminal joint of inner ramus in 4th pair, however, distinguished by the quite rudimentary condition of the distal seta of inner edge; apical spines of this ramus slightly unequal, the outer one being the larger. Last pair of legs of almost exactly the same shape as in *P. signatus*, the distal joint being conspicuously smaller than the

proximal one. Ovisacs generally narrow oblong or fusiform in shape and, as a rule, diverging greatly, in some cases, however, more appressed to the body. Seminal receptacle with the posterior part very little produced and slightly emarginated in the middle. Spermatophores attached to the genital orifice lageniform and closely juxtaposed.

Body of a clear yellowish grey colour, with a more or less distinct olivaceous tinge, and variegated with dark transverse bands at the end of some of the segments, as also across the cephalic part; anterior antennæ generally with 2 very conspicuous dark bands, the one occupying the 2nd and 3rd joints, the other the 10th and 11th joints.

Length of adult female about 1.80 mm.

Remarks.—This form has generally been recorded by recent authors under the name of *Cyclops albidus* Jurine, a name which is very little significant, as the present species in most cases exhibits a rather conspicuous colouring of the body. For the reason noted above the name ought also to be rejected, and to be replaced by that proposed by Koch, which has the precedence to the name *tenuicornis* given to the species by Claus. The *Cyclops gyrinus* of Forbes is unquestionably this species, and is not, as opined by Dr. Schmeil, identical with *C. distinctus* Richard.

The present species is nearly allied to the 2 preceding ones, but is of smaller size, and moreover easily recognisable from them by the shortness of the outermost caudal seta. The manner in which the ovisacs are born is also very characteristic, though in some cases specimens are found in which they are more appressed to the body, a circumstance which at first led me to the erroneous opinion that these specimens might belong to a different species.

Occurrence.—This is one of our commonest Cyclopids, being found both in small ponds and ditches and in large lakes. In the latter it not only occurs at the borders, but descends to rather considerable depths. In the lake Mjøsen I have even taken it in great numbers down to 50 fathoms together with *Cyclops vulgaris*.

Distribution.—Throughout Europe, northern part of Asia, Central Africa, Australia, North and South America, Hawaii Islands. The distribution of this form is accordingly almost cosmopolitan.

Gen. 15. **Leptocyclops**, G. O. Sars, n.

Generic Characters.—Body more or less slender, with the 2 chief divisions very sharply defined. Epimeral parts of the trunk-segments, as a rule, distinctly prominent laterally, especially those of penultimate segment, though rounded at the extremities. Last trunk-segment short and broad, being produced on each side to a narrowly rounded and densely hairy lobe, somewhat impinging upon the base of the genital segment. Tail very slender and narrow, with the genital segment comparatively short and abruptly contracted immediately behind the base. Caudal rami more or less prolonged, and in most cases exhibiting along the outer edge a delicate denticulation; seta of this edge small and not far from the end; middle apical setæ slender and elongated, being, as a rule, clothed on the proximal part with scattered coarse hairs; seta of inner corner of inconsiderable length and very thin, that of the outer corner more or less spiniform. Anterior antennæ in all the known species composed of 12 joints, the outer ones generally very slender and narrow. Posterior antennæ and oral parts on the whole of normal structure. Natatory legs well developed, with 3-articulate rami; 1st pair, as usual, the smallest, and having the 2nd basal joint conically produced at the inner corner and provided with a long deflexed spine; armature of the rami as in the genus *Pachycyclops*. Last pair of legs very small, each forming a simple somewhat trilobate lamella armed inside with a denticulated spine, outside and at the conically exserted tip with a slender seta. Ovisacs generally oval fusiform in shape. Seminal receptacle with the posterior part not produced, forming 2 transverse bands defined in the middle by a slight emargination.

Remarks.—The type of this genus is the species generally described under the name of *Cyclops serrulatus* Fischer, with which Dr. Schmeil has connected another rather diviating form, *C. prasinus* Fischer, to form a particular group of Cyclopses, viz., his "*serrulatus-prasinus* group". The most prominent character distinguishing this genus from the 3 preceding ones, is undoubtedly the very different structure of the last pair of legs. Several other characters common to the greater number of the species comprised within this genus may also be adduced, and are shortly enumerated in the above diagnosis. The genus seems to be very rich in species; but most of these are so closely related to each other, that they can be distinguished only by a careful examination, and for this reason they have been regarded by most earlier authors as only varieties of one and the same species, viz., *C. serrulatus* of Fischer. In the following

pages 5 Norwegian species belonging to this genus will be described. To these may be added a considerable number of exotic species. I have for instance recorded no less than 7 species from the Central African lake, Tanganyika, and another well-defined African species is known to me from Cape Colony. Moreover the North-American species, *Cyclops elegans* Herrick and *C. pectinifer* Cragin, unquestionably belong to the same genus, and also 2 other, apparently new species from the same part of the world have been examined by me.

41. Leptocyclops agilis, (Koch).

(Pl. XLIII).

Cyclops agilis, Koch, l. c. Heft 21, Tab. 3.

Syn: *Cyclops serrulatus*. Fischer.

„ „ *varius*, var. *brachyura*, Lilljeborg.

Specific Characters.—Female. Body moderately slender, with the anterior division oval in outline, greatest width somewhat exceeding half the length and occurring in the middle. Tail slender, about equalling in length $^2/_3$ of the anterior division; genital segment scarcely longer than the 2 succeeding segments combined and considerably dilated at the base. Caudal rami generally not much prolonged, equalling about the length of the last 2 segments combined, and slightly bent outwards at the ends, outer edge finely denticulated throughout: seta of this edge very small and attached near the end somewhat dorsally; middle apical setæ rather slender and, as usual, clothed in their proximal parts with scattered coarse hairs, the inner one about equalling half the length of the body, the outer considerably shorter; seta of inner corner scarcely longer than that of the outer, which is much coarser, spiniform. Anterior antennæ long and slender, reaching, when reflexed, to the end of the 2nd segment, the 3 outer joints very narrow and bordered by a hyaline rib, which is quite smooth throughout. Posterior antennæ with the terminal joint scarcely longer than the penultimate one. Anterior maxillipeds comparatively short and stout, with the subdivision of the 1st basal segment indistinct. Posterior maxillipeds likewise short, with the outer 2 joints imperfectly defined and the setæ issuing from them in front stout and curved against each other. Natatory legs exhibiting the structure characteristic of the genus; apical spines of inner ramus in 4th pair of moderate size, the inner one somewhat longer and more slender than the outer. Last pair of legs with the spine of the inner edge very large and coarsely dentate. Ovisacs oval fusiform in shape and slightly divergent, each containing a rather limited number of ova. Seminal receptacle with the anterior part transversely elliptical in form and slightly emarginated anteriorly.

Colour more or less dark olivaceous, with a greenish tinge; genital segment and bases of the caudal rami generally ochraceous.

Length of adult female scarcely exceeding 1 mm.

Remarks.—This appears to be the species that has been observed by most authors, and to which the name *Cyclops serrulatus* Fischer has generally been applied. It seems evident to me, indeed, that the figures given by Fischer are referable to the present species; but, as the name *agilis* proposed by Koch is of much earlier date, it must be retained for the species. Lilljeborg has applied the name *serrulatus* to a different species, which will be described below as *L. Lilljeborgi*, whereas he has given to the present species a new name, viz., *Cyclops varius*. The latter species he again divides into 3 varieties, viz., *C. speratus*, *C. proximus* and *C. brachyurus*. The first of these supposed varieties I regard as a distinct species, whereas the other 2 must be combined within the species here under consideration. The *C. proximus* does not differ from the typical form (*C. brachyurus*) except in the somewhat longer caudal rami.

Occurrence.—This is a very common Cyclopid, being found everywhere in small ponds and ditches, as also at the margin of large lakes. It is a very active little creature, moving about with considerable speed, and thus fully deserving the specific name given to it by Koch. Like the other species of the present genus, it is however a true bottom-form, keeping constantly near the ground, and scarcely ever being met with in company with the true limnetic species.

Distribution.—Throughout Europe, central and northern parts of Asia, Algeria, Azores, Polar island north of Grinnell Land (2nd Fram Exped.), North America, Australia.

42. Leptocyclops speratus, (Lilljeborg).

(Pl. XLIV).

Cyclops varius, var. *sperata*, Liljeborg, Synopsis specierum generis Cyclops, p. 88, Pl. V, figs. 12—15.

Specific Characters.—Female. Rather like the preceding species, but of much larger size and somewhat more slender form of body. Caudal rami considerably prolonged, attaining almost the length of the last 3 segments combined, and closely approximate throughout, not being at all divergent, outer edge nearly smooth, or with only very slight traces of denticles in its posterior part; middle apical setæ of the usual structure, seta of inner corner considerably longer than the spine of the outer. Anterior antennæ very slender, reaching, when reflexed, even beyond the 2nd segment, outer joints with a distinct

lateral rib, which, as in the preceding species, is quite smooth. Posterior antennæ and anterior maxillipeds about as in that species. Posterior maxillipeds with the last 2 joints well defined. Natatory legs comparatively more strongly built than in the type species, with the rami broader; apical spines of inner ramus in 4th pair rather strong, the inner one being the longer. Last pair of legs somewhat more produced in relation to the width, and having the spine of the inner edge still larger, with very coarse denticles on both edges. Ovisacs comparatively large and considerably divergent. Seminal receptacle with the anterior part evenly convex in front.

Colour light olivaceous or yellowish grey.

Length of adult female 1.20 to 1.50 mm.

Remarks.—This form, as stated above, was considered by Lilljeborg as merely a variety of his species *Cyclops varius* (= *C. agilis* Koch). I think, however that it is entitled to be ranged as a distinct species, as it differs not only in its much larger size, but also in some structural details mentioned in the above diagnosis.

Occurrence.—I have hitherto only met with this form in 2 localities, viz., in some small lagunes at the border of the lake Østensjø, near Christiania, and in widenings of the river Glommen, at Nipen. In both localities it only occurred quite occasionally.

Distribution.—Sweden (Lilljeborg).

43. Leptocyclops Lilljeborgi, G. O. Sars, new name.

(Pl. XLV).

Cyclops serrulatus, Lilljeborg, Synopsis, p. 81, Pl. V, figs. 1—6 (not Fischer).

Specific Characters.—Female. Body somewhat less slender than in the last-described species, and more resembling in shape that of *L. agilis*. Caudal rami, however, more produced, nearly attaining the length of the last 3 segments combined, and slightly flexuous, with the distal part somewhat divergent; outer edge distinctly denticulated throughout, the denticles being especially conspicuous in the distal part; middle apical setæ of the usual structure; seta of inner corner unusually prolonged, attaining almost the length of the corresponding ramus; spine of outer corner likewise somewhat longer than usual, though much shorter than the said seta. Anterior antennæ long and slender, reaching, when reflexed, to the end of the 2nd segment, lateral rib of the outer joints well marked and on the proximal part of last joint divided into a number of well-marked denticles, otherwise only very faintly striated. Posterior antennæ and oral parts of normal

structure. Natatory legs likewise much as in the preceding species, though having the apical spines of the rami more coarsely denticulate; those of inner ramus in 4th pair very unequal, the inner one being nearly twice as long as the outer. Last pair of legs with the spine of the inner edge much feebler than in the 2 preceding species, and only minutely denticulated. Ovisacs of moderate size and somewhat divergent. Seminal receptacle with the anterior part very broad, occupying almost the whole width of the genital segment, and having the front edge nearly straight.

Colour olivaceous, with a more or less brownish tinge.

Length of adult female only slightly exceeding 1 mm.

Remarks.—This form was identified by Lilljeborg with *Cyclops serrulatus* of Fischer, chiefly on account of a short note given by that author, according to which, on a strong amplification, irregular rows of very small spinules were traced on the outer joints of the anterior antennæ. As however similar spinules are also stated to occur on the tail and on the trunk segments, it seems to me very questionable whether this structure in reality refers to the dentate portion of the lateral rib, as opined by Lilljeborg. In any case the figures given by Fischer are evidently not referable to the present species but to *C. agilis* Koch. Through the kindness of Prof. Wirén of the Upsala University, I have had the opportunity of examining the type specimens from which Lilljeborg's description was made.

Occurrence.—I have found this form occasionally in several places near Christiania, sometimes in small tarns, sometimes in ponds and ditches. In a sample taken in France by Dr. Sig. Thor, and kindly sent to me for examination, this form occurred not unfrequently together with *L. agilis*, and could at once be distinguished from the latter by the rather different shape of the caudal rami.

Distribution.—Sweden (Lilljeborg), France (G. O. Sars); very probably also distributed in other parts of Europe.

44. Leptocyclops macruroides, (Lilljeborg).

(Pl. XLVI).

Cyclops macruroides, Lilljeborg, Synopsis, p. 85, Pl. V, figs. 7—11.

Specific Characters.—Female. Body somewhat more slender than in the last described species, with the tail comparatively longer in proportion to the anterior division. Caudal rami very narrow and prolonged, exceeding somewhat in length the last 3 segments combined, and diverging very little, though somewhat remote at the base; outer edge distinctly denticulate throughout, seta of that edge somewhat remote from the end; middle apical setæ of the usual

appearance; seta of inner corner scarcely more than half as long as the corresponding ramus, though longer than the spine of the outer corner; the latter comparatively short and thick. Anterior antennæ less elongated than in the preceding species, scarcely reaching, when reflexed, beyond the middle of the 2nd segment, lateral rib of the outer joints very finely denticulated in the proximal part of last joint, otherwise quite smooth. Posterior antennæ and oral parts scarcely different in structure from these parts in the preceding species. Natatory legs rather strongly built, but likewise of the usual structure. Last pair of legs with the spine of the inner edge comparatively shorter than in *L. Lilljeborgi*, but much thicker and coarsely denticulated. Ovisacs rather large and somewhat divergent. Seminal receptacle with the anterior part less broad than in the last described species.

Colour light yellowish grey.

Length of adult female amounting to 1.30 mm.

Remarks.—This species is nearly allied to *L. Lilljeborgi*, but may be easily distinguished by the very narrow and prolonged caudal rami and by the somewhat shorter anterior antennæ. It also grows to a considerably larger size than that species. The North American form, *Cyclops elegans* Herrich, of which I have had specimens for examination, is not, as opined by Lilljeborg, identical with the present species, as it has the anterior antennæ much more elongated and also exhibits some differences in the structure of the caudal rami and of the last pair of legs.

Occurrence.—I have only met with this species in large lakes, for instance, in the Maridal Lake near Christiania, and in the great lakes Mjøsen and Tyrifjord. It is generally found at a depth of a few fathoms, near the margin, but in some cases it descends to much greater depths. In Lake Mjøsen I have for instance taken it occasionally down to 50 fathoms.

Distribution.—Sweden (Lilljeborg), peninsula of Kola and northern part of Siberia (same author).

45. Leptocyclops macrurus, G. O. Sars.

(Pl. XLVII).

Cyclops macrurus, G. O. Sars, l. c. p. 45.

Syn: *Cyclops maarensis*, Vosseler.

Specific Characters.—Female. Body rather slender, with the tail much produced and only slightly shorter than the anterior division. Caudal rami exceedingly long and narrow, almost attaining the length of the whole remaining

part of the tail, linear in shape and scarcely at all divergent; outer edge for the greater part of its extent quite smooth, with only a short, somewhat oblique row of 4 or 5 small denticles just in front of the seta of this edge; the latter rather remote from the end, and attached somewhat dorsally; middle apical setæ of the usual structure; seta of inner corner fully twice as long as the spine of the outer. Anterior antennæ much shorter than in any of the preceding species, scarcely reaching, when reflexed, to the end of the cephalic segment, outer joints less narrow and without any distinct lateral rib. Posterior antennæ and oral parts of the usual structure. Natatory legs likewise built in the usual manner; apical spines of inner ramus in 4th pair rather strong and coarsely denticulate, the inner one only slightly longer than the outer. Last pair of legs with the spine of the inner edge very small. Ovisacs of smaller size than in the other species and closely appressed to the tail. Seminal receptacle with the anterior part narrowly exserted on each side.

Colour light yellowish grey, with a faint olivaceous tinge.

Length of adult female amounting to 1.10 mm.

Remarks.– This species was established by the present author as early as the year 1863, and has been admitted by all subsequent authors. It is indeed easily distinguishable by its extremely long and narrow caudal rami, which give to the tail a more slender appearance than in most other Cyclopidæ, a character which has given rise to the specific name proposed. According to Dr. Schmeil, the *Cyclops maarensis* of Vosseler is identical with the present species.

Occurrence.—Like the last described species, this form chiefly belongs to the fauna of large lakes, occurring there in shallow water among aquatic plants. It is also occasionally found in small lagunes and ponds formed by the reflux of the water in these lakes.

Distribution.—Sweden (Lilljeborg), British Isles (Brady), Germany (Schmeil), Poland (Lande), France (Richard).

Gen. 16. **Platycyclops,** G. O. Sars, n.

Generic Characters.—Body comparatively robust, with the anterior part conspicuously applanated and the epimeral parts expanded laterally. Last trunk-segment short and broad, with the lateral parts more or less densely hairy. Tail robust, sub-cylindric in shape, and having the genital segment comparatively short and stout. Caudal rami of different shape in the different species, and

generally clothed on the dorsal face with oblique rows of fine spikes; middle apical setæ comparatively strong and rather unequal in length, being minutely denticulated for a good part of their length. Anterior antennæ short, with the number of joints more or less reduced. Posterior antennæ likewise less slender than in the preceding genera. Both pairs of maxillipeds comparatively short and stout; the posterior ones with the outer 2 joints confluent. Natatory legs with the basal part broad and flattened, the rami 3-articulate and nearly equal in length; middle joint of inner ramus in 1st pair with only a single seta inside; terminal joint of same ramus in all the pairs comparatively small. Last pair of legs in some cases well defined, each forming a small lamella carrying 2 thin setæ and inside them a denticulated spine, in other cases replaced on each side by 3 spines only. Seminal receptacle short and broad, not produced behind.

Remarks.—The present genus answers to the last of the groups of Cyclopses distinguished by Dr. Schmeil, viz., his "*phaleratus—affinis—fimbriatus* group". The species belonging to this genus are especially distinguished by the pronouncedly applanated form of the anterior division of the body, which gives them a rather characteristic appearance, and also exerts a certain influence on the movements of the animal. It is indeed from this character that the generic name here proposed has been derived. In some particulars a certain agreement with the preceding genus *Leptocyclops* may be found to exist; but in other points the species here under consideration differ so much, that they cannot properly be brought together in the same genus. In addition to the 3 Norwegian species described below, the *Cyclops Poppei* Rehberg is unquestionably referable to the present genus. This form, it is true, has been considered by Dr. Schmeil as merely a variety of *C. fimbriatus* Fischer; but in my opinion it ought to be kept apart as a distinct, though nearly allied species. Further, among the several species of Cyclops recorded by the present author from Lake Tanganyika, the 2 forms, *C. oligarthrus* and *C. compactus* are undoubtedly members of the same genus. We know accordingly as yet of 6 different species belonging to the present genus.

46. Platycyclops phaleratus, (Koch).

(Pl. XLVIII)

Cyclops phaleratus, Koch, l. c., Heft 21, Tab. 9.

Syn: *Cyclops canthocarpoides*, Fischer.

„ „ *lascivus*, Poggenpol.

Specific Characters.—Female. Body rather short and stout, with the anterior division pronouncedly applanated and broadly oval in outline, greatest width about equalling $^2/_3$ of the length and occurring in the middle. Cephalic segment of moderate size, about the length of the 4 succeeding segments combined, and evenly rounded in front. Last trunk-segment comparatively broad, with the lateral parts slightly produced and minutely hairy. Tail unusually robust, somewhat exceeding half the length of the anterior division, and having the posterior edge of all the segments coarsely denticulated ventrally and laterally; genital segment scarcely as long as the 2 succeeding segments combined, and of nearly equal width throughout; last segment very short. Caudal rami short and thick, about equalling in length the penultimate segment, and scarcely divergent, distal part a little contracted and obliquely truncated at the end, upper face crossed by 3 obliquely curved rows of very delicate spikes, outer edge clothed in the middle with a few small spinules, seta of this edge very small and not far from the end, issuing somewhat dorsally; middle apical setæ very strong and clothed for the greater part of their extent with small appressed spinules, the inner one more than twice as long as the outer; seta of inner corner small, scarcely longer than the spine of the outer. Anterior antennæ much shorter than the cephalic segment and only slightly dilated in their proximal part, being composed of 10 joints clothed with comparatively short simple setæ; 1st and 6th joints the largest. Posterior antennæ very strongly built, with the first 2 joints imperfectly defined, 3rd joint densely hairy in front and on the upper face, its seta very short, spiniform; terminal joint much shorter than the penultimate one, apical setæ of both joints very coarse and curved. Mandibles and maxillæ of usual structure. Anterior maxillipeds very short and stout, with the basal part much dilated. Posterior maxillipeds likewise unusually stout, with the first 2 joints imperfectly defined, the 2nd exhibiting outside a ledge densely clothed with spinules, last joint very small and conically produced inside, carrying 2 short, thick, hairy setæ and outside them 2 thin bristles. Natatory legs distinguished by their exceedingly broad basal part and the coarsely spinulose rami; 2nd basal joint in 1st pair only slightly produced at the inner corner, but having the deflexed spine of quite an unusual size; terminal joint of outer ramus in 1st—3rd pairs with 3 coarse spines outside, in 4th pair with

only 2 such spines; apical spine of inner ramus in 1st pair not particularly strong; those in 4th pair very unequal, the inner one more than twice as long as the outer and equalling in length the 2 outer joints of the ramus combined. Last pair of legs imperfectly developed, and replaced on each side by 3 strong ciliated spines attached to the lateral corners of the corresponding segment, the outermost spine being somewhat thinner and less densely ciliated than the other 2. Ovisacs of moderate size, oblong oval in form and generally closely appressed to the sides of the tail. Ovarial tubes extending backwards more or less far within the tail, generally to the penultimate segment. Seminal receptacle short and broad, occupying almost the whole width of the genital segment.

Colour generally dark reddish brown, with the 1st free trunk-segment somewhat lighter.

Length of adult female about 1.10 mm.

Remarks.—This very characteristic form was first recorded by Koch, who has given a very recognisable figure of an adult female specimen. It was subsequently redescribed by Fischer as a new species under the name *C. canthocarpoides*, a name that was also adopted by some of the subsequent authors. According to Dr. Schmeil, the *Cyclops lascivus* of Poggenpol is also identical with the present species.

Occurrence.—I have found this form occasionally in stagnant pools near Christiania, especially in such as have their surface more or less densely covered with Lemna. Like the other species of the present genus, it is a true bottom form, keeping constantly close to the ground, along which it moves with great rapidity. Even when out of the water, it has the power for some time of creeping along a plane surface. The manner in which the male gets hold of the female during copulation, is rather different from that observed in most other Cyclopidæ, and more resembles that generally found in the *Harpacticoida*. As in the latter, the male grasps the female with his prehensile anterior antennæ dorsally across the tail, and the hold is so firm that it not infrequently happen that the two sexes remain tied together in this manner after being killed in alcohol.

Distribution.—Throughout Europe, Turkestan (H. Ganin), North America (Herrich), Australia (G. O. Sars).

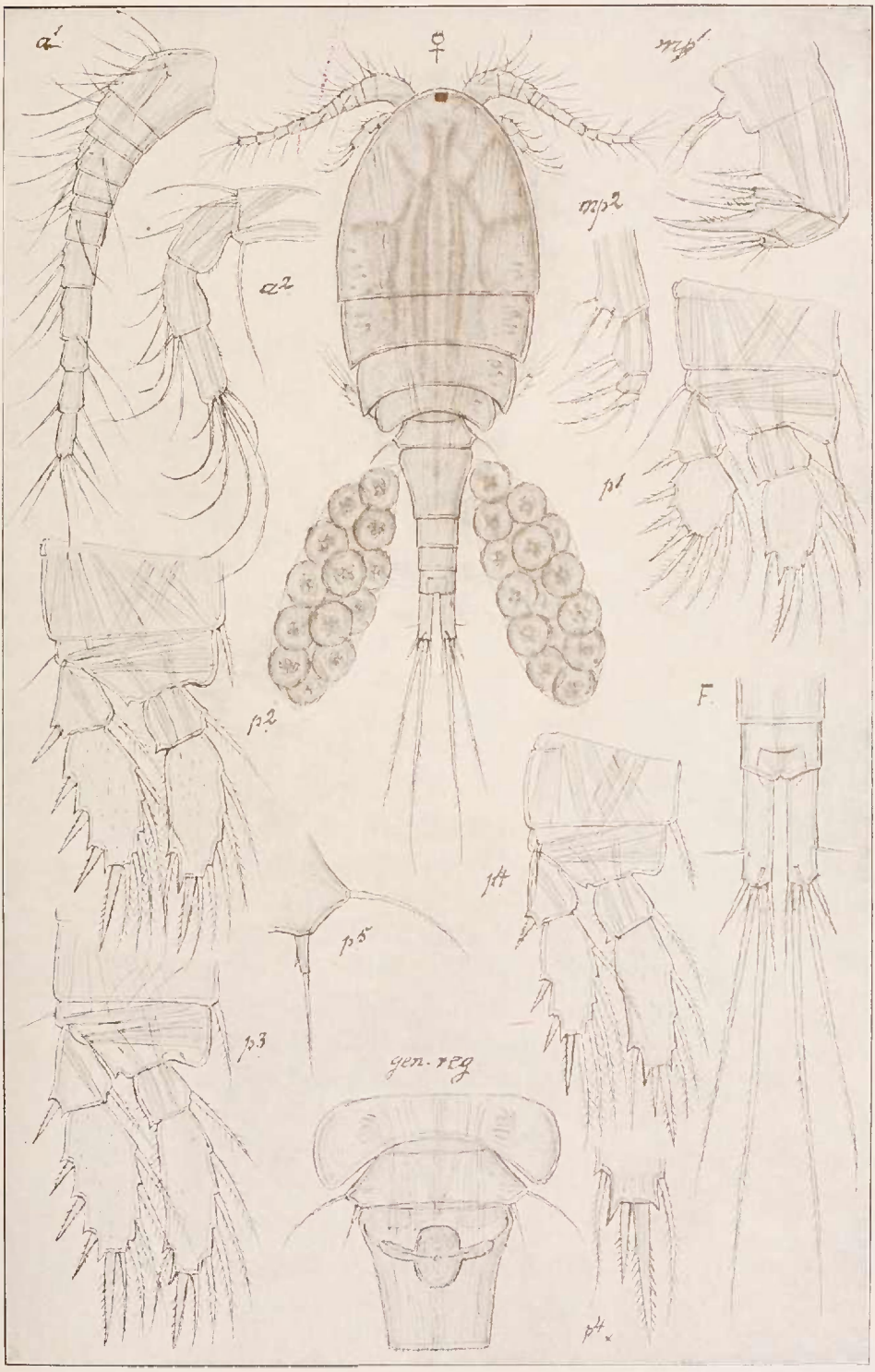
47. Platycyclops affinis, G. O. Sars.

(Pl. XLIX).

Cyclops affinis, G. O. Sars, l. c., p. 47.

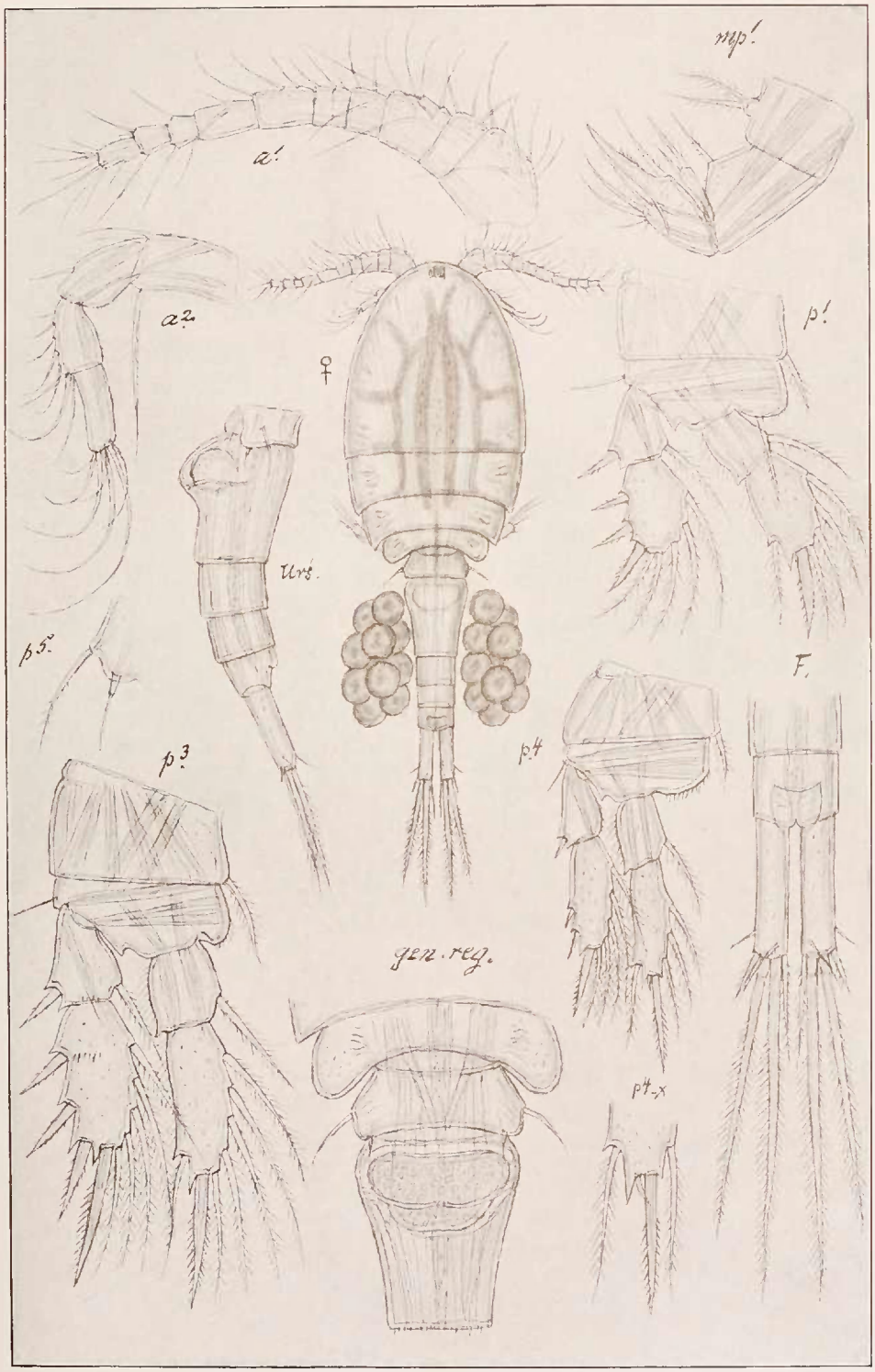
Syn: *Cyclops pygmæus*, Rehberg.

Specific Characters.—Female. Body somewhat less robust than in the preceding species, with the anterior division comparatively narrower. Cephalic segment considerably exceeding in length the 4 succeeding segments combined, and narrowly rounded in front. Last trunk-segment with the lateral parts slightly produced and clothed at the edge with slender recurved spinules. Tail about equalling in length $^2/_3$ of the anterior division, and slightly tapered distally; genital segment about as long as the 2 succeeding segments combined, and somewhat dilated at the base, last segment more fully developed than in *P. phaleratus*, though smaller than the penultimate segment. Caudal rami resembling in shape those in that species, but a little more produced; seta of outer edge very small, and attached near the end somewhat dorsally; upper face crossed by a row of small spikes extending from the said seta obliquely anteriorly; middle apical setæ strong and minutely denticulated for some part of their length, the inner one about twice as long as the outer, and equalling about half the length of the body; seta of inner corner very small, shorter than the spine of the outer. Anterior antennæ shorter than the cephalic segment, and, as in the preceding species, not much dilated in their proximal part, being composed of 11 joints clothed with short, simple setæ. Posterior antennæ far less robust than in *P. phaleratus*, with all the joints well defined. Maxillipeds resembling in structure those in that species; the posterior ones, however, wanting the spinulose ledge of the middle joint. Natatory legs with the basal part less broad and the rami less coarsely spinulose outside; 2nd basal joint in 1st pair obtusely produced at the inner corner, with the deflexed spine rather slender, terminal joint of outer ramus in 1st and 2nd pairs with 3 spines outside, in 3rd and 4th pairs with only 2 such spines; apical spine of inner ramus in 1st pair rather coarse; those in 4th pairs, as in the preceding species very unequal, the inner one being more than twice as long as the outer and conspicuously bent inwards; middle joint of same ramus with only a single seta inside. Last pair of legs well defined, each forming a small sub-quadrangular lamella carrying inside a very slender denticulated spine, outside a seta of about same length, and in the middle another much smaller seta. Ovisacs comparatively smaller than in the preceding species and containing only a limited number of ova. Seminal receptacle less broad.



G. O. Sars, del.

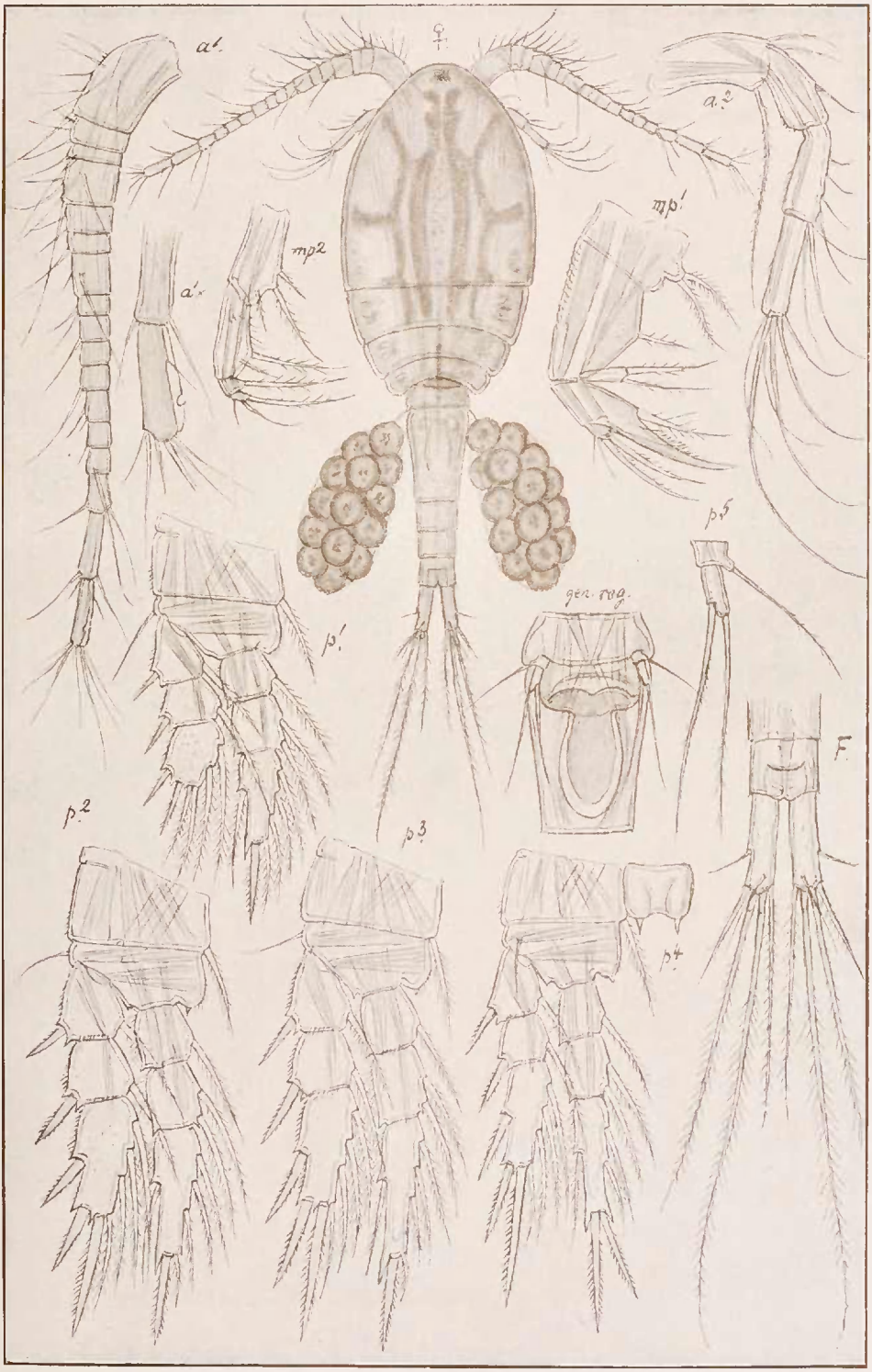
Cyclops varicans, G. O. Sars.



G. O. Sars, del.

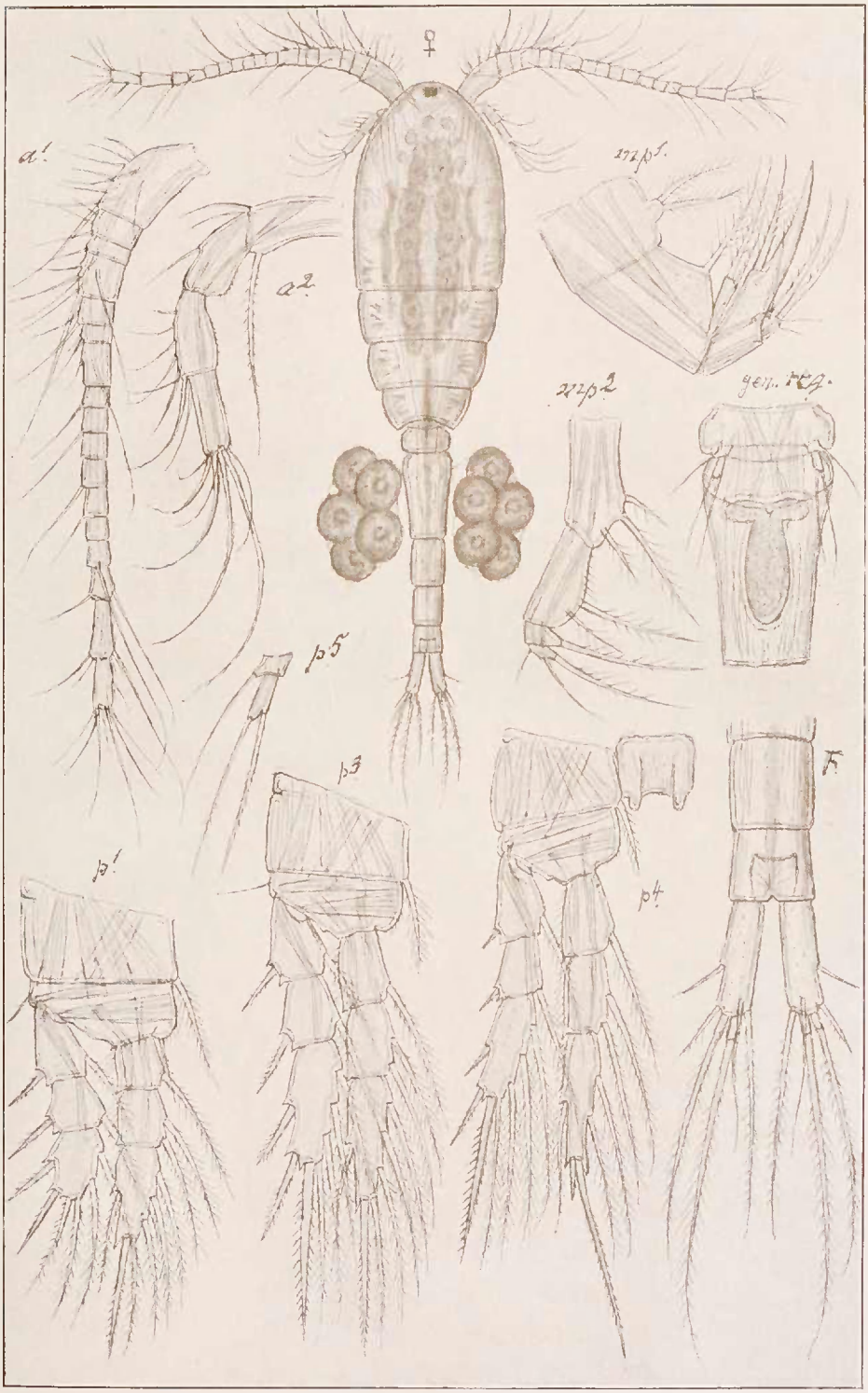
Cyclops bicolor, G. O. Sars.

Copepoda



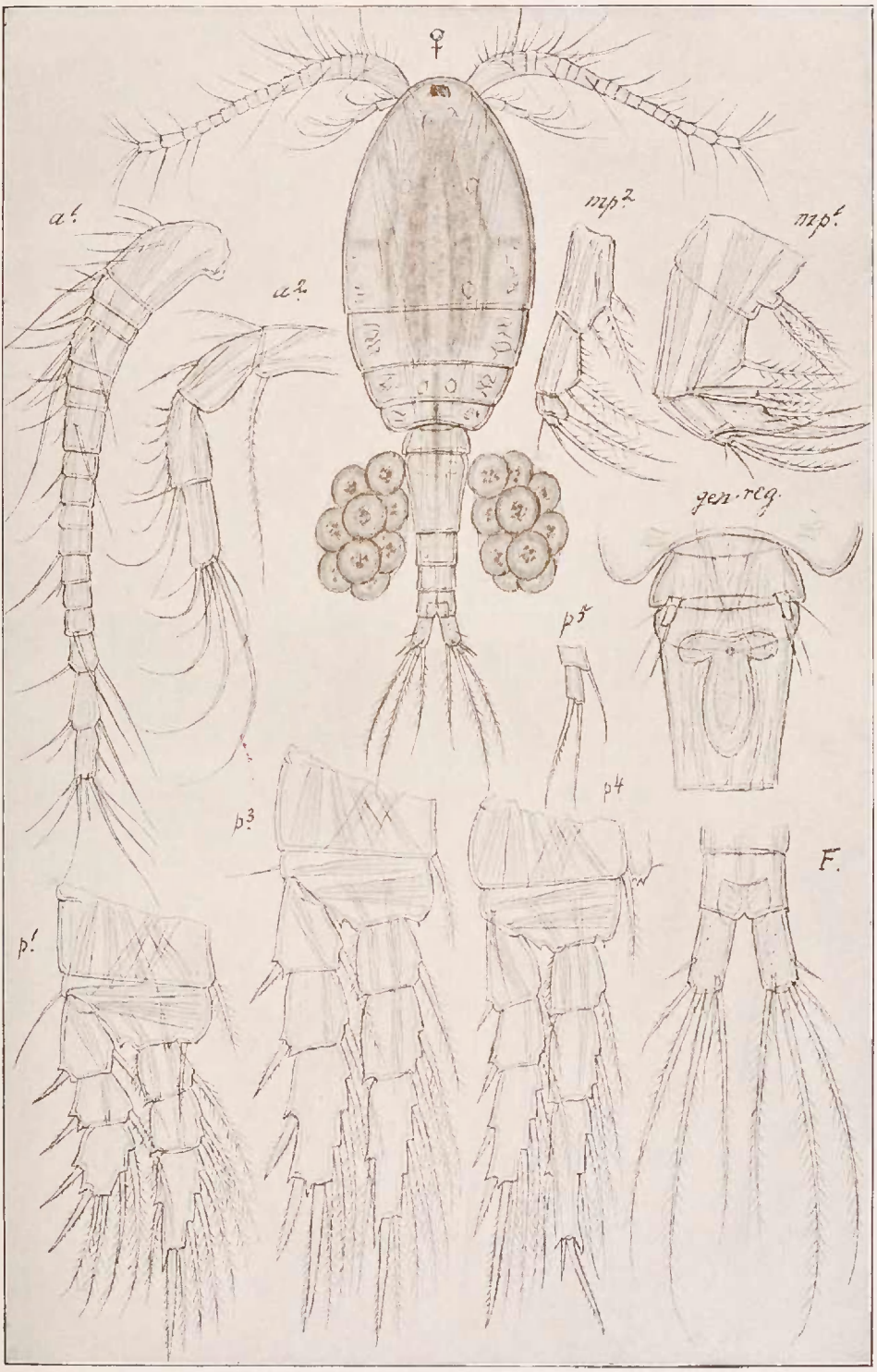
G. O. Sars, del.

Mesocyclops obsoletus (Koch).



G. O. Sars, del.

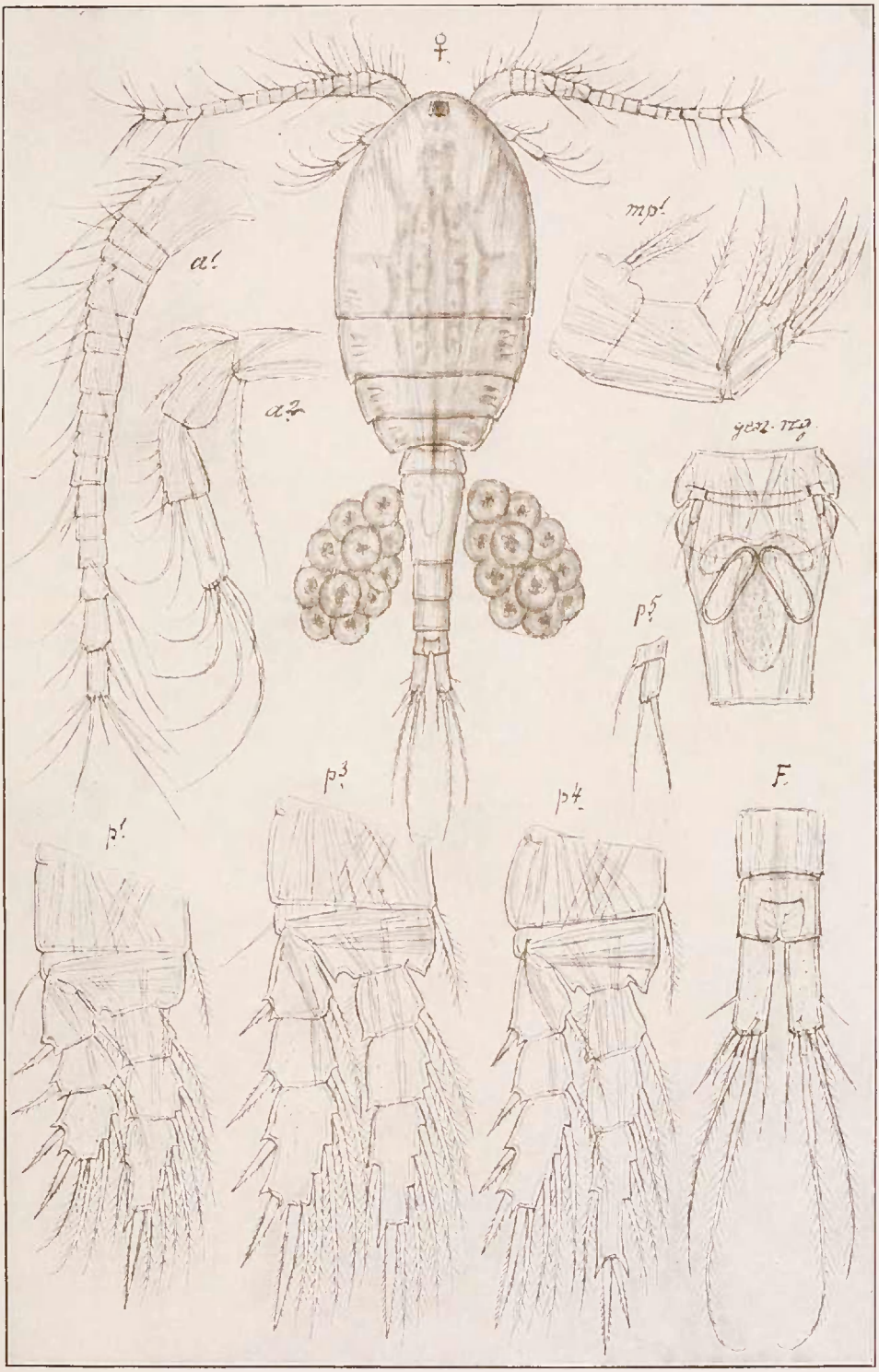
Mesocyclops oithonoides, G. O. Sars.



G. O. Sars, del.

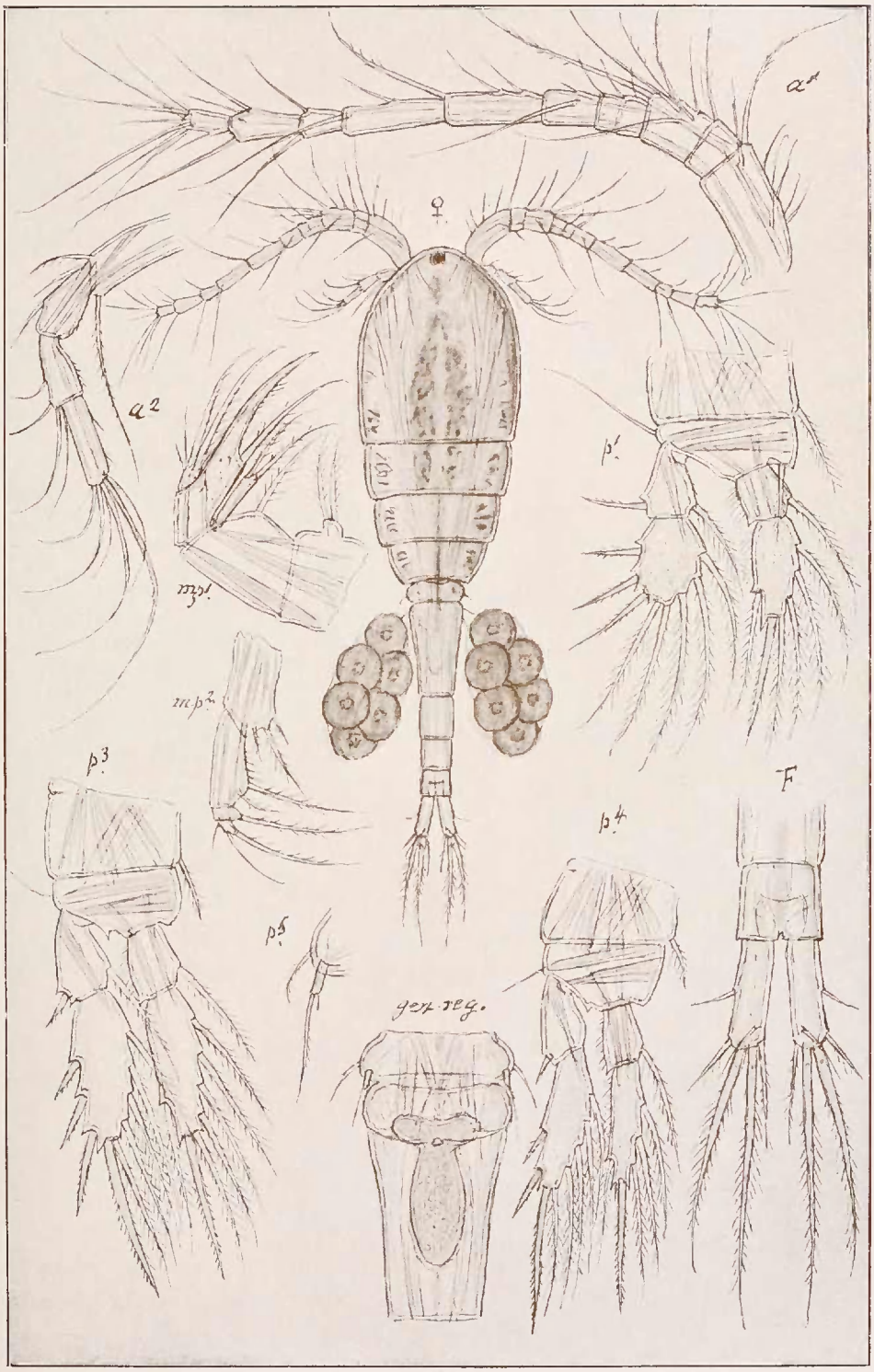
Mesocyclops crassus, (Fischer).

Copepoda



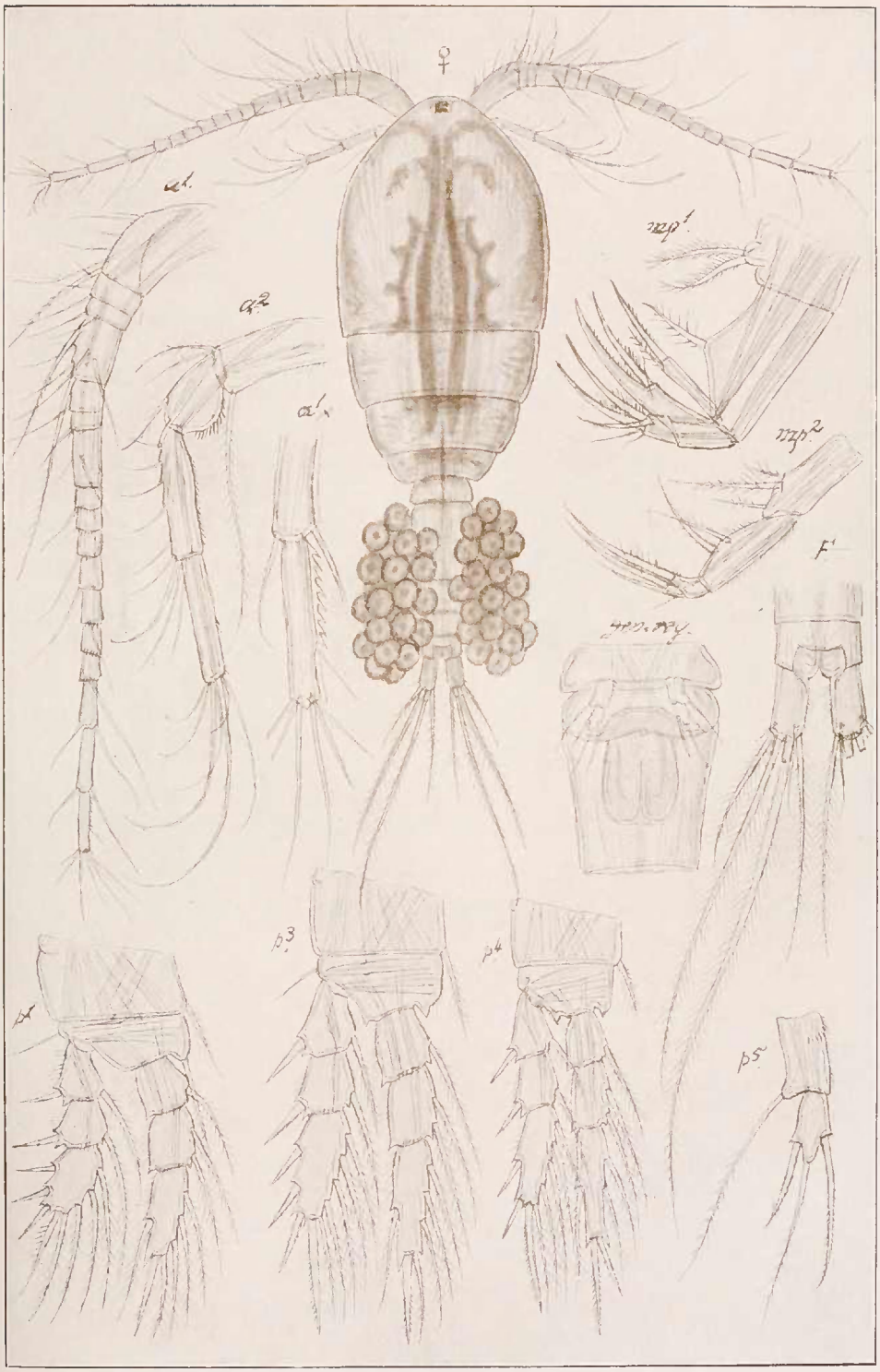
G. O. Sars, del.

Mesocyclops Dybowskyi, (Lande).



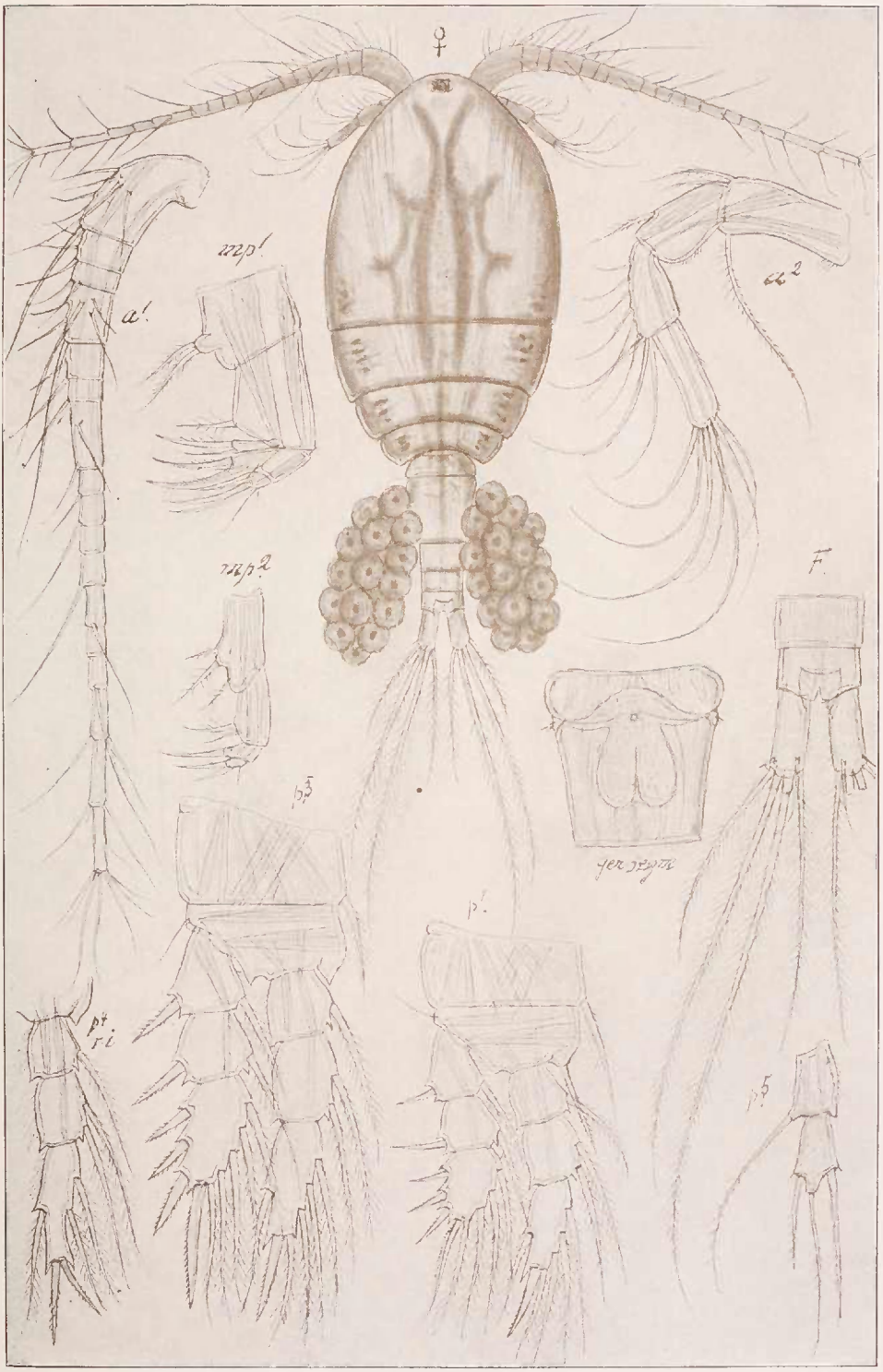
G. O. Sars, del.

Mesocyclops gracilis, (Lilljeb).



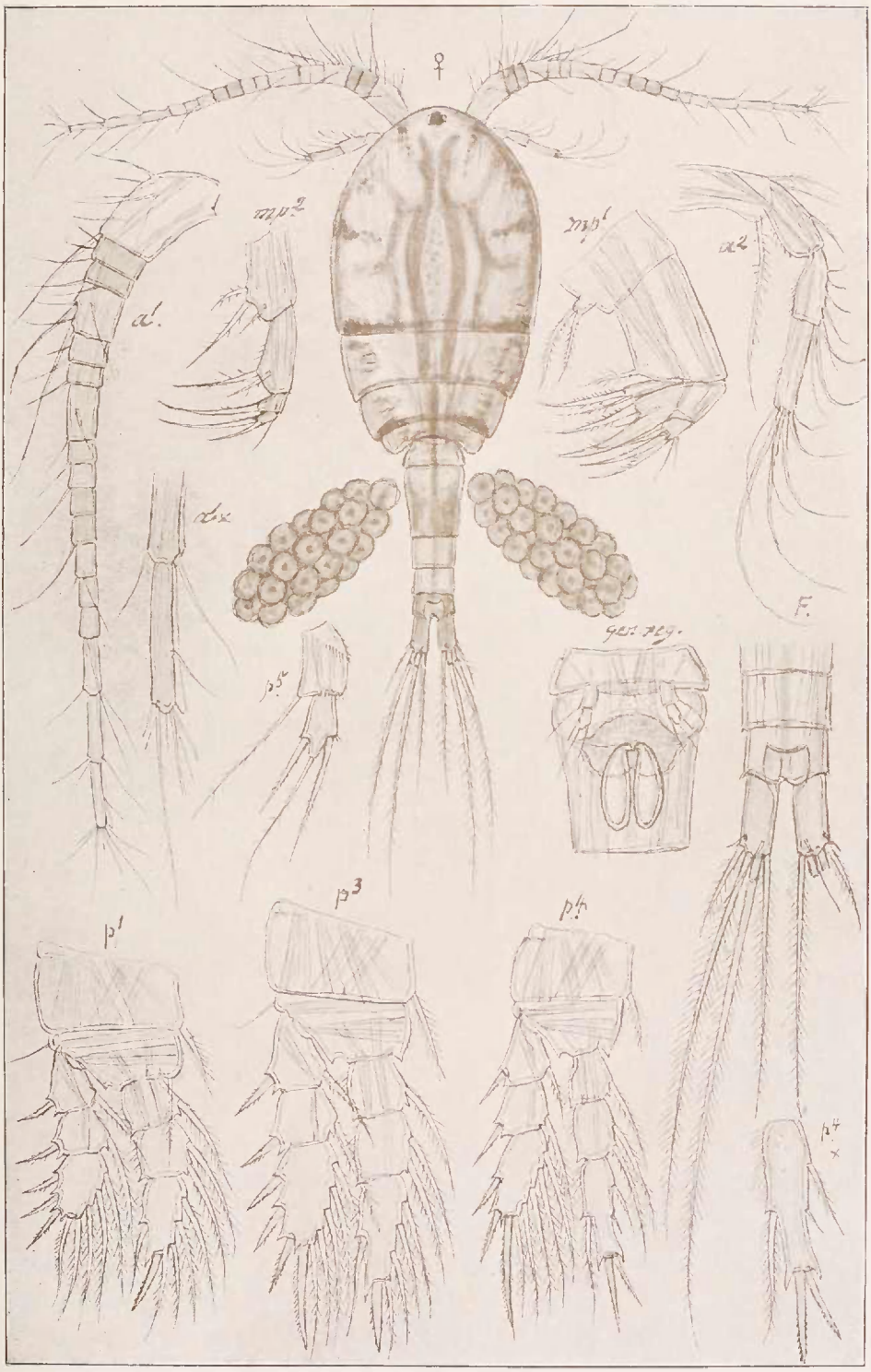
G. O. Sars, del.

Pachycyclops signatus, (Koch).



G. O. Sars, del.

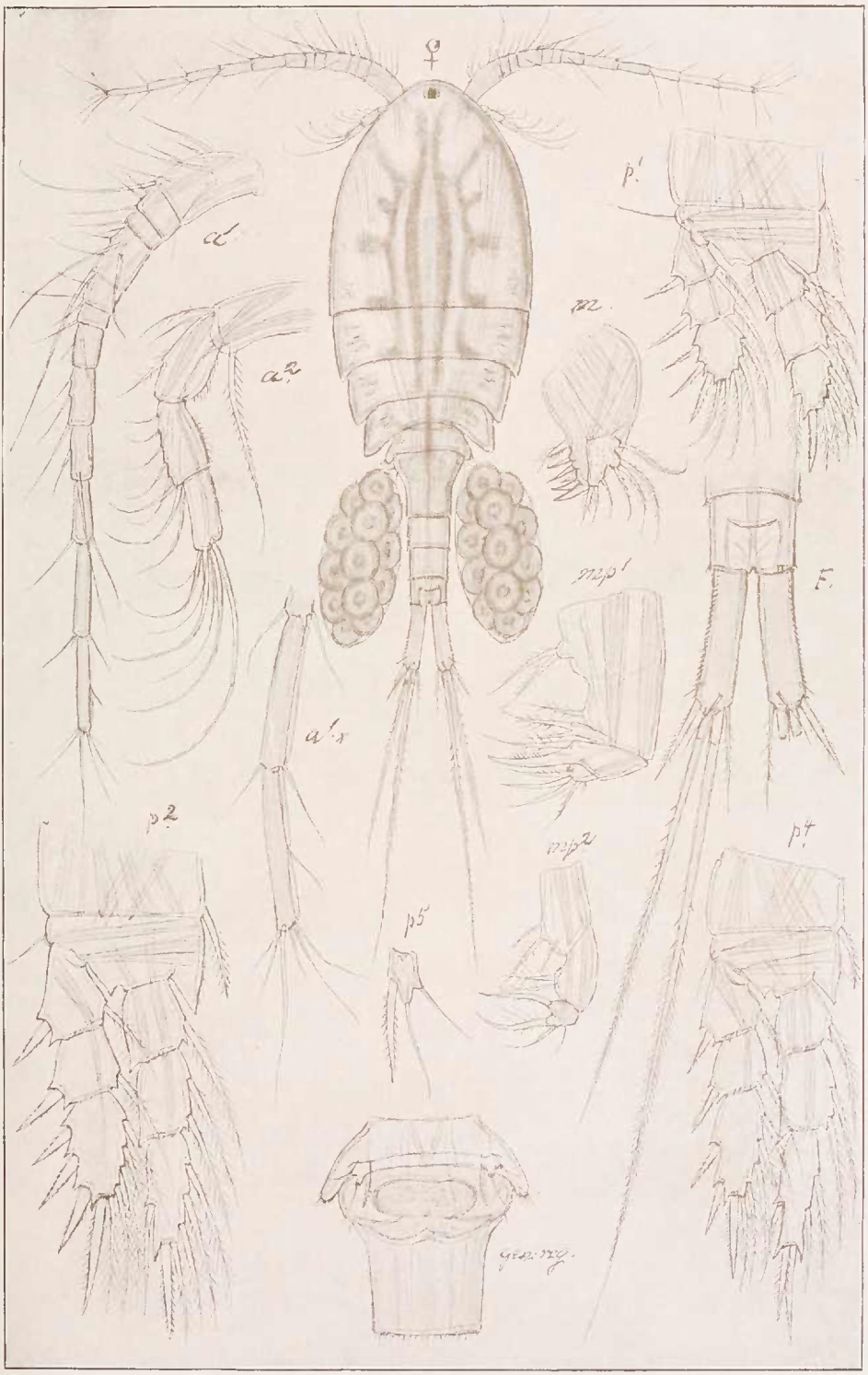
Pachycyclops bistriatus, (Koch).



G. O. Sars, del.

Pachycyclops annulicornis, (Koch).

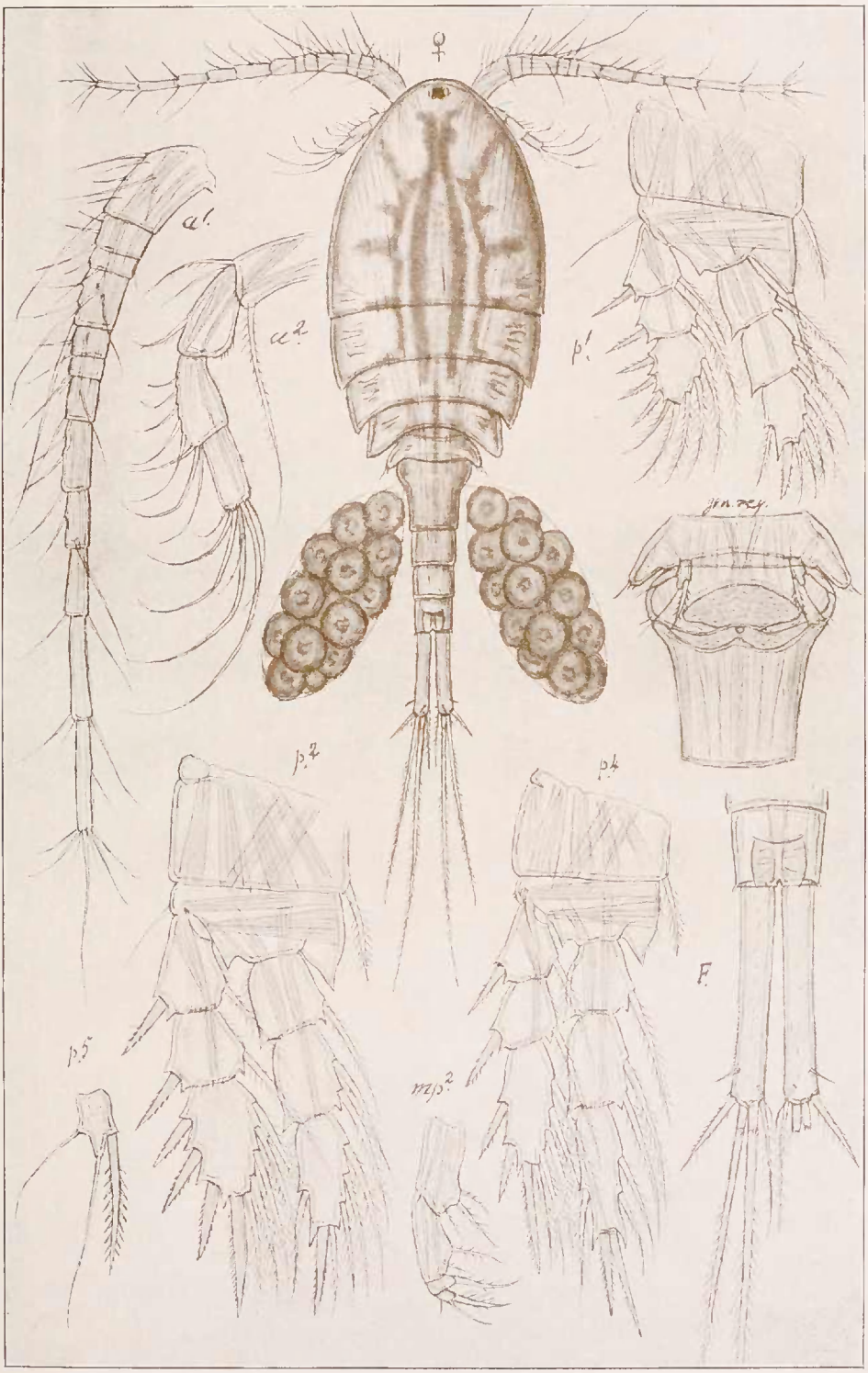
Copepoda



G. O. Sars, del.

Leptocyclops agilis, (Koch).

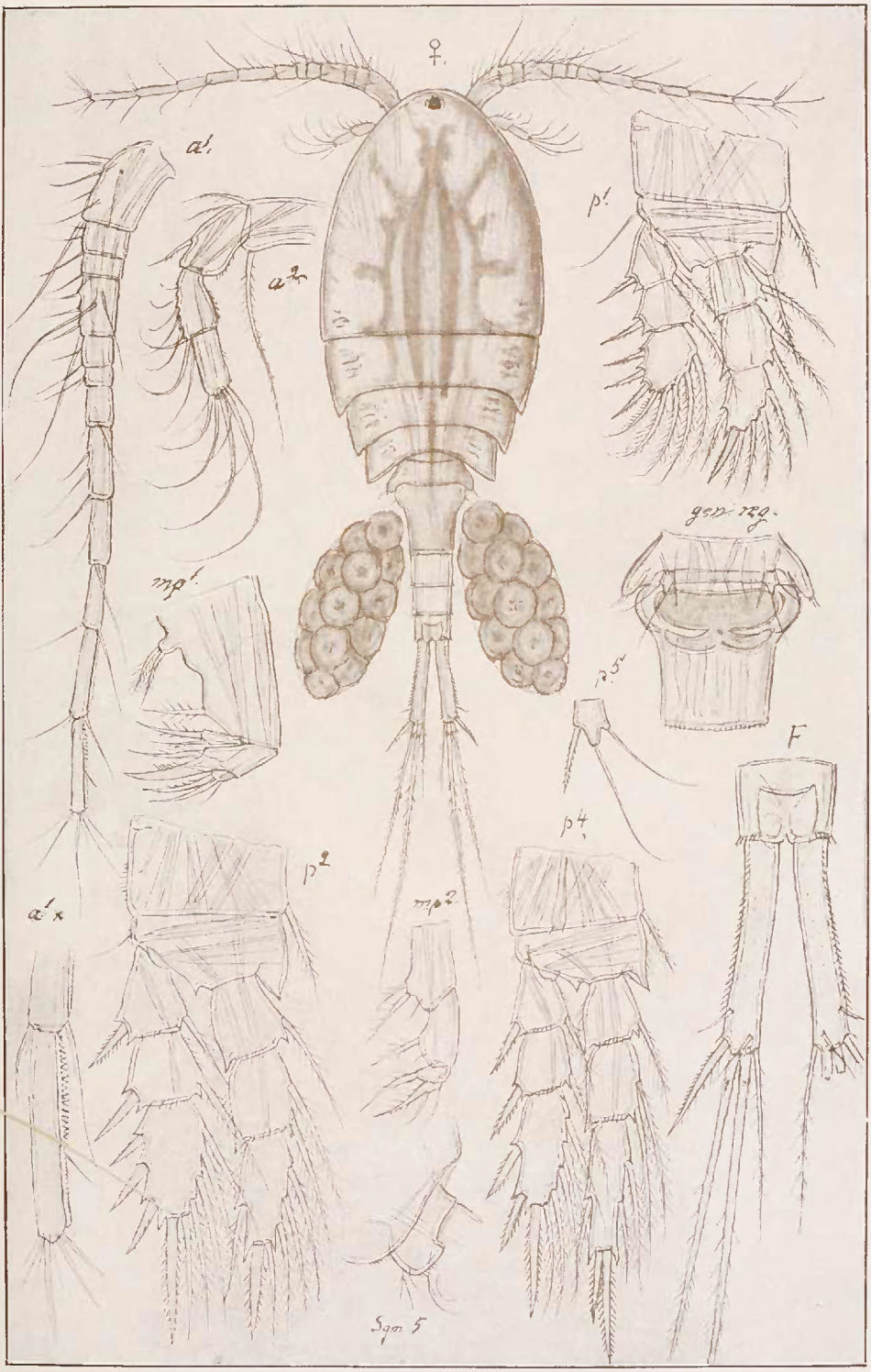
Copepoda



G. O. Sars, del.

Leptocyclops speratus, (Lilljeb).

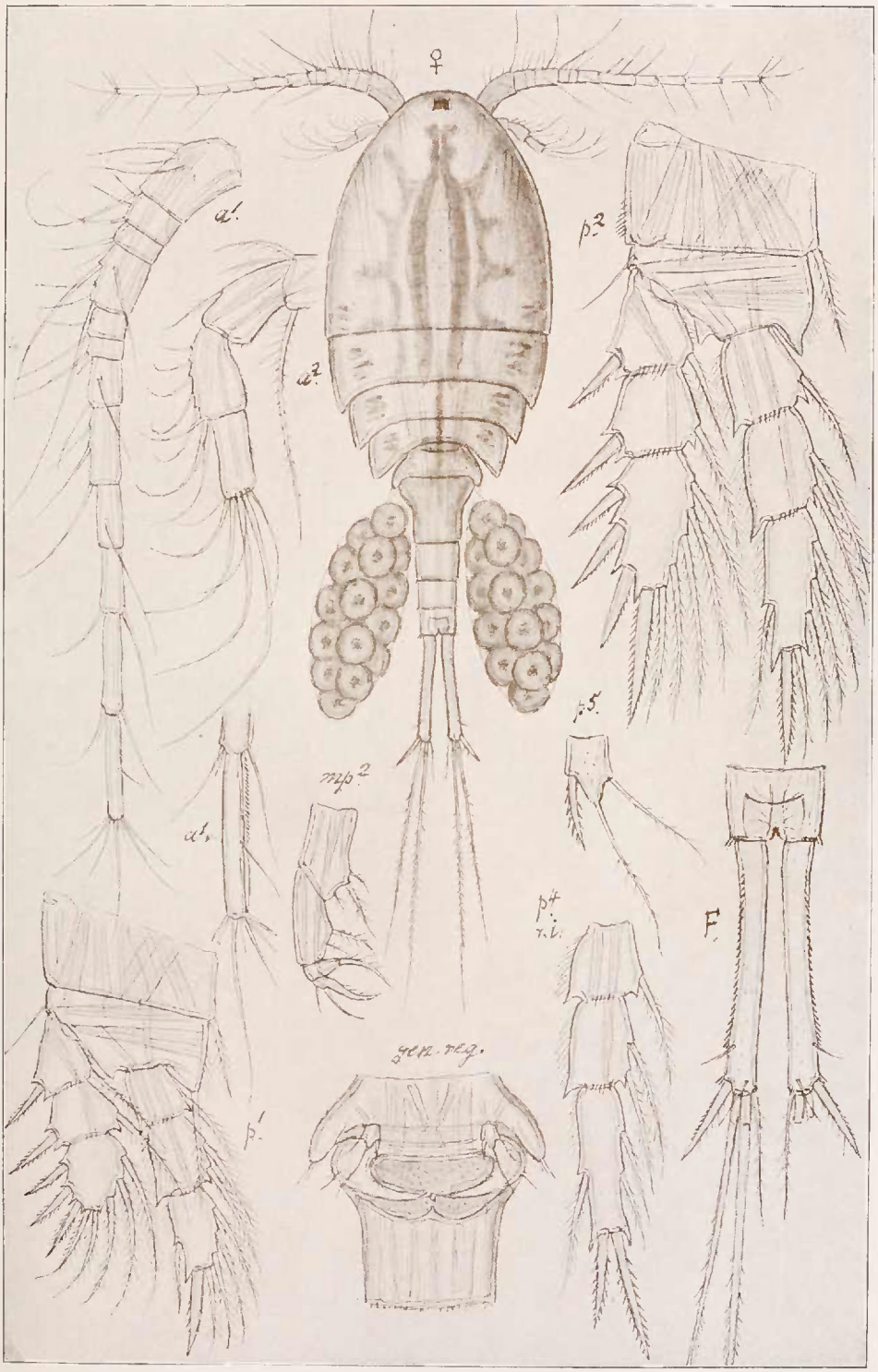
Copepoda



G. O. Sars, del.

Leptocyclops Lilljeborgi, G. O. Sars.

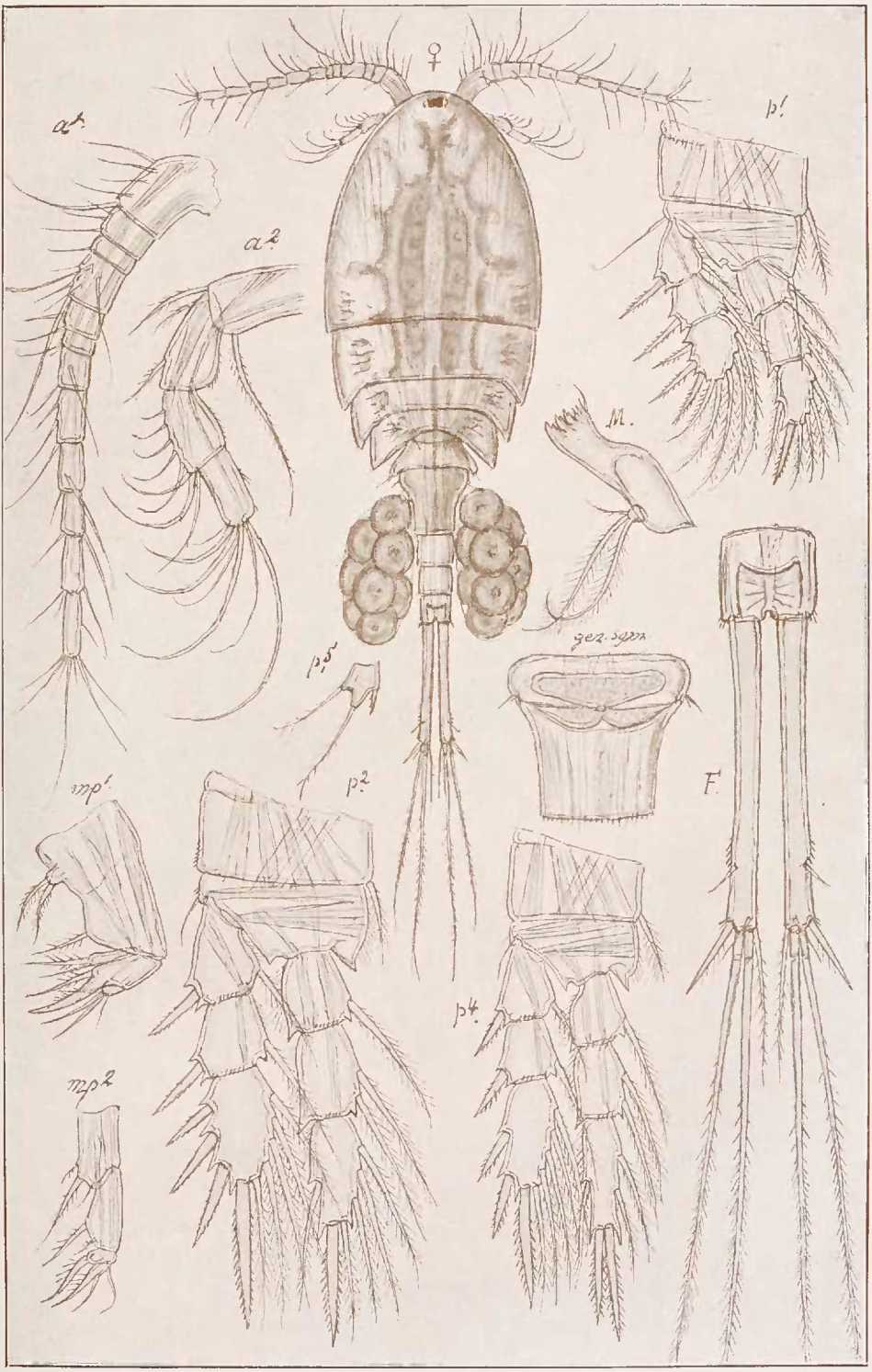
Copepoda



G. O. Sars, del.

Leptocyclops macruroides, (Lilljeb).

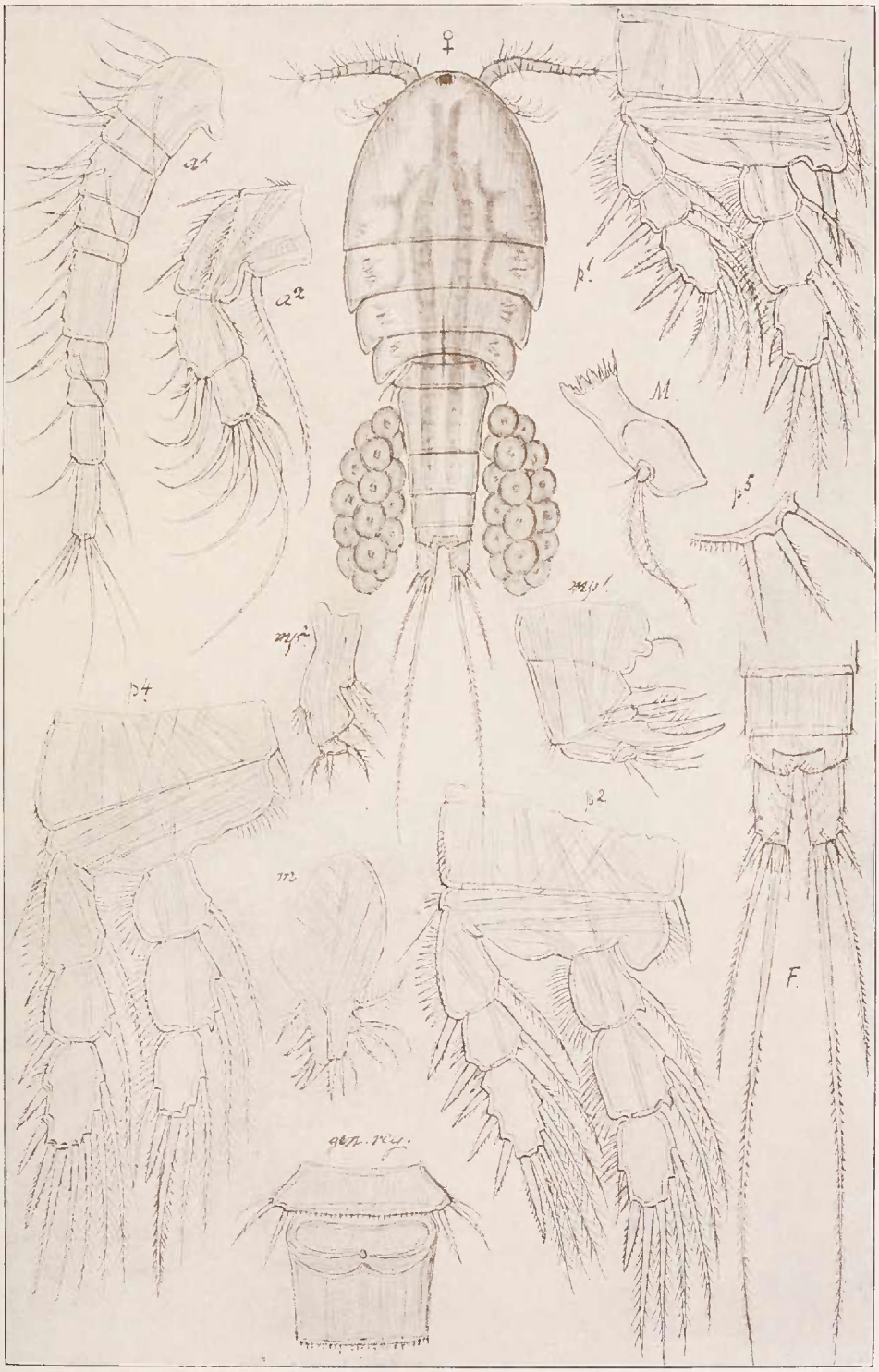
Copepoda



G. O. Sars, del.

Leptocyclops macrurus, G. O. Sars.

Copepoda



G. O. Sars, del.

Platycyclops phaleratus, (Koch).

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 VII & VIII

CYCLOPIDÆ (concluded), ASCOMYZONTIDÆ

WITH 16 AUTOTYPIC PLATES



BERGEN
PUBLISHED BY THE BERGEN MUSEUM
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1915

Colour generally dark bluish grey.

Length of adult female about 0.75 mm.

Remarks.—In its general appearance this form somewhat resembles the preceding species, but is of much smaller size and has the body less robust. It moreover exhibits several well-marked differences in the structure of the antennæ and legs, as indicated in the above diagnosis. The *Cyclops pygmæus* of Rehberg is unquestionably identical with the present species.

Occurrence.—I have taken this form in similar localities to those in which the preceding species has been found. It also occurs occasionally at the borders of large lakes or in closed lagoons formed by the reflux of the water in these lakes during the dry season.

Distribution.—Throughout Europe, Turkestan (Uljanin), Australia (G. O. Sars).

48. Platycyclops fimbriatus (Fischer).

(Pl. L).

Cyclops fimbriatus, Fischer, Beiträge zur Kenntniss der Cyclopiden (Fortsetzung). Bull. Soc. Imp. Moscou 1853. p. 94, Pl. III, figs. 19—28, 30.

Syn: *Cyclops crassicornis*, G. O. Sars (vix Müller).

Specific Characters.—Female. Body comparatively robust, with the anterior division, as in the 2 preceding species, pronouncedly depressed and oval in outline. Cephalic segment large, considerably exceeding in length the 4 succeeding ones combined, and narrowly rounded in front. Last trunk-segment with the lateral parts slightly produced and clothed with stiff, posteriorly-curving hairs. Tail about equalling in length $^2/_3$ of the anterior division, and slightly tapered distally; genital segment longer than the 2 succeeding ones combined, and somewhat dilated in front; anal segment shorter than the preceding one, and nearly transversely truncated at the end. Caudal rami much more prolonged than in the 2 preceding species, almost attaining the length of the last 3 segments combined, and rather remote at the base, being narrowly linear in form and only slightly divergent; seta of outer edge attached at some distance from the end, and somewhat dorsally; upper face of each ramus exhibiting, just in front of this seta, a short transverse row of small denticles; middle apical setæ rather strong, and clothed in their median part with scattered, stiff hairs, the inner one being nearly twice as long as the outer and about the length of the tail; seta of inner corner a little longer than the spine of the outer. Eye large and conspicuous. Anterior antennæ scarcely more than half as long as the cephalic segment, and rather dilated at the base, being composed of only 8 joints, densely clothed with

strong, partly ciliated setæ. Posterior antennæ with all the joints well defined, the terminal one very short, scarcely more than half the length of the penultimate one. Maxillipeds short and stout, the posterior ones, however, somewhat more fully developed than in the 2 preceding species. Natatory legs resembling in structure those in *P. phaleratus:* apical spine of inner ramus in 1st pair, however, comparatively larger; those in 4th pair rather unequal, the inner one being about twice as long as the outer. Last pair of legs well defined, resembling in structure those in *P. affinis:* spine of inner edge, however, considerably shorter. Ovisacs in some cases rather large, oblong oval in form, and closely appressed to the tail. Seminal receptacle rather broad, transversely elliptical in form.

Colour whitish, with the ovarial tubes dark bluish; eggs in the ovisacs generally of a similar dark hue; eye bright red.

Length of adult female about 0.90 mm.

Remarks.—This form was at first identified by me with *Cyclops crassicornis* of O. Fr. Müller; but it is very questionable if the form so named can be assigned to the present species, or even to the genus *Cyclops*. Fischer's description, on the other hand, does not leave any doubt about the identity of his species with that here in question. It may be easily recognised from either of the 2 preceding species by the short and thick anterior antennæ, and the rather different shape of the caudal rami.

Occurrence.—I have met with this form only occasionally in small ponds and ditches, more frequently in larger lakes, where in some cases it descends to rather considerable depths. Thus in Lake Mjøsen I have taken it in depths down to 50 fathoms. Like the other species of this genus, it is a true bottom-form, always keeping close to the ground.

Distribution.—Sweden (Lilljeborg), British Isles (Brady), Germany (Schmeil), Poland (Lande), Russia (Fischer).

Section 2. Siphonostoma.

General Characters.—Anterior antennæ in male generally (but not always) geniculated. Posterior antennæ, as a rule, provided with a very small uniarticulate appendage as the rudiment of an outer ramus. Oral parts not adapted for mastication, the anterior and posterior lips being generally produced to form a prominent cone, terminating in some cases in a long siphon. Mandibles with

the masticatory part styliform. Maxillæ feeble, and generally divided into 2 setiferous lobes. Both pairs of maxillipeds subcheliform, adapted for prehension. Natatory legs, as a rule, well developed, with triarticulate rami.

Remarks.—The name "Siphonostoma" is here taken in a much more restricted sense than is done by its proposer, Thorell, viz., to designate only a section of semiparasitic Cyclopoida, in which the mouth, by the prolongation of the anterior and posterior lips, has assumed a more or less suctorial character, recalling that found in some of the true parasites, for instance in the *Caligoida*. Yet the characteristic Cyclopoid appearance in all of them has been preserved, and none of them are to be regarded as permanent parasites, as they have the power to leave their hosts at will, and to move freely through the water by the aid of their generally well developed natatory legs. Indeed, many of the forms have hitherto only been found in such a free condition, though the structure of the mouth organs evidently show them to be adapted for temporary parasitic habits.

In the restriction here adopted, the present section answers fairly well to the family *Asterocheridæ* of Giesbrecht. This family, which is included in his great division *Amphartbrandria*, comprises several types, which are so widely different, that in my opinion they cannot properly be combined within one and the same family. Giesbrecht himself has also been aware of this difference, and for this reason has established within the family *Asterocheridæ* a number of so-called sub-families. These I regard as true families, and their number will be still somewhat increased.

Fam. 4. Ascomyzontidæ.

Characters.—Body Cyclops-like, with the anterior division more or less dilated, the posterior narrow and attenuated. Anterior antennæ generally slender and composed of a great number of articulations, the outermost of which form a distinctly-defined terminal part, the joint preceding this part being constantly provided with a very fully developed sensory filament; same antennæ in male more or less distinctly hinged, with the number of joints somewhat reduced. Posterior antennæ moderately strong, 4-articulate, 1st, or coxal, joint short, the 2 succeeding ones more or less prolonged, and forming together a geniculate bend, last joint small, carrying on the tip a slender spine accompanied by 2 or 3 short bristles, one of which issues from a knob-like prominence of the anterior edge.

Oral cone more or less produced. Mandibles penetrating the cone up to its apex, and having outside at the base a slender, generally bisetose palp. Maxillæ with the inner lobe the larger. Anterior maxillipeds, as a rule, shorter and stouter than the posterior, and having the basal joint imperfectly defined, terminal claw uniarticulate or in some cases biarticulate; that of the posterior ones always 3-articulate. Natatory legs on the whole of normal structure. Last pair of legs biarticulate, with the proximal joint laminar and in most cases imperfectly defined from the segment, distal joint lamelliform, and extended laterally.

Remarks.—This family, established by Thorell, is here taken in a more restricted sense than is done by that author, who comprised within it also the genus *Dyspontius*, which ought to be referred to quite a distinct family. Nor does it fully answer to the sub-family *Asterocherinæ* of Giesbrecht, as I have found it necessary to remove the genus *Acontiophorus* in to a separate family.

Gen. 17. **Ascomyzon**, Thorell, 1859.

Syn: Asterocheres, Boeck.
„ Cyclopicera, Brady (part).
„ Artotrogus, Brady (part).

Generic Characters.—Body pronouncedly depressed, with the anterior division broad and expanded. Cephalic segment very large and having the rostral prominence more or less distinctly defined and incurved. Penultimate trunk-segment much smaller than the preceding one, and partly covered by it; last segment still smaller, and firmly connected with the genital segment. Tail not much prolonged, and composed in female of 3, in male of 4 segments; genital segment in female considerably dilated, and having the lateral edges clothed with stiff hairs; that of male still more tumefied, and provided at the end, on each side, with a prominent triangular lobe carrying a spiniform seta. Caudal rami comparatively short and without any seta on the outer edge; apical setæ of moderate length, the 2 mediate ones being, as usual, the largest, and distinctly jointed at the base. Anterior antennæ slender and elongated, exhibiting a proximal, somewhat thicker portion composed of 9 short articulations, and a much narrower, linear distal portion; terminal part, as a rule, composed of 3 articulations, which however in some cases may be more or less completely coalesced; same antennæ in male distinctly hinged. Posterior antennæ with the penultimate joint almost as long as the preceding one. Oral cone, as a rule, pyriform in shape, though in some cases abruptly narrowed to form a slender straight siphonal tube. Man-

dibles with the masticatory part very narrow and lancet-shaped at the end; palp biarticulate. Maxillæ with the lobes rather unequal, both carrying on the tip 4 setæ. Maxillipeds more or less powerfully developed, the posterior ones having in male a slight palmar projection near the base of the hand. Natatory legs of moderate size, terminal joint of outer ramus in 1st pair with only 2 seta inside, in the other pairs with 4 such setæ. Last pair of legs with the proximal joint imperfectly defined from the segment, but carrying outside the usual seta; distal joint somewhat tapered distally and ciliated on both edges, apex provided with 2 curved setæ, generally accompanied inside by a small bristle.

Remarks.—This genus, which is the type of the family *Ascomyzontidæ*, was established in the year 1859 by Thorell, to comprise a form found by him parasitic in the branchial cavity of Ascidians. In the very same year Boeck established his genus *Asterocheres*, which has turned out to be identical with Thorell's genus. Although Boeck's paper seems to have been published a little prior to Thorell's Monograph, it appears to me that the generic name proposed by Boeck can scarcely be admitted, because the species of this genus are by no means exclusively parasites of Asterids, but are found to infest many other invertebrate animals. For the same reason, of course, the family-name *Asterocheridæ*, proposed by Giesbrecht, ought to be rejected. Brady has confounded this genus with the genus *Artotrogus* of Boeck, which in reality belongs to quite a different family, and one of the species *(A. latum)* has moreover been referred by that author to his genus *Cyclopicera*. The present genus seems to be very rich in species. In the following pages will be described 6 different species belonging to the Fauna of Norway.

49. Ascomyzon asterocheres, Boeck.

(Pl. LI & LII).

Asterocheres Lilljeborgi, Boeck, Tvende nye parasitiske Krebsdyr. Chr. Vid. Selsk. Forh. f. 1859, p. 6, Pl. II.

Specific Characters.—Female. Anterior division of body very broad and flattened, its greatest width fully equalling the length. Cephalic segment exceedingly large, being more than twice as long as the 4 succeeding segments combined, and almost semicircular in outline; lateral edges not inflexed; rostrum imperfectly defined, and only represented by a slight convexity below the front. Epimeral parts of the trunk-segments expanded laterally and acutangular behind. Penultimate segment, as usual, much smaller than the preceding one; last segment still smaller. Tail comparatively short, not nearly attaining half the length of the anterior division, and

gradually attenuated behind; genital segment considerably tumefied; anal segment exceeding in length the preceding one. Caudal rami about twice as long as they are broad, and scarcely at all divergent, tip transversely truncated, with the setæ rather unequal, the innermost but one being, as usual, the longest, and considerably exceeding the tail in length. Anterior antennæ almost equalling in length the cephalic segment, and composed of only 18 articulations, the 3 joints of the terminal part being fused together to form a single joint. Posterior antennæ comparatively strongly built, with the penultimate joint fully as long as the preceding one and not much narrower; apical spine rather strong. Oral cone pyriform in shape, and only extending to the insertions of the posterior maxillipeds. Mandibles with the masticatory part of the usual narrow lancet-shaped appearance; palp rather fully developed. Maxillæ with the lobes less unequal than usual, apical setæ of both lobes rather strong and finely ciliated. Anterior maxillipeds very powerfully developed, with the claw exceedingly strong and curved like a hook at the end. Posterior maxillipeds likewise rather powerful, though somewhat less so than the anterior ones. Natatory legs less fully developed than in most other species, and more or less incurved: their structure, however, quite normal. Last pair of legs with the distal joint oblong in form, and provided, in addition to the 2 apical setæ, with a small bristle at some distance from the tip inside. Ovisacs of moderate size, oval in form, and somewhat divergent.

Male smaller than female, and having the body somewhat less broad. Tail composed of 4 well-defined segments, the anterior of which is greatly tumefied, to form the lateral hollows in which the rather large spermatophores are received. Anterior antennæ composed of 17 joints, the last 2 of which admit of being bent upon the preceding part. Posterior maxillipeds with a well-marked palmar prominence near the base of the hand.

Body in both sexes semipellucid, with a more or less distinct reddish tinge.

Length of adult female about 1.30 mm., of male scarcely 1 mm.

Remarks.—This form was described by Boeck in the year 1859 under the name of *Asterocheres Lilljeborgi*. As, however, the term *Asterocheres* cannot properly be admitted as a generic designation, I propose to use it here as a specific one, substituting it for the original name *Lilljeborgi*. Hereby two advantages are gained, 1stly, that the name *Asterocheres* may be reserved for the present species, though in a somewhat different sense, and 2ndly, that the specific name *Lilljeborgi* proposed by Thorell for his species may stand unchanged.

The present form is a well-marked and easily recognisable species, being especially distinguished by the very broad and flattened body and the unusually

powerful development of the maxillipeds. According to Giesbrecht, the *Ascomyzon Lilljeborgi* of Canu is not this species.

Occurrence.—Boeck found this form on a specimen of *Echinaster sanguinolentus* taken at Farsund, south coast of Norway. I myself, many years ago, collected some specimens off the west coast, and, as far as I remember, from our common *Asterias rubens*.

Distribution.—British Isles (Brady, Scott).

50. Ascomyzon Lilljeborgi, Thorell.

(Pl. LIII).

Ascomyzon Lilljeborgi, Thorell, Bidrag til kännedomen om Krustaceer, som levfa i arter af slägtet Ascidia, p. 78, Pl. XIV, fig. 21.

Syn: *Asterocheres siphonatus*, Giesbr.

Specific Characters.—Female. Anterior division of body moderately expanded and rounded oval in outline, the greatest width not nearly attaining the length; epimeral parts of the segments less prominent than in the preceding species, and rounded at the end. Cephalic segment only slightly longer than the 4 succeeding segments combined, and narrowly rounded in front; rostrum distinctly defined, though not prominent, and blunt at the tip; lateral edges of the segment inflexed. Tail scarcely exceeding in length $^1/_3$ of the anterior division; genital segment less broad than in *A. asterocheres*, and exhibiting on each side, immediately behind the genital orifice dorsally, a knoblike projection; anal segment only slightly longer than the preceding one. Caudal rami very short, being scarcely longer than they are broad; apical setæ of moderate length. Anterior antennæ long and slender, even somewhat exceeding in length the cephalic segment, and composed of 19 joints, the outer 2 joints only of the terminal part being coalesced. Posterior antennæ less strongly built than in *A. asterocheres*, with the penultimate joint rather narrow. Oral cone produced to a long and narrow siphonal tube extending almost to the middle of the genital segment, the tube, for the greater part of its length, being finely striated transversally; tip slightly dilated, spoon-shaped. Mandibles with the masticatory part greatly prolonged in accordance with the great length of the siphon; palp comparatively smaller than in *A. asterocheres*. Maxillæ with the inner lobe moderately produced and rounded at the end, outer lobe scarcely more than half as long and much narrower; setæ of the lobes not particularly strong and rather unequal in length. Maxillipeds less powerfully developed than in the preceding species, the claw of the anterior ones comparatively short and only slightly curved at the end. Natatory legs resembling in structure those in the said species, but of somewhat larger size. Last pair

of legs with the distal joint oblong oval in form, and provided with only 2 apical setæ. Ovisacs of moderate size, oblong in form, and rather divergent.

Male much smaller than female, and exhibiting the usual sexual differences.

Body in both sexes highly pellucid and nearly colourless, with only a very faint yellowish tinge.

Length of adult female about 0.90 mm., of male 0.70 mm.

Remarks.—This form was described under the above name in the year 1859 by Thorell as the type of his genus *Ascomyzon*. Giesbrecht thought it necessary to change the specific name *Lilljeborgi*, because this name was given at a somewhat earlier date by Boeck to another species of this genus. If, however, my proposal to name Boeck's species as above, be accepted, a change in the name of Thorell's species will be avoided.

The most prominent character distinguishing the present species is undoubtedly the exceedingly long and slender siphon, for which reason Giesbrecht proposed to name it *A. siphonatus*. The species which comes nearest to it in this respect is the Neapolitan form *A. stimulans* Giesbr., in which the siphon is said to extend almost to the insertions of the 4th pair of legs.

Occurrence.—Thorell found this form in the branchial cavity of *Corella parallellogramma*, and I have myself taken it not infrequent at Risør, south coast of Norway, from the same Ascidian. Two female specimens were also found among dredged material procured at Grimstad, somewhat farther west.

Distribution.—Bohuslän (Thorell).

51. Ascomyzon Boecki, (Brady).

(Pl. LIV).

Artotrogus Boecki, Brady, Monograph of British Copepoda, Vol. III, p. 60, Pl. XCI. figs. 1—9.

Specific Characters.—Female. Anterior division of body rather broad and expanded, with the cephalic segment very large and evenly rounded in front; lateral parts of the succeeding segments rounded off at the end. Tail comparatively short, scarcely exceeding in length $^1/_3$ of the anterior division; genital segment moderately dilated and occupying more than half the length of the tail; anal segment scarcely longer than the preceding one. Caudal rami short, about as long as they are broad; apical setæ not much elongated. Anterior antennæ nearly as long as the cephalic segment, and composed of 20 articulations, all 3 joints of the terminal part being well defined. Posterior antennæ about as in *A. Lilljeborgi*. Oral cone, as in that species, terminating in a narrow siphonal tube, which however is considerably shorter, only extending a little beyond the

insertions of the 1st pair of legs, and does not exhibit any trace of a transverse striation. Maxillæ with the inner lobe considerably produced and tapered distally, the apical setæ being likewise unusually slender; outer lobe very small. Maxillipeds rather powerfully developed; claw of the anterior ones strong and much elongated, with the end evenly curved and the concave edge finely ciliated throughout. Natatory legs of normal structure. Last pair of legs nearly as in *A. Lilljeborgi*.

Male, as usual, smaller than female, and moreover easily recognisable by the distinctly hinged anterior antennæ and by the structure of the tail.

Colour not yet ascertained.

Length of adult female about 0.90 mm., of male 0.75 mm.

Remarks.—Brady erroneously considered this form to be identical with *A. Lilljeborgi* Thorell, and the change of the specific name was merely made to distinguish it from *Asterocheres Lilljeborgi* of Boeck. The species is however in reality quite distinct from both of those forms, though nearest allied to *A. Lilljeborgi* Thorell, from which it is distinguished by the much shorter siphon.

Occurrence.—A solitary female specimen of this form was taken, many years ago, at Bukken, SW coast of Norway, from some dredged material, and a few additional specimens were picked up recently from the bottom-residue of a large collecting-bottle containing a number of different invertebrate animals taken at Rauø, west coast of Norway. I am of course unable to decide from what hosts the specimens were derived nor is any information upon this point given by Brady.

Distribution.—British Isles (Brady), ? Gulf of Naples (Giesbrecht).

52. Ascomyzon simulans, Scott.

(Pl. LV).

Ascomyzon simulans, Scott, Sixteenth Ann. Rep. of the Fisheries Board for Scotland, Part III, p. 270, Pl. XIII, figs. 1—9, Pl. XIV, fig. 22.

Specific Characters.—Female. Anterior division of body less broad than in the preceding species, the greatest width being much smaller than the length. Cephalic segment of moderate size and evenly rounded in front. Lateral parts of the 2 succeeding segments obtusely rounded, those of the last 2 segments slightly angular. Tail very short, scarcely $^1/_3$ the length of the anterior division; genital segment considerably dilated, being even somewhat broader than it is long; anal segment about the length of the preceding one and somewhat contracted behind. Caudal rami exceedingly small, being broader than they are

long; apical setæ comparatively short. Anterior antennæ not quite as long as the cephalic segment, and composed of 20 articulations, all 3 joints of the terminal part being well defined; proximal portion of the antennæ rather thick and very sharply marked off from the slender distal portion. Posterior antennæ comparatively strong, with the penultimate joint somewhat shorter than the preceding one. Oral cone not much produced, pyriform, extending scarcely beyond the insertions of the posterior maxillipeds. Mandibles with the masticatory part moderately prolonged and terminating in a lancet-shaped point; palp normal. Maxillæ with the inner lobe of moderate size and the apical setæ comparatively short; outer lobe scarcely more than $^1/_2$ the length of the inner, and much narrower. Maxillipeds of normal structure. Natatory legs well developed, with the rami comparatively broader than in the preceding species. Last pair of legs with the distal joint oval in form and carrying, in addition to the 2 apical setæ, a small bristle attached inside the latter. Ovisacs of moderate size and oval in form, being only slightly divergent.

Male differing from female in a manner similar to that in the other species.

Body in both sexes rather pellucid, with a slight rosy tinge.

Length of adult female about 1 mm, of male 0.72 mm.

Remarks.—This form was referred by Scott with some doubt to the genus *Ascomyzon*. It is however certainly a genuine member of this genus, as defined here, though well defined from the other species.

Occurrence.—I have long been aware of this form, of which several specimens have been collected at different times off the south coast of Norway, and always on Sponges, for which reason I had noted it with the provisional name *A. spongiophilum*. It also occurred in great numbers in the bottom-residue of the same collecting-bottle from which *A. Boecki* was procured, and as this bottle contained, besides other invertebrate animals, also a number of sponges, it is most likely that they were in reality derived from the latter.

Distribution.—British Isles (Scott).

53. Ascomyzon latum, (Brady).

(Pl. LVI).

Cyclopicera lata, Brady, Monograph of British Copepoda, Vol. III, p. 56, Pl. LXXXIX, fig. 12, Pl. XC, figs. 11—14.

Syn: *Asterocheres Boecki*, Giesbrecht (part).

Specific Characters.—Female. Anterior division of body very broad and expanded, the greatest width being almost equal to the length. Cephalic segment large, with the frontal edge narrowly rounded. Epimeral parts of 2nd segment

simple and not projecting at all laterally: those of 3rd (antepenultimate) segment, on the other hand, terminating in a very conspicuous prominent corner. Penultimate segment, as usual, much smaller than the preceding ones. Tail considerably exceeding in length $^1/_3$ of the anterior division; genital segment rather dilated in its anterior part and, like the other species, having the lateral edges clothed with stiff hairs; posterior edge of this and the succeeding segment, moreover, finely denticulate; anal segment longer than the preceding one. Caudal rami somewhat produced, being about as long as the anal segment; apical setæ rather long and divergent. Anterior antennæ very slender, equalling about in length the cephalic segment, and composed of 20 articulations, all 3 joints of the terminal part being well defined; proximal portion of the antennæ comparatively short and very sharply marked off from the narrow distal one. Posterior antennæ more slender than in *A. simulans*, and having the penultimate joint about as long as the preceding one. Oral cone rather produced and gradually tapered, extending about to the insertions of the 1st pair of legs. Mandibles with the masticatory part long and slender; palp normal. Maxillæ resembling in structure those in *A. simulans*, though the setæ of the inner lobe are comparatively longer. Maxillipeds and natatory legs of normal structure. Last pair of legs with the distal joint oval in form, and provided with only 2 apical setæ.

Body pellucid, tinged in some places with light yellow.

Length of adult female 0.80 mm.

Remarks.—I cannot doubt that the above-described form is that recorded by Brady in his Monograph as *Cyclopicera lata*. Brady believed this form to be identical with Norman's *Ascomyzon echinicola*; but the form so named in Giesbrecht's work and figured on Pl. 2, II, is certainly a different species. On the other hand, it would seem that Giesbrecht has confounded the present species and *A. Boecki* Brady. In any case the coloured figure given on Pl. 1 is unquestionably referable to the present species and not to *A. Boecki*. The prominent lateral corners of the antepenultimate trunk-segment will suffice for an immediate recognition of the present species as distinct from any of the others.

Occurrence.—I have occasionally met with this form at Risør and Grimstad, south coast of Norway, in moderate depths among algæ, and a few additional specimens were picked up from the bottom—residue of the same collecting—bottle in which *A. Boecki* and *A. simulans* occurred.

Distribution.—British Isles (Brady), Gulf of Naples (Giesbrecht).

54. Ascomyzon parvum, (Giesbrecht).

(Pl. LVII).

Asterocheres parvus, Giesbrecht, Fauna und Flora des Golfes von Neapel; 25th Monographie, Die Asterocheriden, p. 100. Pl. 2, F.

Specific Characters.—Female. Anterior division of body less expanded than in *A. latum*, the greatest width not nearly attaining the length. Cephalic segment of moderate size and evenly rounded in front. Lateral parts of the trunk-segments rounded off at the end, the antepenultimate segment not differing in this respect from the others. Tail almost attaining half the length of the anterior division, and having the posterior edge of the segments perfectly smooth; genital segment less broad at the base than in *A. latum*: anal segment about the length of the preceding one. Caudal rami resembling in structure those in the said species. Anterior antennæ not fully as long as the cephalic segment and composed of 20 articulations. Posterior antennæ moderately strong with the penultimate joint about equal in length to the preceding joint. Oral cone shorter than in *A. latum*, only extending midway between the insertions of the posterior maxillipeds and those of 1st pair of legs. Mandibles, maxillæ, maxillipeds and natatory legs differing very little in structure from those parts in *A. latum*. Last pair of legs likewise very similar, though having on the distal joint a small bristle inside the 2 apical setæ. Ovisacs of moderate size, oblong oval in form, and somewhat divergent.

Colour light greenish.

Length of adult female scarcely attaining 0.70 mm.

Remarks.—This species is closely allied to *A. latum*, but is of smaller size, and moreover easily distinguishable by the less expanded anterior division of the body, and the evenly rounded lateral parts of the trunk-segments. Finally, the oral cone is considerably shorter than in *A. latum*.

Occurrence.—I collected this form, many years ago, in the upper part of the Christiania Fjord, and, on account of its peculiar colour, noted it with the provisional name *A. virescens*. I have also found it occasionally off the south coast, at Grimstad and Lillesand. All the specimens were taken in the free state among dredged material.

Distribution.—Gulf of Naples (Giesbrecht), coast of France (Canu).

Gen. 18. **Echinocheres**, Claus. 1889.

Generic Characters.—Body less depressed than in *Ascomyzon*, the dorsal face of the anterior division being rather strongly vaulted. Tail, as in that genus, composed in female of 3, in male of 4 segments. Anterior antennæ much shorter and stouter than in *Ascomyzon*, though composed of a similar number of articulations. Posterior antennæ of comparatively feeble structure. Oral cone very short. Mandibles with the palp uniarticulate. Maxillæ with one of the setæ of the inner lobe excessively developed. Maxillipeds comparatively short and stout. Natatory legs very fully developed, with the rami unusually broad; their armature about as in *Ascomyzon*. Last pair of legs with the proximal joint small and indistinctly defined from the segment, distal joint well developed, lamelliform.

Remarks.—This genus was established in the year 1889 by Claus, to include 2 species found by him as parasites on Echinids. Giesbrecht, however, did not admit this genus, but referred the species to the genus *Asterocheres (= Ascomyzon)*, and this view was also adopted by Scott. On a closer examination of the type species, I find, however, that in some points it differs so conspicuously from the other species of the genus *Ascomyzon*, that in my opinion the Clausian genus ought to be supported. As to the term *Echinocheres*, the same objection could perhaps be urged against it as against the term *Asterocheres*; but as in fact both species have hitherto been found exclusively on *Echinids*, I do not find in the present case any imperious necessity for rejecting it. Only the type species is represented in the Fauna of Norway.

55. Echinocheres violaceus, Claus.

(Pl. LVII).

Echinocheres violaceus, Claus. Halbparasitische Copepoden; Arb. Zool. Inst. Wien, Voll. III.

Syn: *Asterocheres violaceus*, Giesbr.

„ *Ascomyzon Thompsoni*, A. Scott.

Specific Characters.—Female. Body robust, with the anterior division considerably tumefied and broadly oval in outline. Cephalic segment large and evenly arched in front; rostral prominence comparatively small, though well defined; lateral edges of the segment inflexed. Epimeral parts of the trunk-segments rounded off at the end; penultimate segment, as usual, much smaller than the preceding one; last segment still smaller. Tail comparatively short, with the genital segment gradually widening in front, and having the lateral edges very finely ciliated; anal segment smaller than the preceding one. Caudal rami about the length of the anal segment and slightly divergent; apical setæ comparatively short, the 2 middle ones rather thicker, but not much longer than the

others, and densely plumose. Anterior antennæ much shorter than the cephalic segment, and composed of 20 articulations, terminal part very short, though having all 3 joints well defined. Posterior antennæ with the penultimate joint somewhat shorter than the preceding one; terminal joint distinctly subdivided in the middle. Oral cone scarcely extending beyond the insertions of the anterior maxillipeds, and having the outer part abruptly narrowed. Mandibles with the masticatory part narrow styliform. Maxillæ with the inner lobe short and thick, transversely truncated at the end; principal seta very largely developed, extending far beyond the insertions of the maxillipeds, and densely plumose; outer lobe much smaller, and having the apical setæ comparatively short. Maxillipeds rather powerfull; claw of the anterior ones very strong and curved at the end in a hook-like manner. Natatory legs largely developed, with the middle joint of the inner ramus in 1st pair unusually broad and expanded. Last pair of legs with the distal joint oval in form and rounded at the extremity, which carries 2 setæ accompanied by a small bristle. Ovisacs comparatively small, oval in form.

Colour somewhat variable, in some cases dark violaceous, in other cases much paler.

Length of adult female 0.90—1.10 mm.

Remarks.—This form, as above mentioned, was first described by Claus as the type of his genus *Echinocheres*. Another species of smaller size was also recorded by the same author under the name of *Echinocheres minutus*, and this species has likewise been observed by Giesbrecht, who admits its specific difference. The very close relationship between these 2 species, both as to structural details and habits, would indeed seem to justify the opinion of Claus, that they should be kept apart under a separate genus. The *Ascomyzon Thompsoni* of A. Scott is unquestionably identical with the present species.

Occurrence.—I have taken this form occasionally from 3 different Echinids, viz., *Strongylocentrotus dröbachiensis* (small variety), *Echinus sphæra* and *Echinus elegans*, all collected off the west coast of Norway from different depths. The specimens found on the first-named Echinid were all of a very dark violaceous colour, like that indicated in the coloured figure given in Giesbrecht's work on Pl. 1; whereas those occurring on the other 2 Echinids were much paler, of a whitish grey hue, with a very slight rosy tinge. These specimens were also of a somewhat larger size, but otherwise fully agreeing with the dark-coloured variety. Giesbrecht also mentiones the variability of colour in the present species.

Distribution.—British Isles (Scott), Triest (Claus), Gulf of Naples (Giesbrecht).

Gen. 19. **Dermatomyzon**, Claus, 1889.

Syn: *Cyclopicera*, Brady (part).

Generic Characters.—General form of body resembling that in the preceding genus, the anterior division being rather tumid and evenly vaulted above. Tail, however, composed in female of 4, in male of 5 well-defined segments. Anterior antennæ not much elongated, though composed of a considerable number of joints; those in male imperfectly hinged and, at any rate in some cases, provided with supplementary sensory filaments. Posterior antennæ with the penultimate joint comparatively short. Oral cone very little produced. Mandibles with the masticatory part rather strong, knife-shaped; palp uniarticulate. Maxillæ with the inner lobe normal; outer lobe narrow linear. Maxillipeds of the usual structure; the posterior ones in male without any distinct palmar projection. Natatory legs strongly built, though not very different in structure from those in the preceding genera. Last pair of legs with the proximal joint well defined from the segment; distal joint lamelliform and provided with lateral spines in addition to the apical setæ.

Remarks.—This genus is also closely allied to *Ascomyzon*, though at once distinguished by the tail having one segment more in both sexes. The genus *Cyclopicera* of Brady, though of earlier date than *Dermatomyzon*, cannot properly be retained, because it was originally (in 1872) based upon a species that has turned out to be a true *Ascomyzon* (*A. latum*). Two species of the present genus have been described; but their specific difference has not been admitted by Giesbrecht.

56. Dermatomyzon nigripes (Brady).

(Pl. LIX & LX).

Cyplopicera nigripes, Brady, Monogr. of British Copepoda, Vol. III, p. 54, Pl. LXXXIX, figs. 1–11.

Syn: *Ascomyzon Thorelli*, G. O. Sars.

Specific Characters.—Female. Anterior division of body rather tumid, broadly oval in outline, with the cephalic segment very large and evenly arched in front; lateral edges of this and the succeeding segment inflexed. Rostrum triangular, but not very prominent. Lateral parts of the trunk-segments obtusely rounded at the end. Tail nearly half the length of the anterior division and having the segments very sharply marked off from each other, each segment being produced at the end on each side to an acute corner; genital segment moderately broad and imperfectly subdivided in the middle, with the lateral edges perfectly smooth; anal segment smaller than the preceding one. Caudal rami comparatively short,

about the length of the anal segment, and slightly divergent, outer edge smooth, inner finely ciliated, tip obtusely rounded; apical setæ of moderate size and somewhat spreading, the innermost but one about equalling the tail in length. Anterior antennæ much shorter than the cephalic segment, and composed of 19 joints, terminal part bi-articulate. Posterior antennæ with the penultimate joint scarcely more than half as long as the preceding one; apical spine rather strong. Oral cone comparatively small, extending only slightly beyond the insertions of the anterior maxillipeds, and terminating in a sharp point apparently formed by the extremity of the posterior lip. Masticatory part of mandibles cultriform, with a very fine denticulation on the inner edge of the extremity. Maxillæ with the inner lobe somewhat curved and tapered distally, apical setæ comparatively short; outer lobe very narrow, linear, with the apical setæ longer than those on the inner lobe. Anterior maxillipeds rather powerful, with the claw very strong and slightly curved at the end. Posterior maxillipeds of the usual structure. Natatory legs differing a little in their armature from those in the preceding forms, the terminal joint of the outer ramus being provided inside in 1st pair with 3, in 2nd pair with 5 setæ; same joint of inner ramus in the last 2 pairs with only a single spine on the tip. Last pair of legs with the distal joint rounded oval in form, and armed on the hind edge with 2 blunt spines, the extremity carrying 2 setæ accompanied inside by a small bristle. Ovisacs comparatively small, rounded oval in form.

Male, as usual, smaller than female, and having the anterior division far less dilated. Tail with the segments still more sharply marked off from each other; genital segment greatly swollen. Anterior antennæ 17-articulate, and each provided with about 7 supplementary sensory filaments curving backwards.

Body in both sexes generally of a brownish grey hue, with the anterior antennæ and natatory legs very dark-coloured, almost black; tail also partly tinged with a dark brownish colour.

Length of adult female amounting to 1·55 mm., of male to 1·20 mm.

Remarks.—This form was recorded as early as the year 1875 by Brady & Robertson under the name of *Cyclopicera nigripes*, and was justly referred by Giesbrecht to the genus *Dermatomyzon*, as defined by Claus. It seems however very questionable to me, if Giesbrecht was right in identifying the form described by Claus under the name *Dermatomyzon elegans* with the present species, as the latter differs not only in its much larger size and peculiar coloration of the body, but also in the presence on the male anterior antennæ of greatly developed

supplementary sensory filaments. These filaments, according to Canu, are wholly absent in the male of *D. elegans*.

Occurrence.—I have met with this form not unfrequently along the whole Norwegian coast, from the upper part of the Christiania Fjord to Vadsø, in moderate depths. All the specimens have been taken in the free state among dredged material, and, though the parasitic habits of the animal are proved by the structure of the oral parts, we do not as yet posess any information as to what kind of invertebrate animals are at times infested by it.

Distribution.—British Isles (Brady), Spitsbergen (G. O. Sars), Franz Joseph Land (Scott), ? Gulf of Naples (Giesbrecht).

Gen. 20. **Rhynchomyzon**, Giesbrecht, 1895.

Generic Characters.—Body more slender than in the preceding genera, with the anterior division far less expanded, and some of the trunk-segments acutely produced laterally. Rostrum large and prominent, curved downwards. Tail comparatively slender, consisting in female of 4, in male of 5 segments. Caudal rami more or less produced. Anterior antennæ of moderate length, and composed of a varying number of articulations; those in male imperfectly hinged and without any supplementary sensory filaments. Posterior antennæ resembling in structure those in *Dermatomyzon*. Oral cone short and massive, not prolonged in any siphonal tube. Mandibles with the masticatory part more or less cultriform; palp very small, uniarticulate. Maxillæ and maxillipeds about as in *Dermatomyzon*. Natatory legs well developed, and on the whole normally built. Last pair of legs comparatively small, biarticulate, distal joint of somewhat different shape in the different species.

Remarks.—This genus, established by Giesbrecht, differs conspicuously, as to the external appearance of the body, from the preceding ones, though in the structural details approaching somewhat the genus *Dermatomyzon*. One of the most conspicuous external characters is the very large and prominent falciform rostrum, which indeed has given rise to the generic name proposed by Giesbrecht. The genus comprises as yet 3 well-defined species, 2 of which will be described below, the 3rd species, *R. falco* Giesbrecht, being hitherto only known from the Gulf of Naples.

57. Rhynchomyzon purpurocinctum, (Scott).

(Pl. LXI).

Cyplopicera purpurocincta, Scott. Eleventh Ann. Rep. of the Fishery Board for Scotland, Part III p. 209, Pl. III, figs. 29—40

Specific Characters.—Female. Anterior division of body rather strongly vaulted above, and oblong oval in outline, greatest width scarcely exceeding half the length. Cephalic segment large, being fully twice as long as the 4 succeeding segments combined, and having the frontal edge narrowly arched, epimeral edges of the segment evenly curved in front and strengthened behind by a number of transverse chitinous stripes. Rostrum very conspicuous in the lateral aspect of the animal, and produced to a sharp point. Epimeral parts of the 2 succeeding segments terminating behind in acute corners. Tail about equalling in length $^2/_3$ of the anterior division; genital segment almost cylindric in form, with a very slight angular prominence on each side of the anterior part; 2nd segment almost as long as the 2 succeeding segments combined; anal segment the smallest. Caudal rami rather produced, somewhat exceeding in length the last 2 segments combined, and slightly divergent, outer edge smooth, inner finely ciliated; apical setæ comparatively short, the innermost but one scarcely exceeding twice the length of the corresponding ramus. Anterior antennæ rather narrow, but much shorter than the cephalic segment, and composed of 16 joints only, 2nd joint the largest and apparently formed by the fusion of 4 short joints; terminal part biarticulate. Posterior antennæ with the penultimate joint scarcely half as long as the preceding one; apical spine rather slender. Oral cone very massive and rather prominent below; anterior lip terminating in a somewhat curved point. Mandibles with the masticatory part pronouncedly knife-shaped and minutely denticulate inside the tip. Maxillæ with the outer lobe nearly as long as the inner, but much narrower, linear in form; setæ on both lobes comparatively short. Maxillipeds moderately strong. Natatory legs exhibiting a similar armature to that in *Dermatomyzon nigripes*. Last pair of legs with the distal joint oval in form and subtruncate at the extremity, which carries 2 thin bristles between which a somewhat larger lanceolate spine is attached; posterior edge of the joint finely ciliated and having on each side of the innermost bristle a slight dentiform projection.

Male much smaller than female, but not very different in the general form of the body. Tail, however, somewhat more slender and composed of 5 well-defined segments, the foremost of which (the genital segment) is comparatively smaller than in most other forms of the present section. Anterior

antennæ very imperfectly hinged and composed of only 14 joints. Last pair of legs differing from those in female by the presence on the distal joint of 3 additional spines attached to the inner edge.

Body in both sexes of a whitish colour, with a broad dark purplish, or almost black band across the posterior part of the trunk, occupying the whole of the 2nd, 3rd and 4th segments. Rostrum of a similar colour, and the anterior antennæ, the natatory legs, and the ends of the caudal rami also more or less dark in colour.

Length of adult female amounting to 1.03 mm., of male to 0.73 mm.

Remarks.—This is a very distinct and easily recognisable form. It was at first recorded by Scott as a species of the genus *Cyclopicera* Brady, but was subsequently justly removed from that genus by Giesbrecht, and referred to his new genus *Rhynchomyzon*. The present species may be regarded as the type of that genus.

Occurrence.—I have only met with this form quite occasionally at Aalesund and Christiansund, west coast of Norway. The specimens were found in moderate depths among dredged material.

Distribution.—British Isles (Scott), Gulf of Naples (Giesbrecht).

58. Rhynchomyzon rubrovittatum, G. O. Sars, n. sp.

(Pl. LXII).

Specific Characters.—Female. Anterior division of body less strongly vaulted above than in the preceding species, and, viewed dorsally, of a somewhat irregular oblong oval form. Cephalic segment not quite twice as long as the 4 succeeding ones combined, and narrowly rounded in front, epimeral edges of the segment evenly curved. Rostrum very large, falciform, and terminating in an acuminate point. Antepenultimate trunk-segment produced on each side to a prominent acute process pointing obliquely backwards; penultimate segment, as usual, much smaller, with the lateral parts broadly rounded; last segment scarcely broader than the genital segment. Tail exceeding somewhat in length $^2/_3$ of the anterior division; genital segment slightly dilated in front and produced on each side to a spiniform, posteriorly pointing process: the succeeding segments gradually diminishing in size, and, combined, about the length of the genital one. Caudal rami rather produced, exceeding in length the last 2 segments combined, and somewhat divergent, outer edge perfectly smooth and produced at the end to a well-marked dentiform projection, inner edge finely ciliated; apical setæ com-

paratively short. Anterior antennæ very slender, almost attaining the length of the cephalic segment, and composed of 20 joints, terminal part comparatively small and, as in the preceding species, biarticulate. Posterior antennæ about as in that species. Oral cone very short and abruptly contracted at the extremity. Mandibles with the masticatory part less strong than in the type species, and scarcely denticulated at the tip. Maxillæ with both lobes comparatively shorter. Anterior maxillipeds with the claw imperfectly biarticulate. Posterior maxillipeds rather slender, with a thin bristle in the middle of the palmar edge. Natatory legs with the spines of the outer ramus rather broad, lancet-shaped and distinctly denticulated at the edges; terminal joint of this ramus in 1st pair with only 2 setæ inside, that of 2nd pair with 4 such setæ. Last pair of legs with the distal joint rather short and projecting into 2 unequal dentiform processes, between which 2 likewise unequal bristles are attached.

Colour rather peculiar: anterior division of body of a clear whitish hue, with a number of narrow transverse bands of a bright red colour, 3 of them occupying the hindmost part of the 3 anterior segments, 2 others, of a more irregular form, crossing the cephalic segment in front of the middle. Tail and anterior antennæ of a beautiful rosy hue.

Length of adult female about 1 mm.

Male unknown.

Remarks.—This form is at once distinguishable from both of the 2 hitherto recorded species, though evidently belonging to the same genus. The specific name is derived from the very peculiar and beautiful colour of the body, when alive.

Occurrence.—Only a solitary female specimen of this handsame form has come under my notice. It was taken, many years ago, at Kallevaag, west coast of Norway, from a depth of about 50 fathoms, among dredged material.

Gen. 21. **Collocheres**, Canu, 1893.

Syn: *Cyclopicera*, Brady (part).
„ *Clausomyzon*, Giesbrecht.

Generic Characters.—Body of very slender form, with the anterior division only slightly dilated and somewhat compressed in front; rostrum comparatively small, but acutely produced. Epimeral parts of the trunk-segments rounded off. Tail composed in female of 4, in male of 5 segments. Caudal rami long and

narrow, with the outermost seta more or less remote from the apex Anterior antennæ slender, resembling in structure those in the genus *Ascomyzon*, though having the proximal and distal portions less sharply marked off from each other; those in male distinctly hinged. Posterior antennæ of normal structure. Oral cone not much prolonged, pyriform in shape. Mandibles with the masticatory part moderately slender; palp small, uniarticulate. Maxillæ with the outer lobe much narrower than the inner, and tipped with only a single seta. Maxillipeds comparatively slender; claw of the anterior ones distinctly biarticulate. Natatory legs with the rami rather narrow; their armature about as in *Dermatomyzon*. Last pair of legs with the distal joint more or less prolonged.

Remarks.—This genus was established in the year 1893 by Canu, to include the species recorded by Brady as *Cyclopicera gracilicauda*. Another nearly-allied species has been described by Giesbrecht from the Gulf of Naples under the name of *C. Canui*, and a 3rd species, *C. elegans*, has been added by A. Scott. The last-named species differs however in some points so much from the other two, that I have felt justified in removing it to a separate genus To the Fauna of Norway only belongs the type species, to be decribed below.

59. Collocheres gracilicauda, (Brady).

(Pl. LXIII).

Cyplopicera gracilicauda, Brady. Monogr. British Copepoda, Vol. III, p. 58, Pl. LXXXIII. figs. 1—10.

Syn: *Ascomyzon comatulæ*, Rosoll.
„ *Clausomyzon gracilicauda*, Giesbr.

Specific Characters.—Female. Anterior division of body, viewed dorsally, regularly oblong oval in outline, with the greatest width about equalling half the length. Cephalic segment large and very deep, the epimeral edges being angularly curved in the middle; rostrum not very large, but distinctly prominent below, and acutely pointed. Last trunk-segment very small, scarcely broader than the genital segment. Tail slender and elongated, being not much shorter than the anterior division; genital segment large and somewhat dilated in the middle; the 3 succeeding segments gradually diminishing in size. Caudal rami exceedingly long and narrow, almost attaining half the length of the tail, and slightly divergent, both edges smooth; outermost apical seta short, spiniform, and, together with the dorsal bristle, somewhat remote from the apex, which projects outside to a short dentiform process; inner mediate seta scarcely exceeding in length the corresponding ramus. Anterior antennæ almost as long as the cephalic segment,

and composed of 20 joints, terminal part biarticulate. Posterior antennæ with the penultimate joint scarcely more than half as long as the preceding one; rudimentary outer ramus remote from the end of the latter joint, being attached nearly at the middle of its posterior edge. Oral cone extending only to the insertions of the posterior maxillipeds, and gradually tapered. Mandibles with the masticatory part moderately slender, and distinctly denticulated inside the tip; palp with only a single apical seta. Maxillæ with the outer lobe a little shorter than the inner, and much narrower, apical seta rather elongated and accompanied by a small hair. Claw of anterior maxillipeds very slender and distinctly subdivided in the middle, outer part evenly curved. Posterior maxillipeds, as usual, more elongated than the anterior ones. Natatory legs of rather feeble structure, the rami, especially in the 4th pair, being unusually narrow. Last pair of legs with the proximal joint well defined from the segment, and produced inside to an acuminate process; distal joint very long and slender, sabre like, and extending far beyond the middle of the genital segment, outer edge produced, at some distance from the end, to a dentiform projection, the apical part, beyond the process, being provided with 3 or 4 small bristles.

Male, as usual smaller than female, and of still more slender shape. Anterior antennæ composed of 19 joints, the last 2 of which admit of being bent upon the adjoining part. Last pair of legs differing somewhat from those in female, the distal joint being comparatively shorter and almost claviform in shape, and moreover provided with 2 additional blunt spines inside. Genital lobes bipartite.

Body in both sexes very pellucid and nearly colourless.

Length of adult female amounting to 0.85 mm., of male to 0.68 mm.

Remarks.—As mentioned above, this form was first described by Brady as a species of his genus *Cyclopicera*. It was subsequently justly removed from that genus by Canu and placed in the new genus *Collocheres* established by that author. According to the same author, the *Ascomyzon comatulæ* of Rosoll is identical with the present species.

Occurrence.—I have hitherto only met with this form in a single locality, viz., at Risør, south coast of Norway, where a few specimens were taken from a depth of about 30 fathoms among dredged material. Rosoll found this form parasitic on *Comatula mediterranea*.

Distribution.— British Isles (Brady), coast of France (Canu), Triest (Rosoll), Gulf of Naples (Giesbrecht).

Gen. 22. **Mesocheres**, Norm. & Scott, 1905.

Generic Characters.—Body slender and elongated, with the anterior division only slightly dilated. Cephalic segment less deep than in *Collocheres* with the rostrum comparatively small. Epimeral parts of the trunk-segments slightly produced. Tail slender, and composed in female of only 3 segments. Caudal rami long and narrow. Anterior antennæ slender, resembling in structure those in *Ascomyzon*. Posterior antennæ moderately strong, with the penultimate joint comparatively short. Oral cone very little produced. Mandibles with the masticatory part comparatively short, tapered and minutely denticulated inside the tip; palp small, uniarticulate. Maxillæ with the lobes likewise rather small, the inner one being the larger. Anterior maxillipeds distinguished by the presence of a secondary spine at the base of the claw. Posterior maxillipeds of normal structure. Natatory legs rather strongly built, with the spines unusually broad, dagger-like. Last pair of legs very small, biarticulate, distal joint triangular in shape.

Remarks.—With regard to the general form of the body and the long and narrow caudal rami, this genus somewhat recalls the preceding one, from which it is, however, at once distinguished by the different segmentation of the tail, in which respect it agrees with the genus *Ascomyzon*. In the other structural details also, several peculiarities are found to exist, fully justifying the establishment of the present genus. It comprises as yet only a single species, to be described below.

60. Mesocheres anglicus, Norm. & Scott.

(Pl. LXIV).

Mesocheres anglicus. Norm. & Scott, Crustacea Copepoda new to science, Ann. & Mag. Nat. Hist. Ser. 7. Vol. XV, p. 298.

Specific Characters.—Female. Anterior division of body oblong oval in outline, with the greatest width about equalling half the length. Cephalic segment large and narrowly rounded in front, epimeral edge gently curved; rostrum acutely produced below. Lateral parts of the 3 succeeding segments somewhat angular behind. Last segment very small, scarcely broader than the genital segment. Tail somewhat shorter than the anterior division, and very narrow; genital segment about the length of the other 2 combined, and slightly dilated

in its anterior part, which projects on each side to a hamiform, posteriorly-pointing process; anal segment much smaller than the preceding one. Caudal rami exceedingly long and slender, linear, attaining about the length of the remaining part of the tail, and only very slightly divergent; outer edge very finely ciliated, inner smooth, tip transversely truncated; apical setæ comparatively short, the innermost but one scarcely longer than the corresponding ramus. Anterior antennæ not quite as long as the cephalic segment, and composed of 21 well-defined joints, terminal part distinctly 3-articulate. Posterior antennæ with the penultimate joint scarcely half as long as the preceding one; rudimentary outer ramus attached close to the end of the latter joint. Oral cone very short, almost globular in form, its extremity being obtusely blunted and only extending to the insertions of the anterior maxillipeds. Mandibles and maxillæ pointing almost straight inwards. Anterior maxillipeds with the claw rather slender and evenly curved in its outer part, basal spine rather strong and likewise curved. Posterior maxillipeds comparatively slender. Natatory legs with the number of setæ about as in *Ascomyzon:* spines distinguished by their broad dagger-like form and the coarse denticulation of their edges. Last pair of legs with the proximal joint well defined and of the usual appearance, distal joint rounded triangular in form and provided with 2 small apical bristles and 2 lateral ones, that of the outer edge the longer. Ovisacs, in the specimen examined, very small, each containing only 3 ova, arranged in a single row.

Body of a clear whitish colour, partly tinged with reddish orange; ovarial tubes dark green.

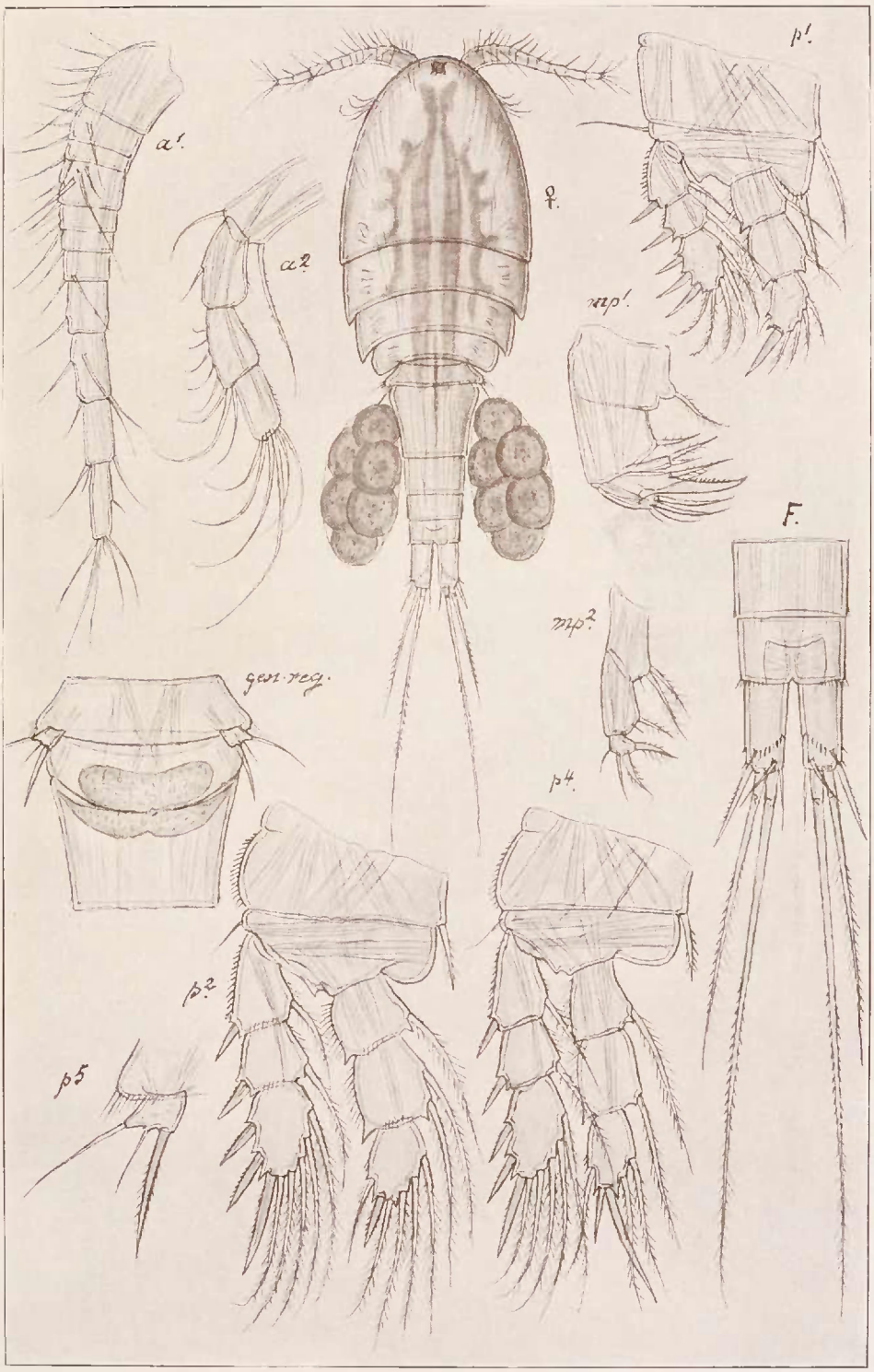
Length of adult female about 1 mm.

Male unknown.

Remarks.—This form was first anounced under the above name by Norman & Scott in the year 1905 from a single female specimen taken in Plymouth Sound. In the following year this specimen was redescribed and figured in detail by the same authors in their work on the Crustacea of Devon and Cornwall.

Occurrence.—Only a few female specimens of this form have hitherto come under my notice. They were taken, many years ago, in the upper part of the Christiania Fjord from a depth of about 30 fathoms among dredged material.

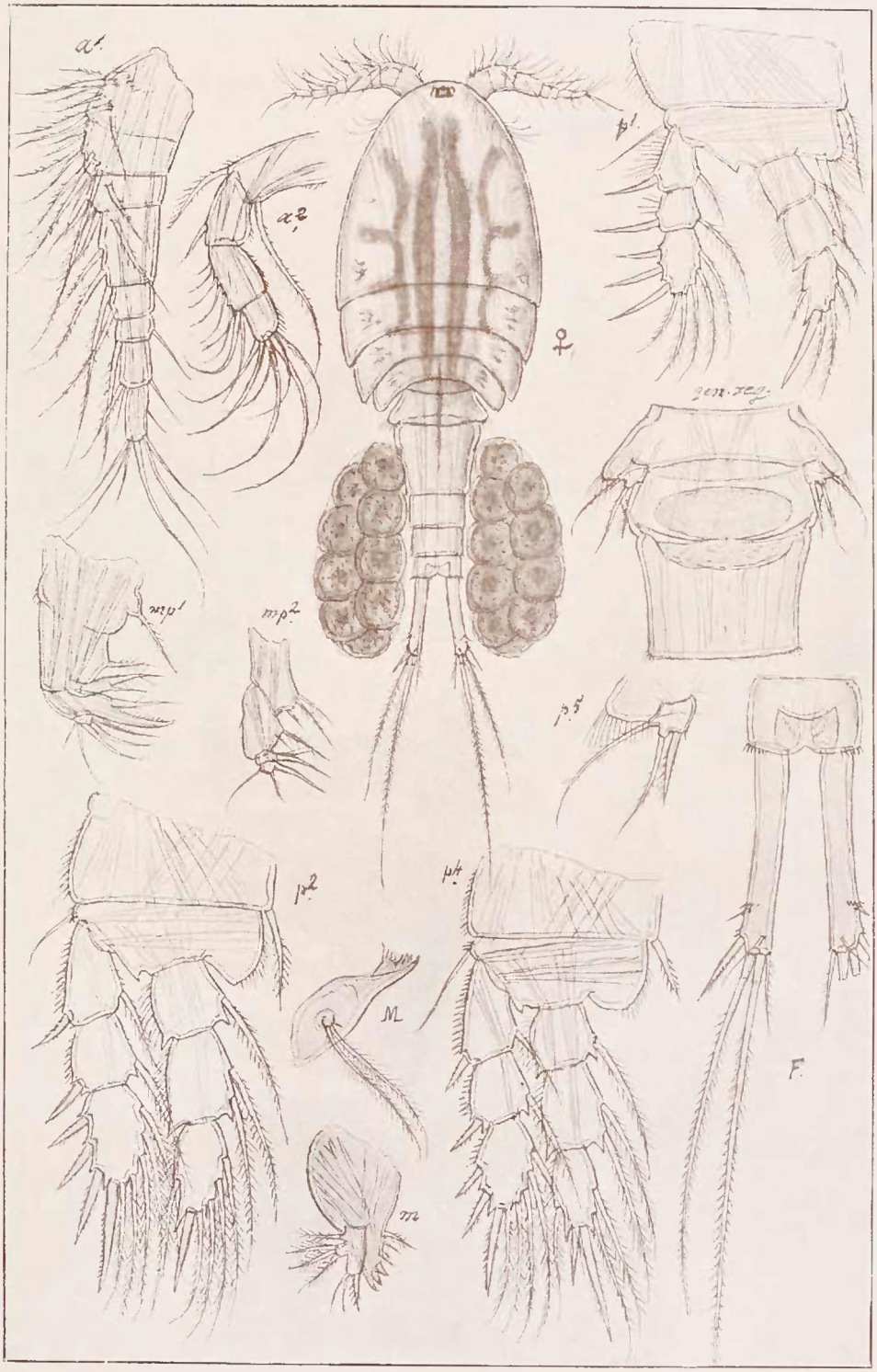
Distribution.—British Isles (Norman & Scott).



G. O. Sars, del.

Platycyclops affinis, G. O. Sars

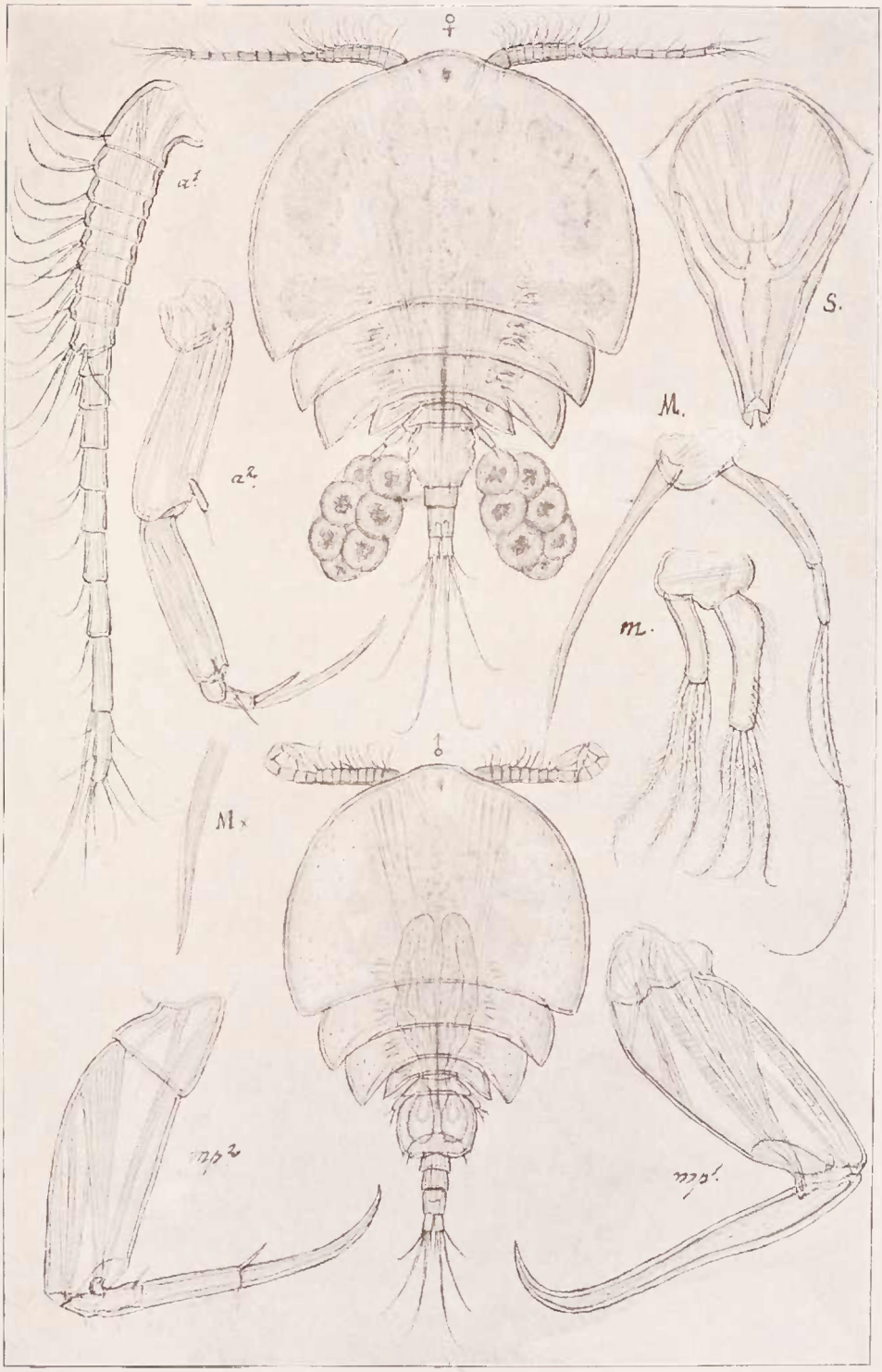
Copepoda



G. O. Sars, del.

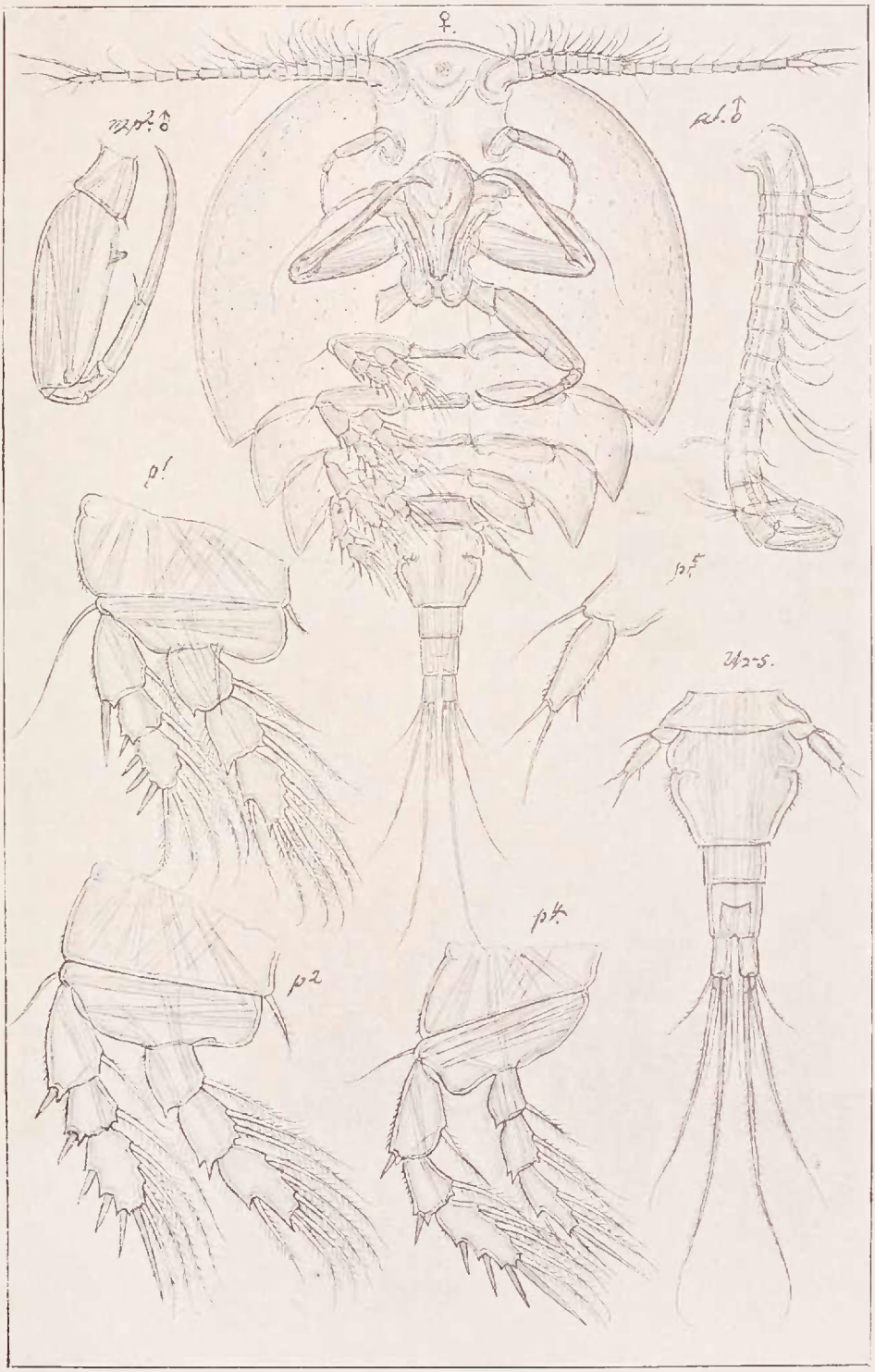
Platycyclops fimbriatus, (Fischer)

Copepoda



G. O. Sars, del.

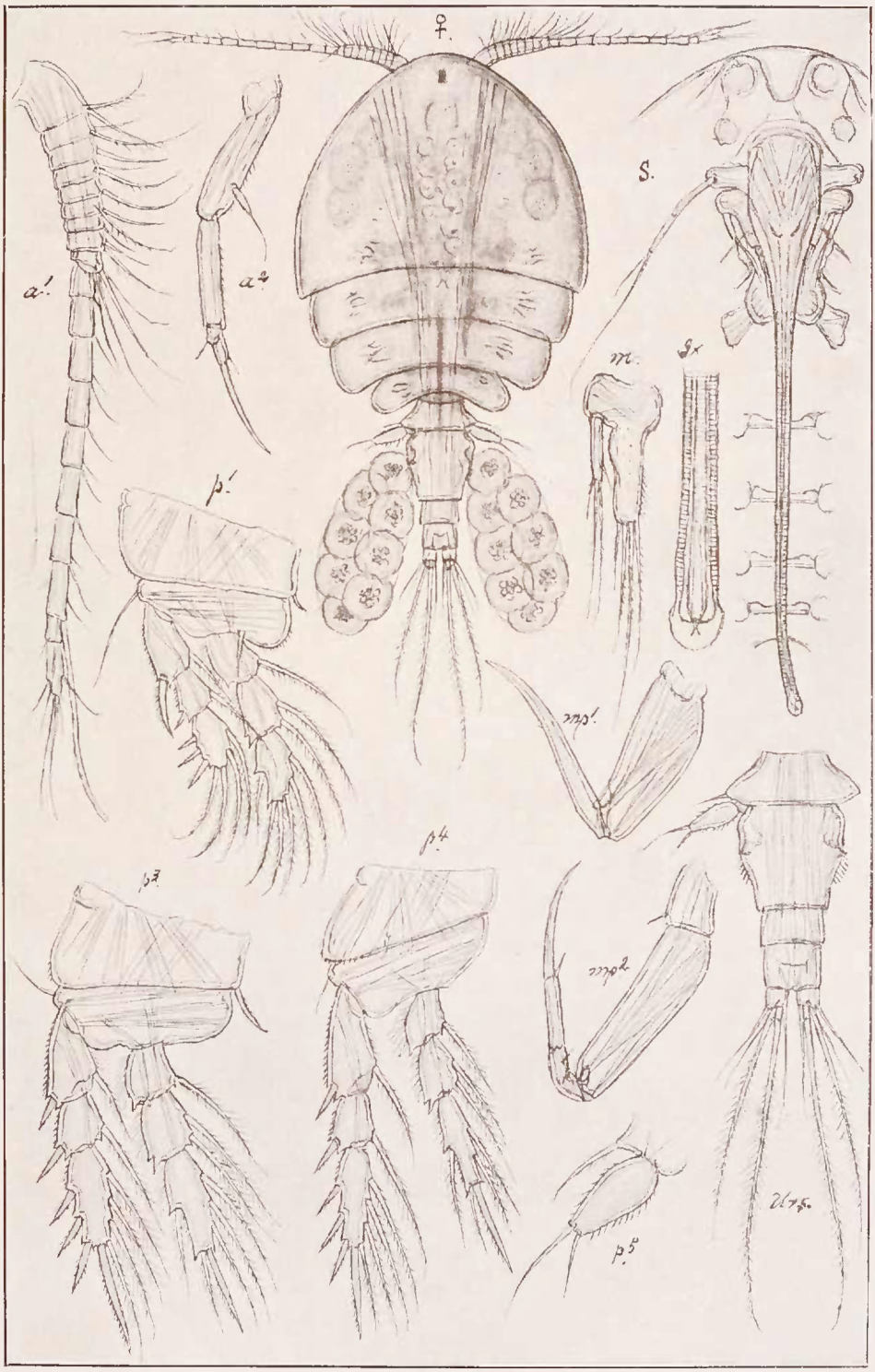
Ascomyzon asterocheres, Boeck



G. O. Sars, del.

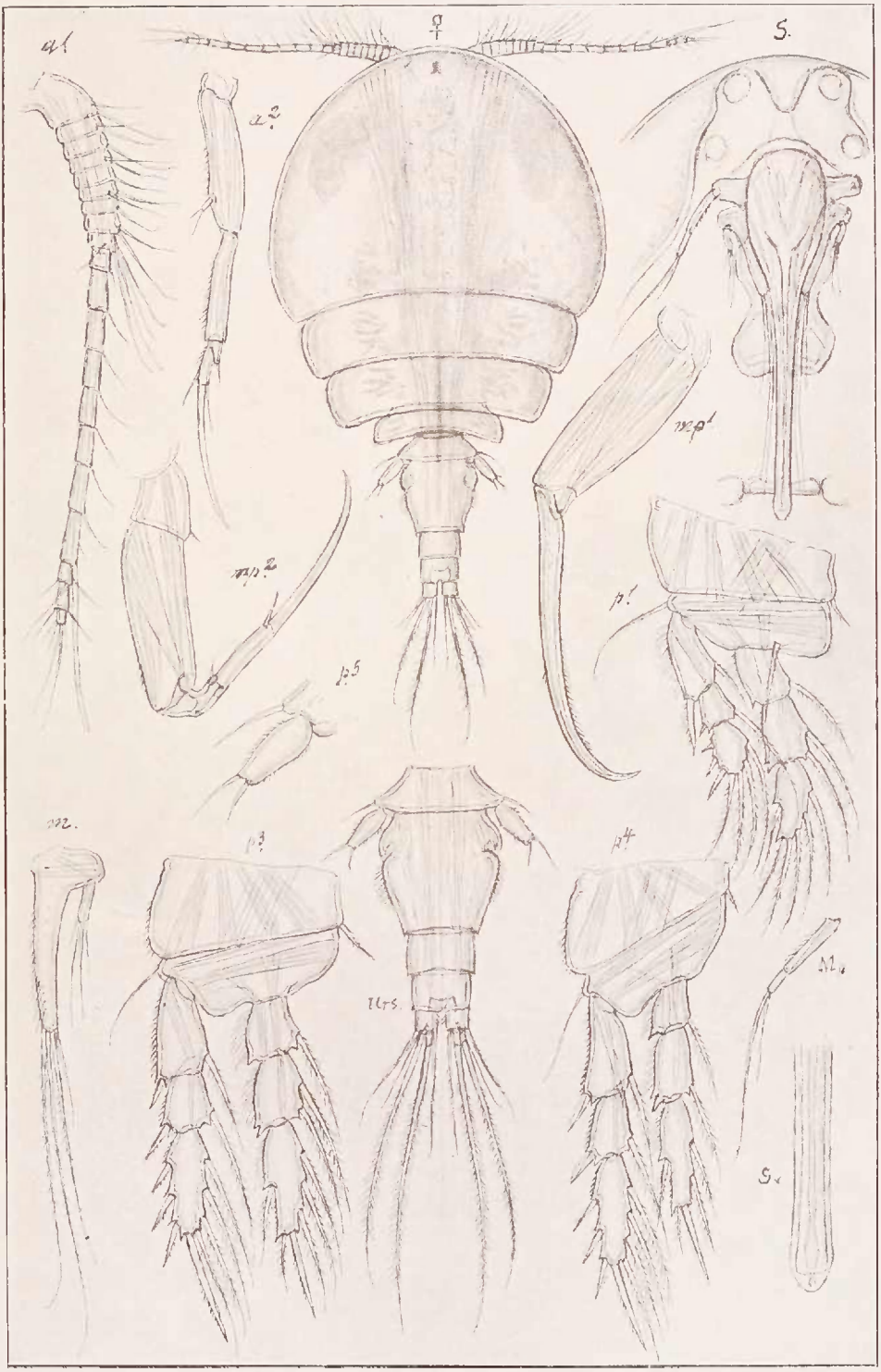
Ascomyzon asterocheres, Boeck
(continued)

Copepoda



G. O. Sars, del.

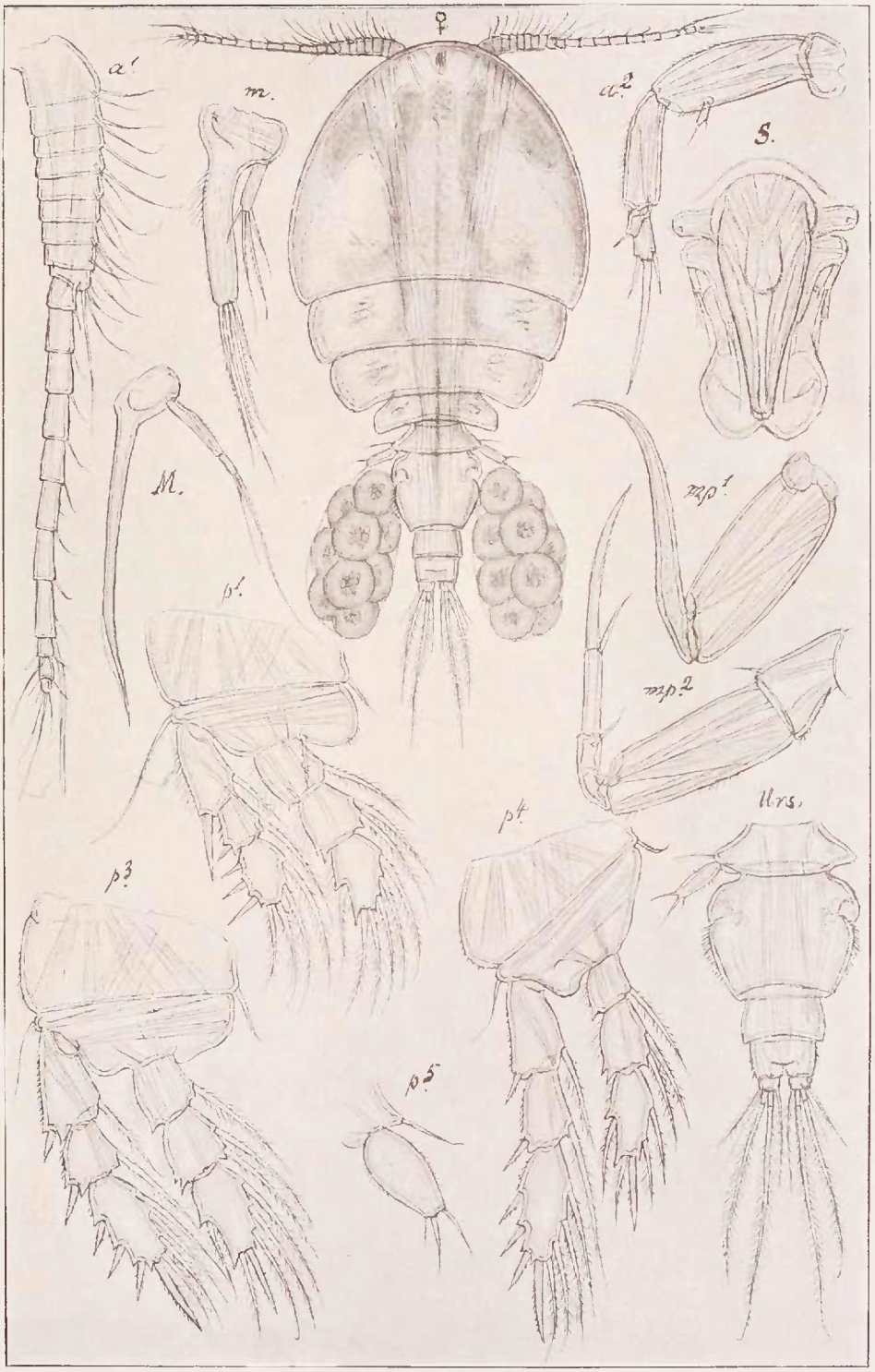
Ascomyzon Lilljeborgi, Thorell



G. O. Sars, del.

Ascomyzon Boecki, (Brady)

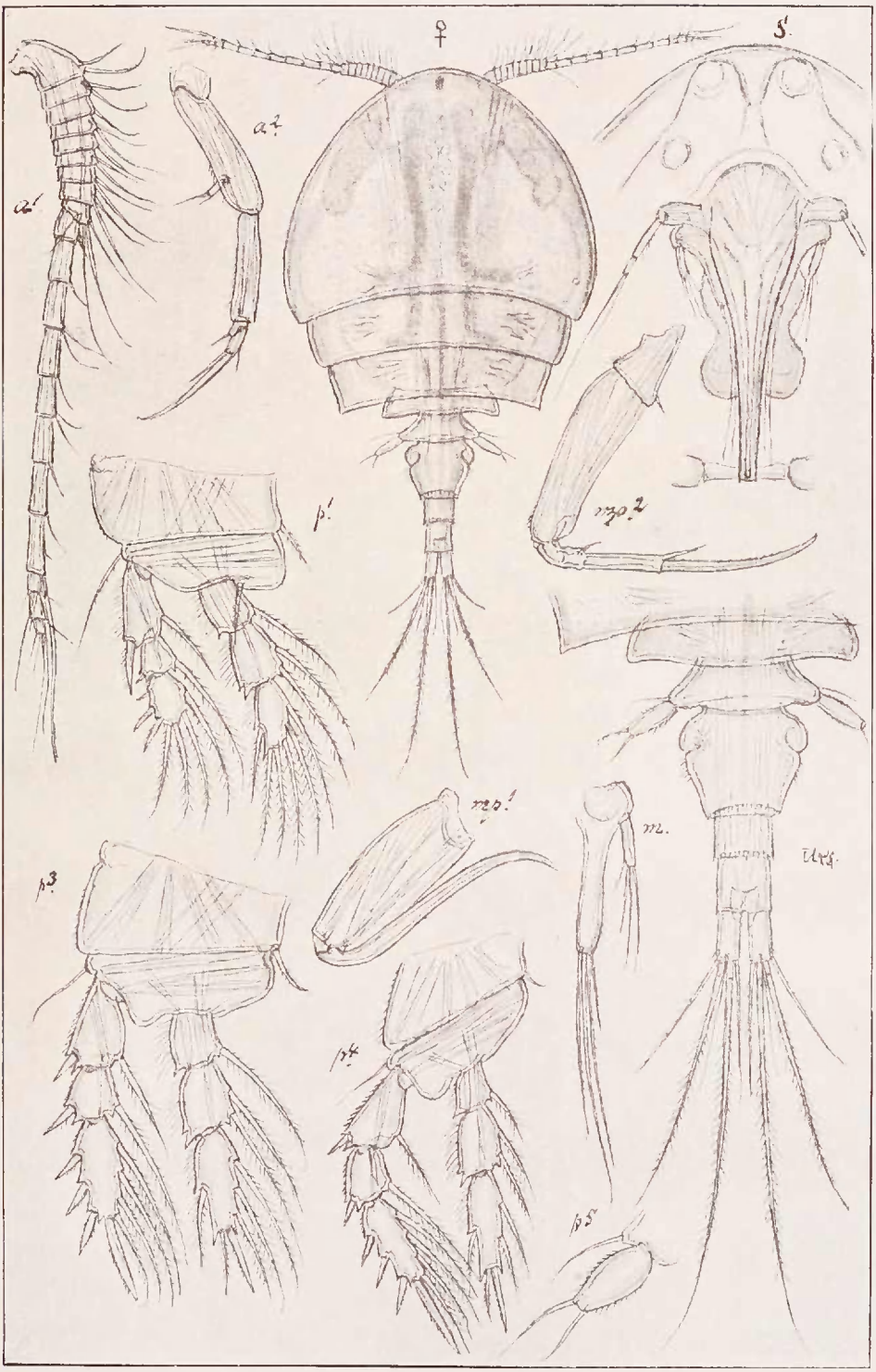
Copepoda



G. O. Sars, del.

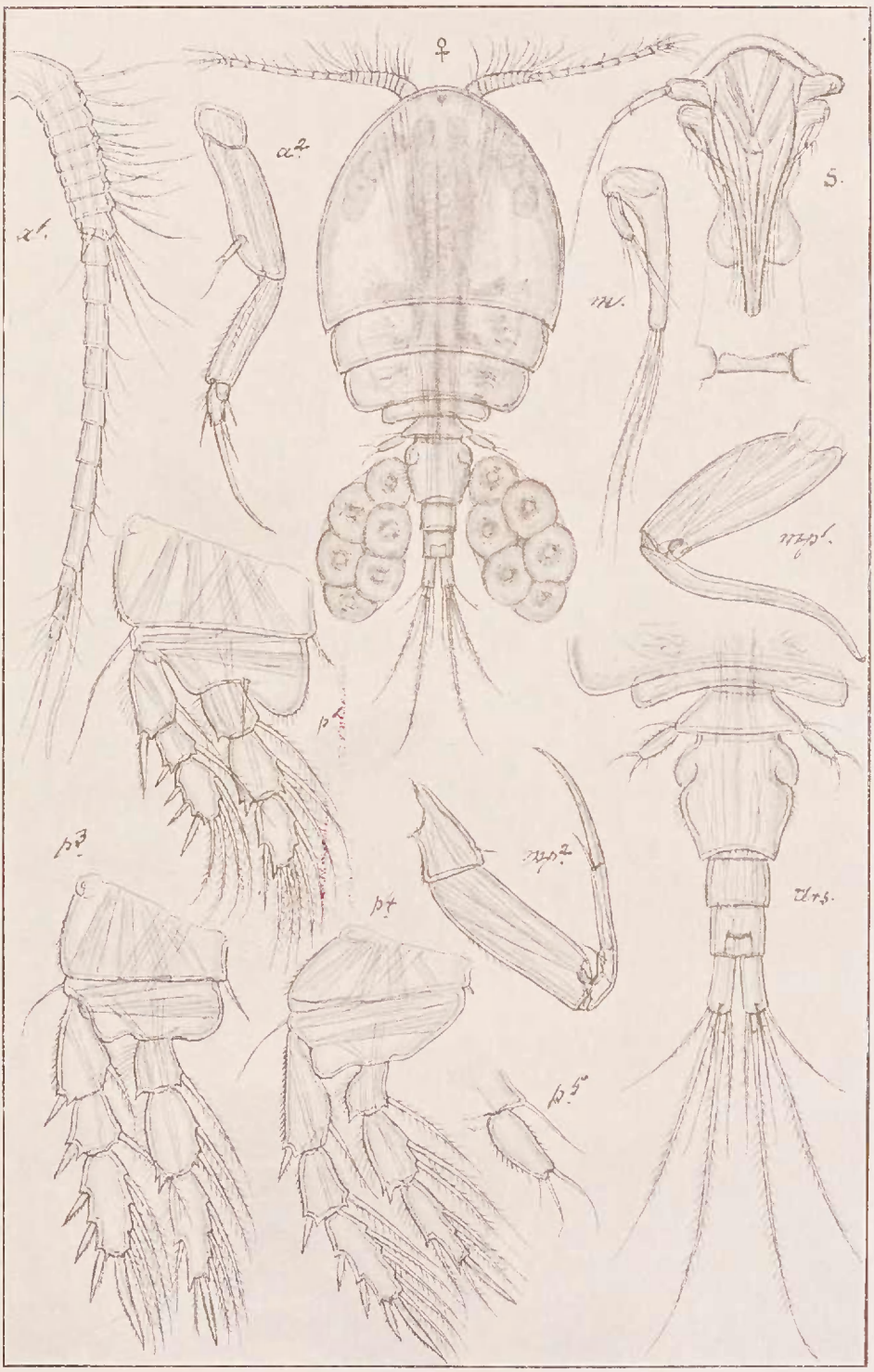
Ascomyzon simulans, Scott

Copepoda



G. O. Sars, del.

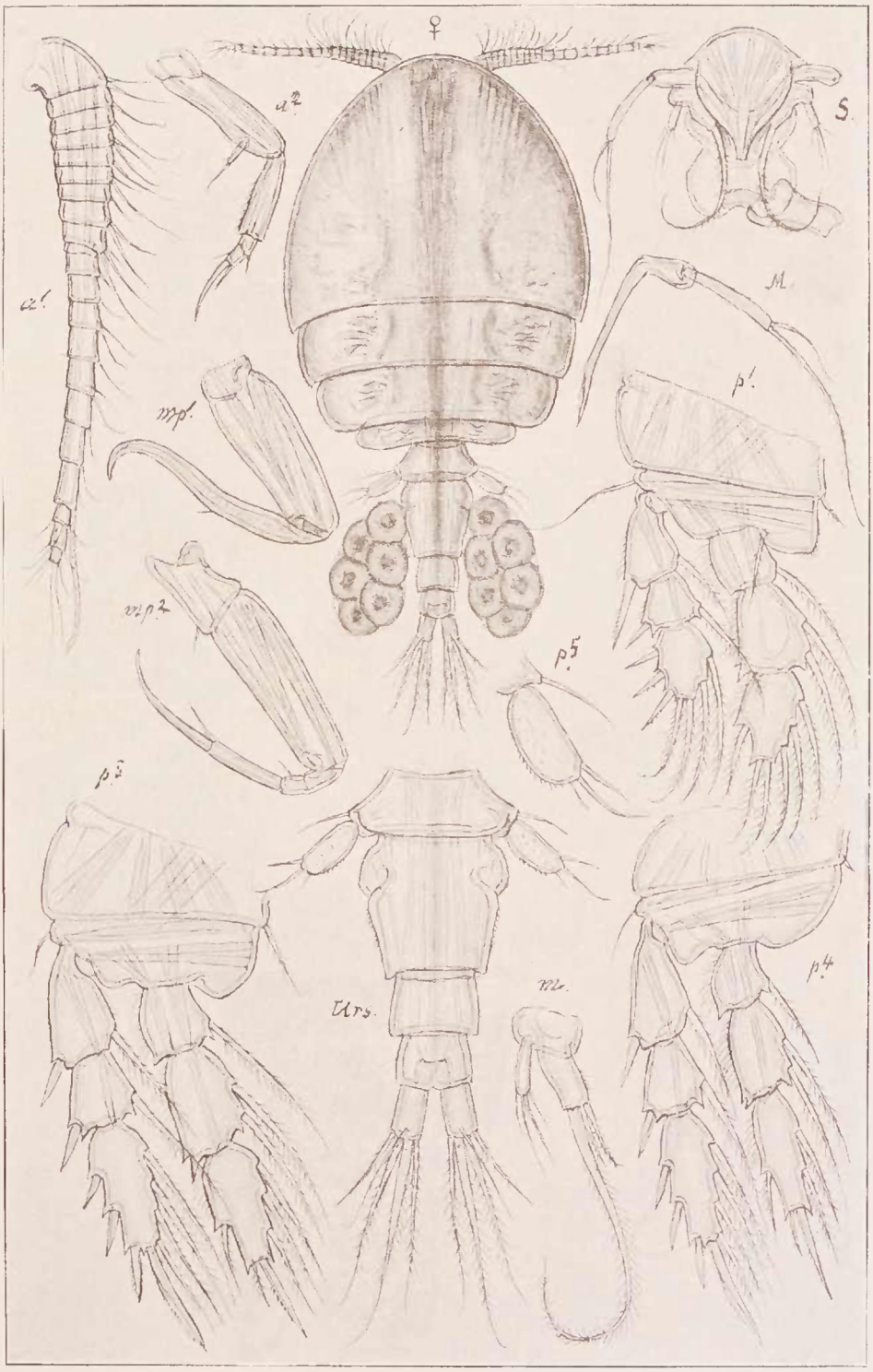
Ascomyzon latum, (Brady)



G. O. Sars, del.

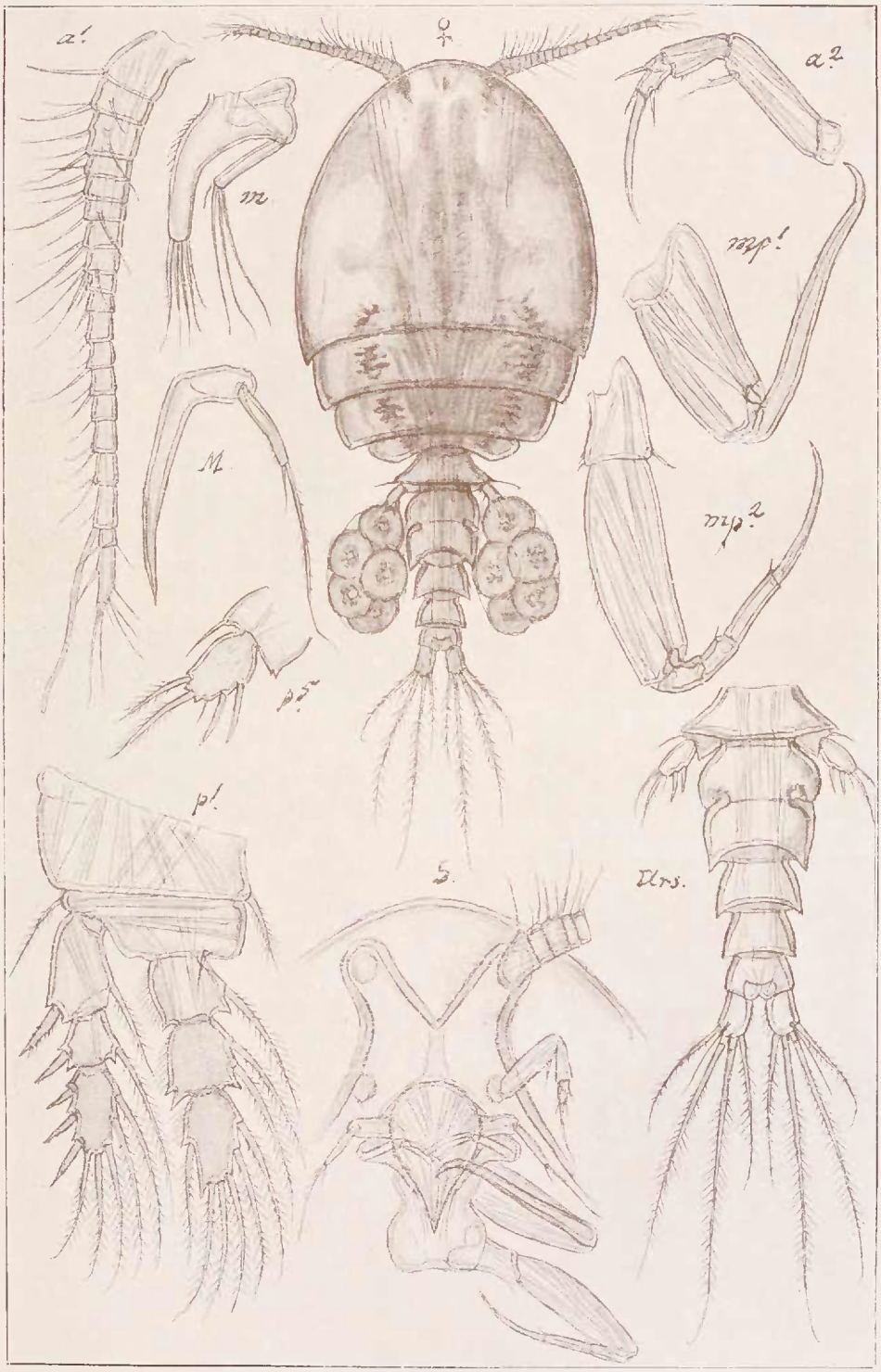
Ascomyzon parvum, (Giesbrecht)

Copepoda



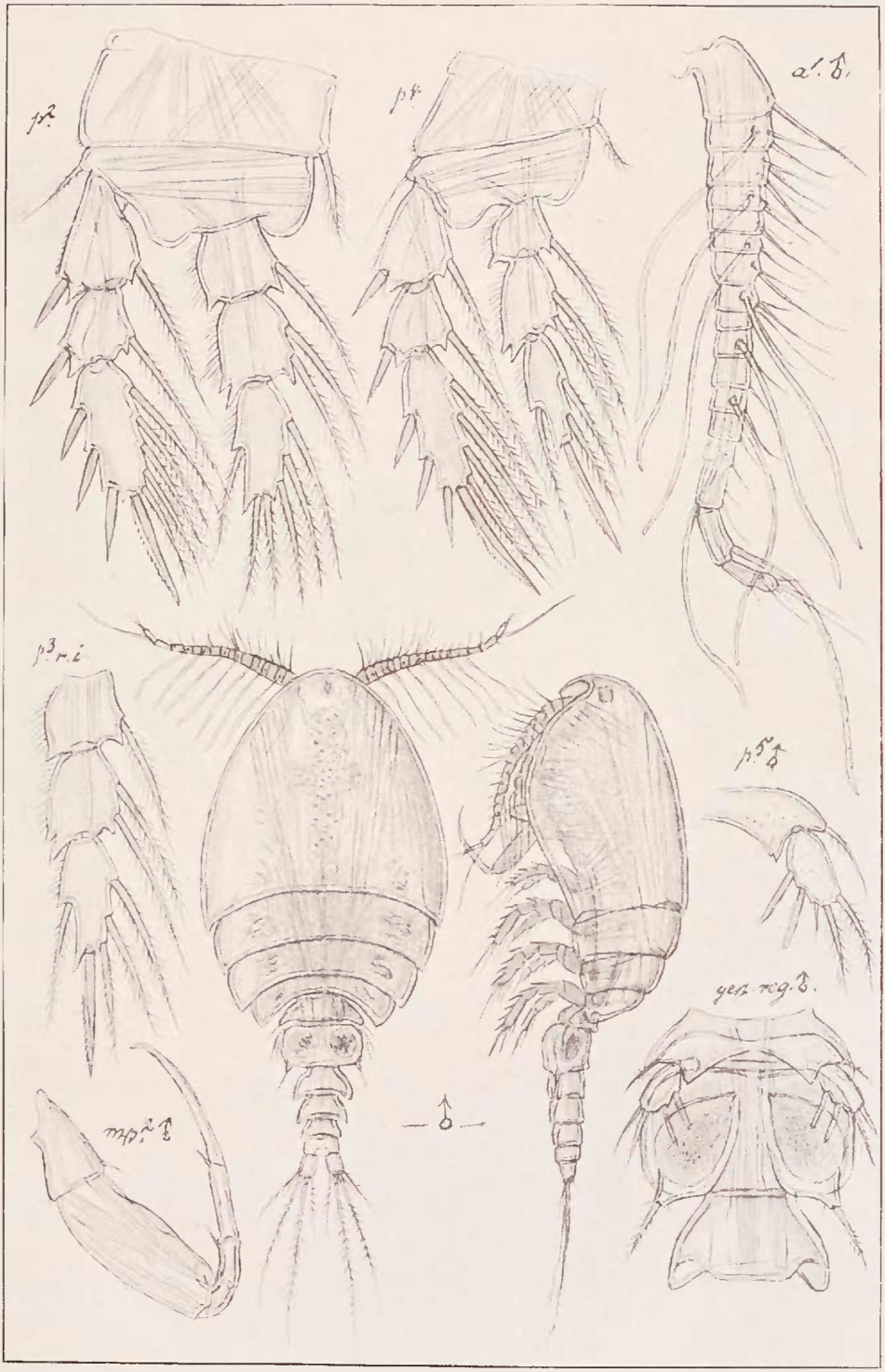
G. O Sars, del

Echinocheres violaceus, Claus



G. O. Sars, del.

Dermatomyzon nigripes, (Brady)

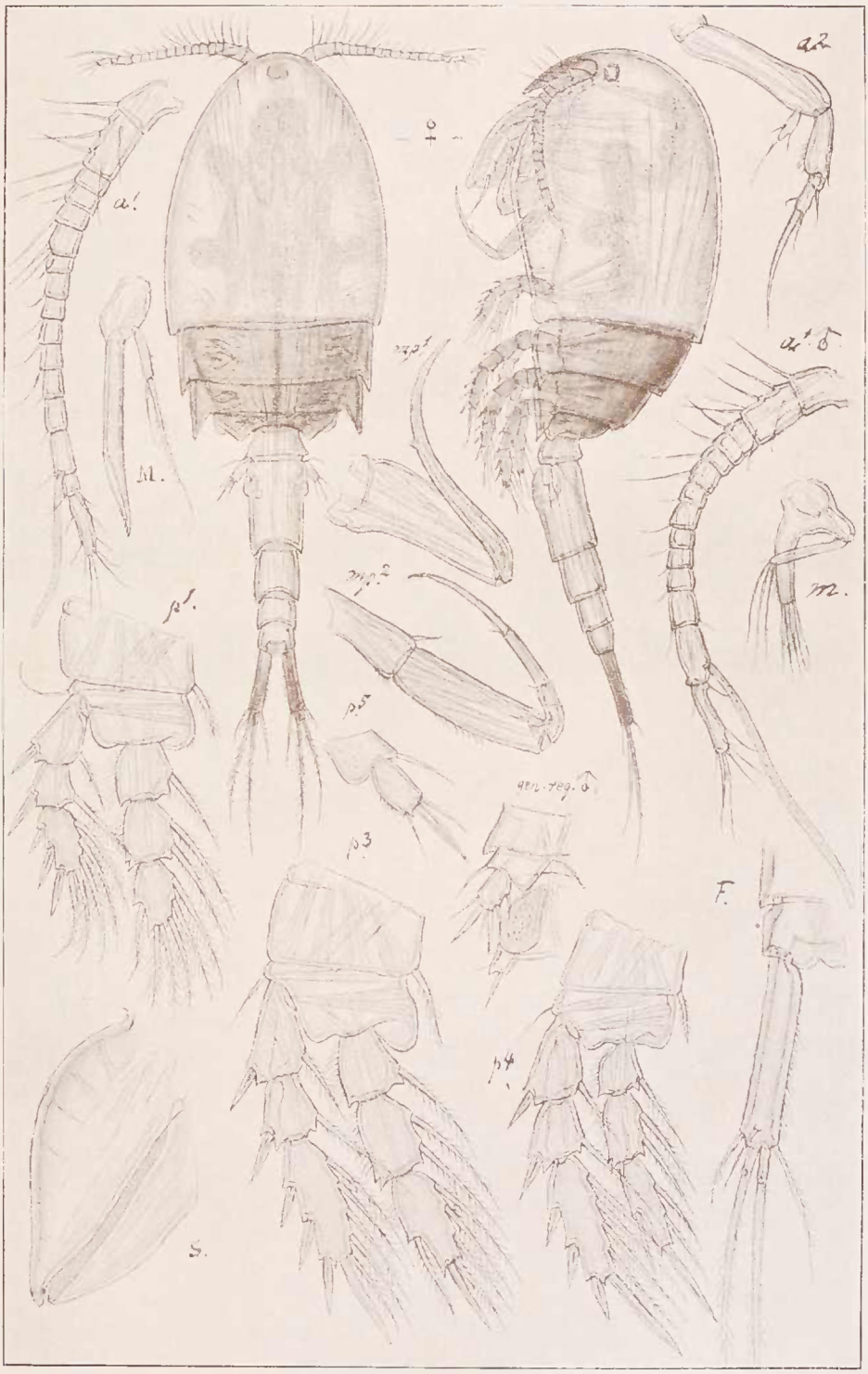


G. O. Sars, del.

Dermatomyzon nigripes, (Brady)

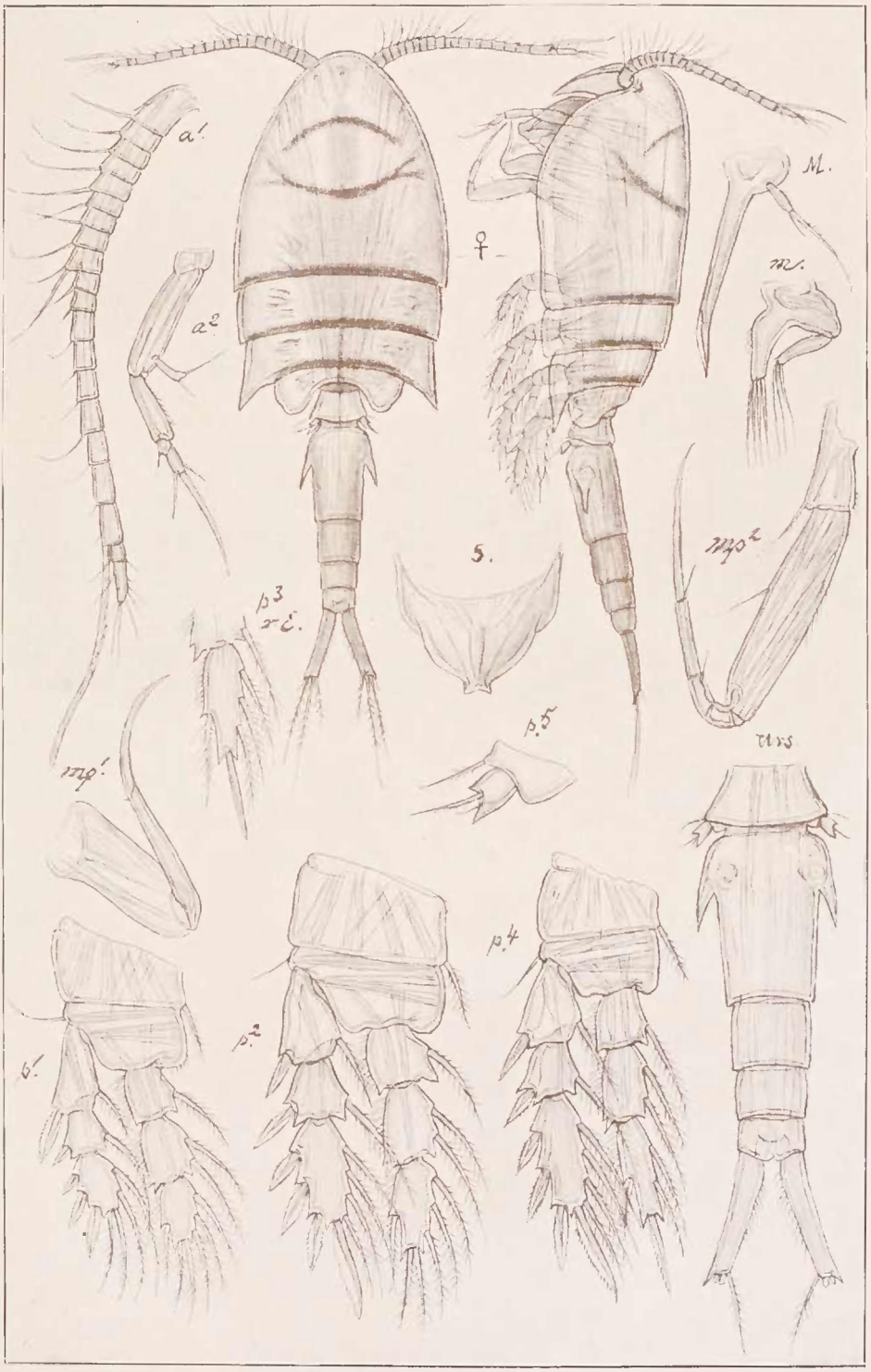
(continued)

Copepoda



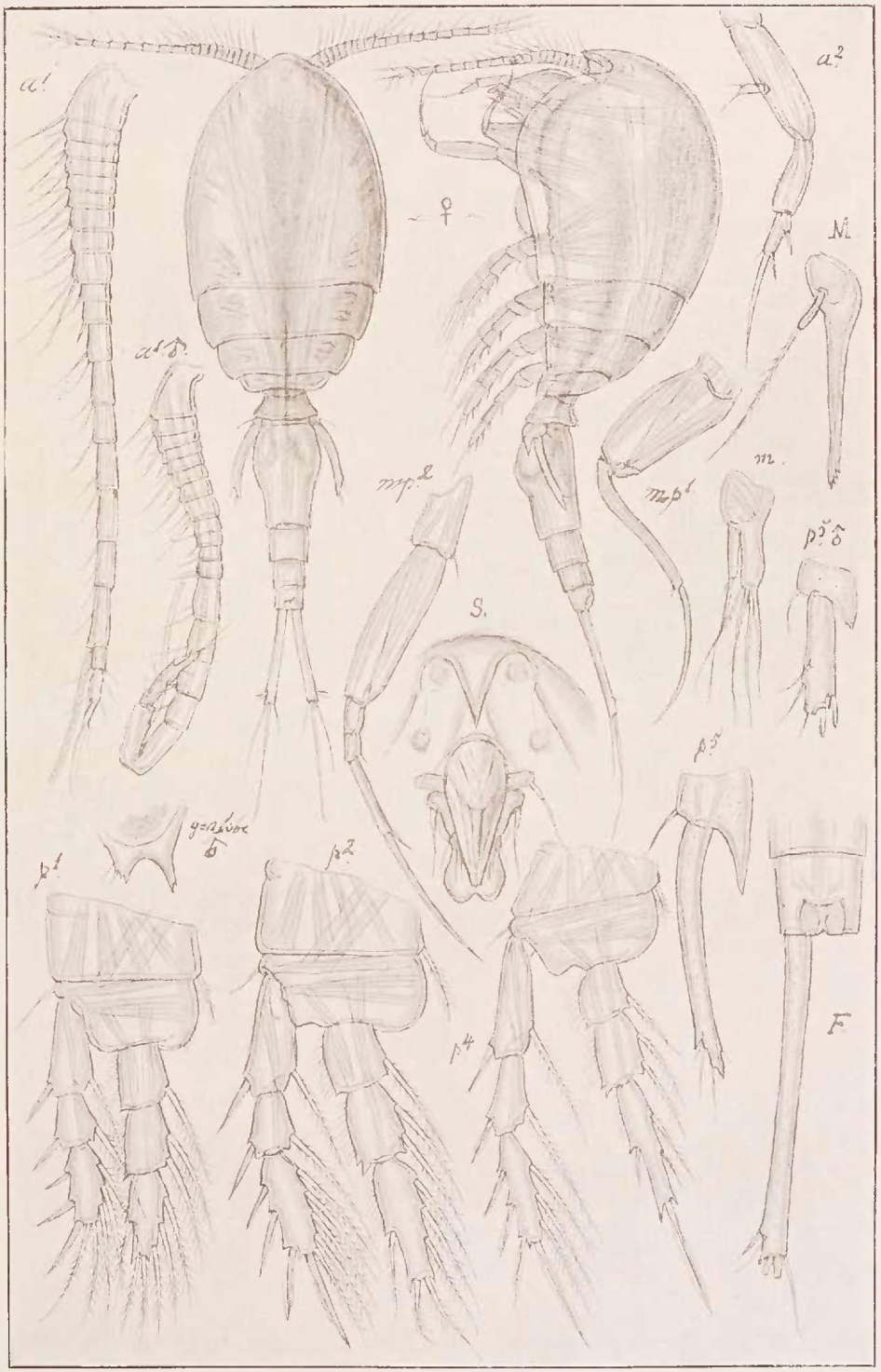
G. O. Sars, del.

Rhynchomyzon purpurocinctum, (Scott)



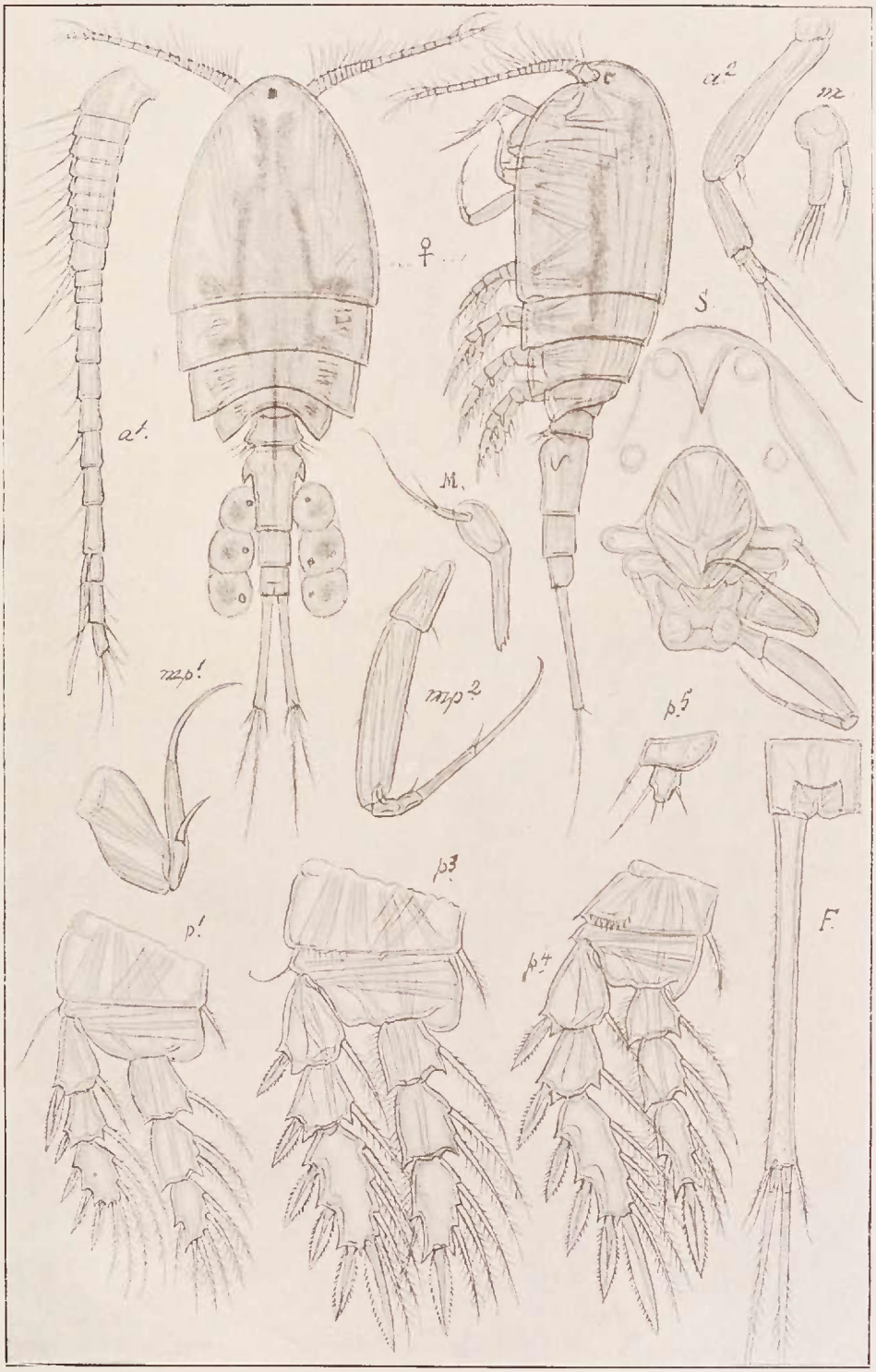
G. O. Sars, del.

Rhynchomyzon rubrovittatum, G. O. Sars



G. O. Sars, del.

Collocheres gracilicauda (Brady)



G. O. Sars, del.

Mesocheres anglicus. Norm. & Scott

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 IX & X

ASCOMYZONTIDÆ (concluded), ACONTIOPHORIDÆ, MYZOPONTIIDÆ, DYSPONTIIDÆ, ARTOTROGIDÆ, CANCERILLIDÆ

WITH 16 AUTOTYPIC PLATES



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1915

Gen. 23. Leptomyzon, G. O. Sars, n.

Syn: *Collocheres*, A. Scott (part).

Generic Characters.—Body slender, with the anterior division very little dilated. Cephalic segment with the inferior edges considerably curved in front; rostral projection very slight and obtuse at the tip. Epimeral plates of the succeeding segments rounded off. Tail very slender, and composed in female of 4 well-defined segments; genital segment without any lateral projections. Caudal rami somewhat produced, though far less slender than in the 2 preceding genera, outer seta more or less remote from the apex, dorsal bristle, however, occupying its usual place near the end of the ramus. Anterior antennæ slender, with the full number of articulations. Posterior antennæ resembling in structure those in *Collocheres*. Oral cone short and stout, carrying at the obtuse apex 2 remarkable diverging tentacular appendages, apparently attached to the posterior lip. Mandibles rather strong, with the apex distinctly denticulate, palp small, consisting of a narrow cylindrical joint, carrying on the tip a ciliated seta. Maxillæ with the inner lobe well developed and furnished at the end with 4 rather strong setæ; outer lobe much narrower, but of about the same length, and provided with only a single apical seta. Maxillipeds with the dactyli extremely slender, that of the anterior ones distinctly biarticulate. Natatory legs well developed, with the rami comparatively broader than in *Collocheres;* their armature about as in that genus. Last pair of legs distinctly biarticulate, proximal joint forming inside a linguiform expansion, distal joint rather large, oblong, and extending backwards along the genital segment.

Remarks.—The present new genus is established to include the form described by A. Scott as *Collocheres elegans*. This form, it is true, exhibits some characters in common with the type of the genus *Collocheres*, but differs in other particulars so materially, that in my opinion it ought to be kept apart as the type of a distinct, though nearly-allied genus. The chief differences are found in the structure of the oral cone, the last pair of legs and the caudal rami. In addition to the type species described below, the form recorded by A. Scott from Ceylon as *Collocheres Giesbrechti* is undoubtedly referable to the present genus.

61. Leptomyzon elegans, (A. Scott).

(Pl. LXV).

Collocheres elegans, A. Scott. Report for 1895 of the Lancashire Sea-Fisheries Laboratorium. p. 52, Pl. V, figs. 6—15.

Specific Characters.—Female. Body exceedingly slender and elongated, with the anterior division oblong fusiform in outline, greatest width scarcely

exceeding half the length. Cephalic segment somewhat longer than the 4 succeeding segments combined, and narrowly rounded in front. Tail slender, almost attaining the length of the anterior division; genital segment rather large, exceeding in length the 3 succeeding segments combined, and slightly dilated in its anterior part. Caudal rami rather produced, being about the length of the last 2 segments combined, and somewhat lamellar, with the outer part slightly narrowed, inner edge finely ciliated; outermost seta at a considerable distance from the apex, and attached to a distinct ledge on the exterior margin, innermost seta slender, exceeding the corresponding ramus in length; the inner mediate one about half the length of the tail. Anterior antennæ nearly as long as the cephalic segment, and composed of 21 joints, the outer 3 constituting the terminal part. Posterior antennæ with the outer ramus very small and attached about in the middle of the very slender 2nd joint. Natatory legs of a similar structure to that in *Collocheres gracilicauda*, but more strongly built, especially the 4th pair. Last pair of legs scarcely extending beyond the middle of the genital segment; inner expansion of proximal joint obtusely triangular in form, unarmed; distal joint oblong oval in form, with the inner edge straight, outer gently curved and minutely ciliated, tip obliquely truncated and provided with 3 small bristles.

Body rather pellucid, of a whitish grey colour.

Length of adult female 0.87 mm.

Male unknown.

Remarks.—This form, as already mentioned, was described by A. Scott as a species of the genus *Collocheres*, the characteristic structure of the oral tube having escaped his attention, as also the difference in the arrangement of the caudal setæ.

Occurrence.—A few female specimens of this form were collected, many years ago, at Eggesbønæs, west coast of Norway, from a depth of about 20 fathoms.

Distribution.—Off Port Erin, west coast of Scotland (A. Scott).

Gen. 24. **Scottocheres**, Giesbrecht 1897.

Syn: *Acontiophorus*, Scott (part).

Generic Characters.—Body of a similar slender form to that in the 3 preceding genera, the anterior division being only slightly dilated. Cephalic segment scarcely compressed, its inferior edges being quite evenly curved; rostrum

wholly absent. Epimeral parts of the 3 succeeding segments rounded off. Tail composed in female of only 3, in male of 4 segments. Caudal rami not much produced, in some cases very short, with all the setæ originating from the end. Anterior antennæ resembling in structure those in the other *Ascomyzontidæ*, though having the number of joints somewhat reduced; those in male distinctly hinged and provided with supplementary æsthetasks. Posterior antennæ of the usual appearance. Oral cone, however, rather peculiar and somewhat similar to that in the next family, being produced into a very narrow, more or less curved siphonal tube. Mandibles without any palp, and having the masticatory part extremely slender, setiform. Maxillæ with the lobes very unequal in size, each carrying 3 setæ. Maxillipeds comparatively slender, with the dactyli exceedingly narrow, that of the anterior ones distinctly biarticulate. Natatory legs well developed, with the rami comparatively broad and equal-sized; their armature differing slightly from that in the other genera. Last pair of legs of moderate size, biarticulate, proximal joint broadly expanded inside, distal joint lamelliform.

Remarks.—This genus was established by Giesbrecht, to include the form at first described by Scott as *Acontiophorus elongatus*. The differences of this form from the true *Acontiophori* have been duly pointed out by Giesbrecht. Indeed, the only character by which it seems to approach that genus, is the structure of the siphon. Otherwise it agrees fairly well with the other *Ascomyzontidæ*, and of course ought to be included in that family as here defined. In addition to the type species described below, Giesbrecht records another nearly-allied form from the Bay of Naples under the name of *S. longifurca*.

62. Scottocheres elongatus, (Scott).

(Pl. LXVI).

Acontiophorus elongatus, Scott, Ann. & Mag. Nat. Hist., Ser. 6, Vol. XII, p. 145, Pl. IX, figs. 15—20.

Specific Characters.—Female. Body comparatively narrow and elongated, with the anterior division oblong in form, greatest width scarcely exceeding half the length. Cephalic segment of moderate size and obtusely rounded in front, without any trace of a rostral projection below. The 3 succeeding segments gradually diminishing in size, with the epimeral parts not very prominent. Tail scarcely exceeding half the length of the anterior division; genital segment comparatively large, occupying more than half the length of the tail, and somewhat dilated in its anterior part, with a slight prominence on each side, just in front of the genital orifices; anal segment very small, scarcely half as long as the

preceding segment. Caudal rami short, quadrangular in form, being scarcely longer than they are broad, and transversely truncated at the end; apical setæ of moderate length, the outer mediate one remarkably thickened in its middle part. Anterior antennæ not nearly attaining the length of the cephalic segment and rather narrow, being composed of 17 joints sparingly clothed with comparatively small setæ, proximal division well marked off from the distal one, terminal part uniarticulate. Posterior antennæ with the 2nd (basal) joint rather slender, rudimentary outer ramus attached near the end of this joint; terminal joint very small, but with the apical spine rather strong. Siphon extending about to the end of the anterior division of the body, being, as a rule, conspicuously curved, and in preserved specimens often split up into its two components, the anterior and posterior lips. 1st pair of natatory legs with the spine, issuing from the 2nd basal joint inside, lanceolate in form; terminal joint of outer ramus with only 2 setæ inside, distal spine of outer edge well developed, the other 2 very small. Same joint in 2nd and 3rd pairs with 4, in 4th pair with 3 setæ inside. Terminal joint of inner ramus in 1st pair with a conspicuous dentiform projection inside the tip; same joint in 4th pair with only a single apical spine. Last pair of legs with the inner expansion of proximal joint broadly rounded, unarmed; distal joint oval in form, with the edges minutely ciliated and the tip provided with 3 comparatively short setæ, the middle one spiniform.

Male resembling the female in the general shape of the body, but of smaller size, and having the tail composed of 4 well defined segments, the 1st of which is considerably swollen, to receive the comparatively large globular spermatophores. Anterior antennæ much more powerfully developed than in female, though composed of a smaller number of joints, viz., 15, the last 2 of which form together a movable terminal section, which admits of being bent upon the somewhat thickened adjoining part of the antenna.

Body (in female) rather pellucid, with a faint orange tinge, and with the translucent ovarial tubes of a somewhat darker hue.

Length of adult female about 1 mm., of male 0.70 mm.

Remarks.—This form, as mentioned above, was at first described by Scott as a species of the genus *Acontiophorus*, apparently on account of the somewhat similar structure of the siphon. Its generic difference has however subsequently been admitted by that author, and it was redescribed under the above name in the sixteenth Annual Report of the Fishery Board for Scotland. From the nearly-allied Neapolitan species, *S. longifurca* Giesbr., it is easily distinguished by the very short caudal rami.

Occurrence.—A few female specimens of this form were collected, many years ago, at Eggesbønæs, west coast of Norway, and some additional specimens, among them a single male, were recently picked up from the residue of the same collecting bottle, in which, as mentioned above, several species of *Ascomyzon* were found.

Distribution.—British Isles (Scott), Bay of Naples (Giesbrecht), Ceylon (A. Scott).

Fam. 5. Acontiophoridæ.

Characters.—General form of body resembling that in the *Ascomyzontidæ*, the anterior division being more or less dilated, the posterior one attenuated. Anterior antennæ not much produced, and densely clothed with partly ciliated setæ, no distinct boundary being found, as in most of the *Ascomyzontidæ*, between the proximal and distal portions; a small terminal part, however, distinguishable, formed by the outermost joints succeeding that carrying the usual æsthetask. Posterior antennæ rather unlike those in the *Ascomyzontidæ*, the terminal joint being much more fully developed and provided with several spines and setæ; outer ramus comparatively large, though uniarticulate. Oral cone produced into a very narrow siphonal tube somewhat resembling that in *Scottocheres*. Mandibles with the masticatory part imperfectly developed, terminating in a simple hair-like point, which does not extend to the end of the tube; palp replaced by a single very large and densely plumose seta. Maxillæ with the basal part unusually large and massive, lobes more or less curved downwards and provided with richly ciliated setæ. Maxillipeds of the usual structure. Natatory legs likewise on the whole normally built. Last pair of legs comparatively small, with the proximal joint imperfectly defined; distal joint scarcely lamellar, and provided with several spiniform setæ.

Remarks.—This family is established to include the genus *Acontiophorus* of Brady, which seems to me to differ in some respects so materially from the preceding genera comprised within the family *Ascomyzontidæ*, that it can hardly be associated with them. The structure of the posterior antennæ and the oral parts, in particular, is very unlike that found in the true *Ascomyzontidæ*. I am inclined to believe that the 2 hitherto known species, *A. suctatus* and *ornatus*, should more properly be regarded as types of 2 nearly-allied genera, as their outward appearance is rather dissimilar, and some of the structural details also

seem to exhibit differences of more than specific value. In any case, the species described below, as the first one recorded, ought to be regarded as the type of the genus *Acontiophorus*.

Gen. 25. **Acontiophorus**, Brady 1880.

Syn: *Solenostoma*, Brady (preoccupied).

Generic Characters.—Anterior division of body moderately dilated, not depressed. Epimeral parts of the trunk-segments not produced, but evenly rounded off. Tail composed in female of 3, in male of 4 segments, none of them produced at the postero-lateral corners. Caudal rami of moderate size, and transversely truncated at the end, apical setæ well developed. Anterior antennæ very short, with the number of joints considerably reduced; those in male imperfectly hinged, and provided with supplementary æsthetasks. Posterior antennæ with the terminal joint rather large and scarcely narrowed distally, outer ramus attached close to the end of the 2nd (basal) joint, and cylindrical in form. Siphon exceedingly slender and elongated. Maxillæ with the inner lobe larger than the outer, and carrying on the tip 4 setæ, the 2 inner of which are densely plumose. Maxillipeds quite normal. Natatory legs with the rami comparatively slender and subequal in length; their armature resembling that in the gen. *Scottocheres*. Last pair of legs very small; distal joint provided with 5 rather unequal setæ.

Remarks.—The above-given generic diagnosis chiefly refers to the type species *A. scutatus*. The other species referred to this genus, *A. ornatus*, differs more or less in some of the characters here given, and should in my opinion, as noted above, more properly be removed to a separate, though closely-allied genus.

63. Acontiophorus scutatus, Brady.

(Pl. LXVII).

Acontiophorus scutatus, Brady. Monogr. of British Copepoda. Vol. III. p. 69. Pl. XC. figs. 1—10.

Syn: *Solenostoma scutatum*, Brady & Roberts.

Specific Characters.—Female. Body moderately slender, obpyriform in shape, with the anterior division broadly ovate, greatest width considerably exceeding half the length. Cephalic segment very large, occupying nearly half the length of the body, and quite evenly rounded in front; rostral projection extremely small, almost obsolete. Tail scarcely exceeding in length $^1/_3$ of the anterior

division and having all the segments quite simple; genital segment about the length of the 2 succeeding segments combined and slightly dilated in front. Caudal rami sublinear in form, being about 3 times as long as they are broad, and scarcely at all divergent; apical setæ more or less curved outwards in their distal part, the inner mediate one exceeding the tail in length. Anterior antennæ short and rather thick at the base, tapering distally, and composed of only 11 joints clothed with slender spreading setæ, 1st, 2nd and 6th joints larger than the others; terminal part 3-articulate. Posterior antennæ fully as long as the anterior ones, and having the 2nd (basal) joint comparatively large and slightly curved in the middle, terminal joint exceeding somewhat in size the preceding one, and carrying on the blunted end 2 comparatively large spines of unequal length and finely denticulated on the edges, these spines being moreover accompanied inside by a slender ciliated seta, and outside by a somewhat shorter seta and a minute bristle; outer ramus somewhat longer than the terminal joint and provided with a long apical seta and another much shorter lateral one. Siphonal tube exceedingly long and slender, extending almost to the end of the body. Maxillæ with the outer lobe originating far in front and considerably curved, carrying on the tip 3 moderately long plumose setæ accompanied outside by a minute bristle. Maxillipeds moderately strong, dactylus of the anterior ones only slightly curved and imperfectly subdivided in the middle; basal part of the posterior ones composed of 2 well-defined joints. Natatory legs with the spines of the outer ramus narrow lancet-shaped; terminal joint of this ramus in 1st and 4th pairs with 3 setæ inside; terminal joint of inner ramus in 3rd and 4th pair with only a single spine on the tip. Last pair of legs with the distal joint rather small, rounded oval in form, and carrying inside 2 short setæ, outside 2 much longer setæ attached close together to a distinct ledge and partly crossing each other, and at the somewhat exserted tip another similar seta. Ovisacs oblong in form, and closely appressed to the tail, each containing a rather limited number of ova, in some cases only 4 arranged in a single row.

Male considerably smaller than female, and exhibiting the usual sexual differences. Anterior antennæ composed of the same number of joints as in the female, though their mutual relation is rather different; terminal part consisting of only a single narrow lamellar joint; æsthetask issuing from the preceding joint very largely developed.

Colour (in female) generally light yellowish brown, with darker intestine and ovarial tubes.

Length of adult female about 1 mm.

Remarks.—This form was at first recorded by Messrs. Brady and Robertson under the name of *Solenostoma scutatum*. The generic name being however preoccupied, it was redescribed and figured by the former author in his monograph under the above name. It is a very distinct and easily recognizable form, especially distinguished by the unusually short anterior antennæ and the extraordinary development of the siphon.

Occurrence.—I have met with this form in 2 different localities on the west coast of Norway, viz., at Kalvaag and Aalesund. In the latter place it occurred not unfrequently at a depth of about 10 fathoms among algæ and other marine growths.

Distribution.—British Isles (Brady), coast of France (Canu), Mediterranean (Claus, Giesbrecht).

Fam. 6. Myzopontiidæ.

Characters.—General form of body resembling that in some of the *Ascomyzontidæ*, being comparatively slender, with the anterior division moderately broad, and the cephalic segment scarcely projecting at the postero-lateral corners. Tail rather produced and of quite normal appearance, being composed in female of 4, in male of 5 segments. Anterior antennæ slender, with the number of joints somewhat reduced; terminal part not defined, the usual æsthetask issuing from the last joint, near the tip. Posterior antennæ comparatively small, but with the terminal joint more developed than in the *Ascomyzontidæ*, outer ramus rudimentary. Oral cone more or less produced. Mandibles without any palp. Maxillæ and maxillipeds on the whole normal. Natatory legs resembling in structure those in the *Ascomyzontidæ*. Last pair of legs with the proximal joint imperfectly defined from the segment, distal joint very small or of moderate size.

Remarks.—This is another family, which I have found it necessary to establish in order to include the 2 genera *Myzopontius* and *Neopontius*, the systematic position of which has appeared rather doubtful. Giesbrecht refers both these genera to his sub-family *Dyspontiinæ*, apparently on account of the somewhat similar structure of the anterior antennæ; but in other respects they differ very conspicuously from the true *Dyspontiinæ*, both as regards the outward appearance of the body and the structural details, while on the other hand they exhibit, several

characters in common, as indicated in the above diagnosis. As the genus *Myzopontius* was the first established of the two, the name of the family must be derived from that genus.

Gen. 26. **Myzopontius**, Giesbrecht, 1895.

Generic Characters.—Anterior division of body moderately dilated, with the cephalic segment comparatively large, and the epimeral parts of the trunk-segments only slightly angular. Tail slender, though not much elongated. Caudal rami moderately produced. Anterior antennæ slender and only sparingly setiferous; those in male distinctly hinged, and provided with supplementary æsthetasks. Posterior antennæ likewise comparatively slender, with the penultimate joint well defined and the terminal joint rather elongated. Oral cone produced into a slender siphonal tube. Mandibles very narrow. Maxillæ with the inner lobe shorter than the outer, and provided with only a single apical seta. Both pairs of maxillipeds very slender. Terminal joint of outer ramus in 1st pair of natatory legs with 3 setæ inside; same joint in the 3 succeeding pairs with 5 setæ. Last pair of legs very small.

Remarks.—This genus was established in the year 1895 by Giesbrecht, to include a species found by him in the Bay of Naples. In the elaborate monograph of the *Asterocheridæ* by the same author, this genus was placed at the head of the sub-family *Dyspontiinæ*, and its differences from the more typical genera, showing an approach to the *Asterocherinæ* (= *Ascomyzontidæ*), were pointed out. The genus as yet only comprises a single species, to be described below.

64. Myzopontius pungens, Giesbr.

(Pl. LXVIII).

Myzopontius pungens, Giesbrecht, Asterocheridæ, p. 106, Pl. 1, fig. 6, Pl. 6, figs. 1—14.

Specific Characters.— Female. Body moderately slender, with the anterior division oblong oval in outline, greatest width slightly exceeding half the length. Cephalic segment very large, occupying almost half the length of the body, frontal edge evenly curved, pleural parts incurved and rather broad; rostral projection extremely small. The 3 succeeding segments gradually diminishing in size and having the epimeral parts slightly angular behind. Tail scarcely attaining half

the length of the anterior division and narrow cylindrical in form; genital segment of moderate size, with the anterior part slightly dilated, forming on each side a rounded prominence. Caudal rami slightly exceeding in length the anal segment and sublinear in form, being scarcely at all divergent; outermost seta, together with the dorsal bristle, slightly remote from the apex; middle apical seta of moderate length. Anterior antennæ slender, though scarcely exceeding half the length of the cephalic segment, and composed of 12 joints, the last one much the longest. Posterior antennæ rather narrow, with the terminal joint considerably produced, being almost as long as the 2nd (basal) joint, and carrying 3 apical and one lateral seta, middle apical seta much longer than the other 2, lateral seta attached near the base. Siphon extending about to the end of the cephalic segment. Maxillæ with the outer lobe rather narrow, sublinear in form, and carrying on the tip 2 moderately long setæ; inner lobe conical in form with the apical seta very slender. Anterior maxillipeds with the dactylus exceedingly narrow and elongated, distal part evenly curved and clothed inside with minute spinules. Posterior maxillipeds with the hand unusually narrow, dactylus normal. Natatory legs moderately strong, with the spines of the outer ramus finely denticulate; 1st joint of inner ramus in 1st pair unusually broad and, like the 2nd basal joint, provided on the lower face with a rounded, boss-like prominence. Last pair of legs extremely minute: distal joint provided with 3 small bristles, one apical and 2 lateral.

Body, according to Giesbrecht, nearly colourless, with reddish orange translucent intestine and lateral coeca; eye very large and bright red.

Length of adult female about 1 mm.

Remarks.—This Copepod resembles in its outward appearance certain forms of the *Ascomyzontidæ*, but is easily distinguishable by the rather different structure of the anterior antennæ. The specific name proposed by Giesbrecht alludes to the narrowly-produced siphon, which in some cases is seen projecting from the body at nearly a right angle, as indicated in the side-view figure given by Giesbrecht.

Occurrence.—A solitary, but well preserved female specimen of this form was found in a sample taken at Korshavn, south coast of Norway, from a depth of about 40 fathoms, muddy sand.

Distribution.—Bay of Naples (Giesbrecht), Franz Joseph Land (Scott).

Gen. 27. **Neopontius**, Scott, 1898.

Generic Characters.—Anterior division of body only slightly dilated, with some of the segments angularly produced laterally. Cephalic segment of moderate size and narrowed in front; rostral projection well marked. Tail very slender, with the genital segment in female long and narrow. Caudal rami rather produced and somewhat lamellar; apical setæ comparatively short. Anterior antennæ of moderate size and densely clothed with slender, curved setæ; those in male imperfectly hinged and without any supplementary æsthetasks. Posterior antennæ rather stout, with the 2 middle joints imperfectly defined in female, terminal joint not much produced. Oral cone comparatively short, not being produced into a siphonal tube. Mandibles less slender than in *Myzopontius*, and distinctly denticulated at the tip. Maxillæ with the inner lobe larger than the outer, and carrying at the tip 4 setæ. Maxillipeds comparatively strongly built, dactylus of the anterior ones armed inside, at some distance from the end, with a very conspicuous curved secondary spine. Natatory legs of a similar structure to that in *Myzopontius*. Last pair of legs, however, more fully developed, with the distal joint rather produced and somewhat spatulate in form.

Remarks—This is a very distinct genus, exhibiting, as it does, several well-marked differences from *Myzopontius*. Yet its affinity to that genus is evidently closer than to any other of the siphonostomous Cyclopoida, and this has also been recognised both by Scott and Giesbrecht.

65. Neopontius angularis, Scott.

(Pl LXIX).

Neopontius angularis, Scott, Sixteenth Annual Report of the Fishery Board for Scotland, Part III, p. 271, Pl. XIV, figs. 1—11.

Specific Characters.—Female. Body very slender, with the anterior division oblong oval in outline and somewhat abruptly truncated behind. Cephalic segment scarcely occupying more than $^1/_3$ of the total length and narrowly rounded in front; rostral projection well marked, but incurved, and acute at the tip. The succeeding trunk-segments rather dissimilar both in size and form, the anterior one being comparatively simple, whereas the 3rd segment is unusually broad, with the epimeral parts prominent and triangularly pointed behind; penultimate segment much smaller, with the epimeral parts angularly rounded; last segment very narrow. Tail almost attaining the length of the anterior division and rather narrow; genital segment longer than the 3 succeeding segments combined, and

widening slightly in front. Caudal rami exceeding in length the last 2 segments combined and conspicuously lamellar, inner edge finely ciliated, outer edge exhibiting, somewhat beyond the middle, a distinct ledge to which the outermost seta, together with the dorsal bristle, is attached; apical setæ comparatively short, but rather coarse and densely plumose. Anterior antennæ somewhat exceeding half the length of the cephalic segment, and composed of 12 joints, the 2nd of which is rather large, being fully as long as the 4 succeeding joints combined; terminal joint elongated, club-shaped. Posterior antennæ comparatively short, but rather stout, with the 2 middle joints confluent; terminal joint not much prolonged, and carrying 4 elongated and finely ciliated setæ, 3 apical and one lateral. Oral cone extending only slightly beyond the insertion of the posterior maxillipeds, and evenly tapered distally. Mandibles apparently biarticulate, and very finely denticulate at the tip. Maxillæ with the outer lobe scarcely more than half as long as the inner, and carrying on the tip 2 moderately long setæ. Anterior maxillipeds with the distal part of the dactylus, as also the secondary spine, finely denticulate inside. Posterior maxillipeds with the hand imperfectly defined from the basal part; terminal part of the dactylus denticulate. Natatory legs moderately strong, with the spines of the outer ramus dagger-like. Last pair of legs with the distal joint well developed, sub-spatulate in form, and provided with 3 setæ, 2 issuing from the transversely truncated end, the 3rd from the lower face at some distance from the apex; outer edge of the joint minutely ciliated, inner projecting near the end to a dentiform process.

Male, as usual, smaller than female, and having the anterior division of the body less angular in shape. Anterior antennæ more strongly built, and composed of 14 joints, those of the distal part conspicuously thickened, 10th joint armed in front with 2 slender spines, apical joint small, rounded. Posterior antennæ with the 2 middle joints well defined; the posterior maxillipeds also quite normally developed.

Colour (in female) yellowish grey, with scattered pigmentary patches of an ochraceous hue on the dorsal face of the anterior division of the body.

Length of adult female 1.35 mm., of male 1.10 mm.

Remarks.—This is the only as yet known species of the genus, and may easily be recognized by the peculiar angular shape of the anterior division of the body, which, especially in the female, is very conspicuous and indeed has given rise to the specific name proposed by Scott.

Occurrence.—I have long been acquainted with this peculiar form, of which some few specimens were collected, many years ago, at Eggesbønæs, west

coast of Norway, from a depth of about 20 fathoms. I have, however, not met with it in other localities, and it thus seems to be of very rare occurrence.

Distribution.—Scottish coast (Scott).

Fam. 7. Dyspontiidæ.

Characters.—General form of body, as a rule, very broad and depressed, with the anterior division much expanded. Cephalic segment large and arcuate in front, with the postero-lateral corners produced, and the pleural parts very broad, leaving in front only a narrow space for the insertion of the antennæ and oral parts. Epimeral parts of the trunk-segments forming well-defined lappets projecting laterally. Last segment, however, as usual, not expanded and very small. Tail comparatively short, and composed in female of 4, in male of 5 segments; genital segment much expanded in its anterior part. Anterior antennæ slender and narrow, with the number of joints more or less reduced, last joint club-shaped and carrying near the end the usual æsthetask; those in male more or less distinctly hinged and provided with supplementary æsthetasks. Posterior antennæ very small, 4-articulate, outer ramus rudimentary. Oral cone generally much produced. Mandibles without any palp, masticatory part slender styliform, extending to the end of the siphon. Maxillæ with both lobes very narrow, the inner one the larger and generally provided with only a single apical seta, outer lobe with 2 such setæ. Both pairs of maxillipeds very fully developed. Natatory legs more or less incurved, with the rami comparatively slender, the inner one in 4th pair more or less reduced, in some cases wholly wanting. Last pair of legs extremely small and rudimentary, being only represented by a minute knob-like joint accompanied outside by the usual seta.

Remarks.—The present family does not quite answer to the sub-family *Dyspontiinæ* of Giesbrecht, in which the 2 preceding genera are also included, as also 2 other genera which I have felt justified in removing, viz., the genera *Artotrogus* and *Dystrogus*. In the restriction thus adopted, the family *Dyspontiidæ* forms a very natural group, comprising a number of genera, which agree pretty well in the more essential characters. In addition to the 5 genera treated of in the following pages, the 2 genera *Pteropontius* and *Sestropontius*, established by Giesbrecht, belong to the present family, which thus at present comprises no less than 7 different genera.

Gen. 28. **Dyspontius**, Thorell, 1859.

Syn: *Gallopontius*, Giesbrecht.

Generic Characters.—Anterior division of body broad and expanded, with the epimeral lappets well marked; those of penultimate segment, however, very small. Tail short, with the genital segment considerably expanded. Anterior antennæ in female generally 9-articulate, with the 2nd joint the largest. Siphon rather strong, with the basal part only slightly dilated. Maxillæ with the lobes not very unequal, the inner one carrying a single apical seta, the outer one 2 such setæ. Maxillipeds moderately slender. Natatory legs with the rami comparatively narrow, terminal joint of outer ramus in 1st pair small, with only 2 spines outside and 2 setæ inside. 4th pair of legs with the outer ramus well developed, inner however wholly absent. Free joint of last pair of legs with only 2 apical bristles.

Remarks.—This genus, the type of the present family, was established in the year 1859 by Thorell, who placed it together with the genus *Ascomyzon* within his family *Ascomyzontidæ*. The genus *Gallopontius*, at first established by Giesbrecht for a Neapolitan species, *G. fringilla*, was subsequently withdrawn by that author and identified with Thorell's genus. In addition to the above-named species another Neapolitan species was described as *D. passer*.

The chief characters of the present genus are found in the form of the siphon, the armature of the terminal joint of the outer ramus in the 1st pair of legs, and the total absence of an inner ramus in the 4th pair. In the last-named character it however agrees with 2 other genera, viz., *Cryptopontius* and *Pteropontius*. To the fauna of Norway belongs only the type species, to be described below.

66. Dyspontius striatus, Thorell.

(Pl. LXX).

Dyspontius striatus, Thorell, Bidrag til kännedomen om Crustaceer, som lefva i arter af slægtet Ascidia, p. 81. Pl. XIV, fig. 22.

Syn: *Gallopontius rotundus*, Giesbrecht.

Specific Characters.—Female. Body pronouncedly depressed, with the anterior division broad and expanded, greatest width almost equalling the length. Cephalic segment very large, occupying rather more than half the total length, postero-lateral corners prominent, frontal part evenly rounded, without any dorsal crest; pleural parts of the segment longitudinally striated. Epimeral lappets of the 2 succeeding segments well developed, those of penultimate segment, however,

very small. Tail scarcely exceeding in length $^1/_3$ of the anterior division; anterior part of genital segment considerably expanded. Caudal rami comparatively short, being only slightly longer than they are broad, outermost seta somewhat remote from the apex, inner mediate one a little longer than the tail. Anterior antennæ about half the length of the cephalic segment, and composed of 9 joints, 2nd joint the longest; terminal joint somewhat exceeding in length the 2 preceding joints combined. Posterior antennæ with the terminal joint about as long as the preceding one; middle apical seta rather slender, the other 2 short. Siphon comparatively strong and gradually tapered distally, extending somewhat beyond the limits of the cephalic segment. Maxillæ with the inner lobe only slightly longer than the outer and rather narrow, apical seta scarcely as long as the lobe; apical setæ of outer lobe rather slender. Anterior maxillipeds with the dactylus very slender and elongated, terminating in a short, slightly curved claw, and armed at some distance from this claw with a small secondary spine. Posterior maxillipeds normal. Natatory legs with the spines of the outer ramus comparatively short, 2nd basal joint in 2nd—4th pairs angularly produced inside; 4th pair with the outer ramus fully as large as in the 2 preceding pairs and armed in a similar manner; of an inner ramus not the slightest rudiment present. Ovisacs globular in form.

Male considerably smaller than female, and having the anterior division of the body less broad. Genital segment greatly swollen, to receive the 2 globular spermatophores. Anterior antennæ composed of 11 joints, and distinctly hinged, the last 2 joints forming together a movable part, which admits of being bent upon the adjoining part of the antenna; 8th joint somewhat dilated, and armed in the middle of the anterior edge with a short spine.

Colour of female generally pale yellowish grey, with a few small reddish spots on the cephalic segment; intestine and its distinctly lobular coeca of a darker yellow hue.

Length of adult female amounting to 1.45 mm., of male to 1.10 mm.

Remarks.—This form was described by Thorell from a solitary female specimen taken by Lilljeborg in the open sea, and was supposed by that author to be, like *Ascomyzon Lilljeborgi*, an internal parasite of Ascidiæ. It has subsequently been recorded in both sexes by several other authors, though in some cases it appears somewhat doubtful, whether the descriptions in reality refer to the present species or to some other nearly-allied form. The form at first recorded by Giesbrecht from the Bay of Naples as *Gallopontius rotundus* has subsequently been identified by that author with the present species. From the

other 2 Neapolitan species, *D fringilla* and *D. passer*, it is at once distinguished by the different form of the cephalic segment and the absence of any frontal crest.

Occurrence.—I have met with this characteristic form in many places of the Norwegian coast, from the Christiania Fjord up to Finmark (Hammerfest). All the specimens have been taken free in the sea among algæ and other marine growths, and there is indeed little probability that this form ever, as supposed by Thorell, has its abode within the branchial cavity of Ascidiæ.

Distribution.—Christineberg (Thorell), British Isles (Brady), coast of France (Canu), Bay of Naples (Giesbrecht).

Gen. 29. **Cryptopontius**, Giesbr., 1899.

Generic Characters.—Anterior division of body less expanded and less depressed than in *Dyspontius*, with the epimeral lappets more densely crowded and curved backwards; those of penultimate segment very small, almost wholly concealed. Tail short, but with unusually long apical setæ. Structure of the 2 pairs of antennæ about as in *Dyspontius*. Oral cone with the basal part conspicuously thickened and terminating in a very slender siphonal tube. Maxillæ with the lobes rather unequal in length and very narrow; apical setæ on both lobes slender. Anterior maxillipeds with the dactylus exceedingly slender and elongated. Posterior maxillipeds normal. Natatory legs with the rami comparatively less slender than in *Dyspontius:* outer ramus of 1st pair without any seta inside the 1st joint, terminal joint well developed, with 3 spines outside and 3 setæ inside. 4th pair of legs without any inner ramus. Last pair of legs exhibiting a rudimentary structure similar to that in *Dyspontius*.

Remarks.—The above generic diagnosis chiefly refers to the species described below, as I am by no means certain that the other 3 species referred by Giesbrecht to this genus are in reality congeneric. The chief differences from *Dyspontius* are found in the general form of the body, the structure of the siphon, and the armature of the outer ramus of the 1st pair of legs.

67. Cryptopontius brevifurcatus, Giesbr.

(Pl. LXXI).

Cryptopontius brevifurcatus. Giesbrecht, Asterocheridæ, p. 109, Pl. 1, fig. 7, Pl. 8, figs. 1—12.

Specific Characters.—Female. Body less expanded than in most other *Dyspontiidæ*, with the anterior division oblong oval in outline, greatest width

only slightly exceeding half the length. Cephalic segment very large, nearly twice as long as the remainder of the body, and narrowly rounded in front, with no crista dorsally; rostral prominence very small. Epimeral lappets of the 2 succeeding segments rather broad and curved backwards; those of penultimate segment extremely small and conical in form, being almost wholly concealed in the dorsal view of the animal. Tail scarcely exceeding in length $^1/_4$ of the anterior division, genital segment much dilated in its anterior part. Caudal rami very short, being scarcely longer than they are broad, and transversely truncated at the end, outermost seta attached close to the apex and much shorter than the innermost one; inner mediate seta twice as long as the outer, and attaining about half the length of the body. Anterior antennæ of moderate length and composed of 9 joints, the elongate 2nd joint however exhibiting at the base and at the end slight traces of a subdivision; terminal joint somewhat longer than the 2 preceding ones combined. Posterior antennæ with the last 9 joints of about equal size; middle apical seta rather slender and flexuous. Siphon extremely slender, extending almost to the end of the anterior division of the body. Maxillæ with the outer lobe scarcely more than half as long as the inner and having the 2 apical setæ rather unequal in length; apical seta of inner lobe very slender. Anterior maxillipeds with the dactylus much elongated and narrow, secondary spine of moderate size and attached at a short distance from the apical claw. Posterior maxillipeds with the hand densely ciliated outside. 1st pair of legs considerably smaller than the 2 succeeding pairs, but having the terminal joint of the outer ramus well developed; 2nd and 3rd pairs rather strongly built, with the 2nd basal joint lamellarly produced inside; 4th pair with the outer ramus smaller than that of the 2 preceding pairs, but otherwise of a very similar structure, inner ramus wholly absent. Last pair of legs about as in *Dyspontius striatus*.

Male, as usual, smaller than female, and having the anterior division somewhat more depressed. Anterior antennæ composed of only 10 joints, no apical joint being cut off; 8th joint somewhat dilated and exhibiting near the end in front a short dentiform projection.

Body in female of a whitish grey colour, with a faint yellow tinge.

Length of adult female 0.90 mm., of male 0.75 mm.

Remarks.—I cannot doubt that the above-described form is identical with Giesbrecht's species, though there are some few points of discrepancy. It is an easily recognizable species, differing conspicuously from the other *Dyspontiidæ* in the general form of the body, especially as regards the female.

Occurrence.—The only place, where I have met with this form, is at Korshavn, south coast of Norway. It occurred here occasionally on a sandy bottom, at a depth of about 40 fathoms.

Distribution.—Bay of Naples (Giesbrecht).

Gen. 30. **Arctopontius,** G. O. Sars, n.

Generic Characters.—Anterior division of body greatly expanded, with the cephalic segment exceedingly large and prominent at the postero-lateral corners; epimeral lappets of the 3 succeeding segments well developed and produced laterally. Tail comparatively short, with the genital segment unusually broad, being expanded on each side in a somewhat similar manner to that in the trunk-segments. Anterior antennæ comparatively short, 8-articulate (*in female*). Posterior antennæ very small, but of the usual structure. Siphon resembling in structure that in *Dyspontius*, but less produced. Maxillæ with the lobes rather unequal in size. Both pairs of maxillipeds, but especially the anterior ones, very strongly built. 1st pair of natatory legs with the terminal joint of the outer ramus carrying inside 3 setæ and outside only 2 spines; 4th pair with the outer ramus normally developed, inner very small, biarticulate. Last pair of legs still more rudimentary than in the 2 preceding genera.

Remarks.—This new genus differs from the 2 preceding ones in the very broad and flattened form of the body, the comparatively short antennæ, the very powerfully developed maxillipeds, and, finally in the presence on the 4th pair of legs of a distinct, though rather imperfectly developed inner ramus. It comprises as yet only a single species, to be described below.

68. Arctopontius expansus, G. O. Sars, n. sp.
(Pl. LXXII).

Specific Characters.—*Female.* Body very broad and pronouncedly depressed, with the anterior division almost as broad as it is long. Cephalic segment occupying more than half the total length, postero-lateral corners considerably projecting, free edges evenly curved, front narrowly rounded, without any dorsal crest; rostrum of the usual short linguiform-shape. Epimeral lappets of the 3 succeeding segments rather produced; those of penultimate segment resembling in shape the preceding ones, though somewhat smaller. Tail scarcely exceeding

in length $^1/_3$ of the anterior division; genital segment remarkably dilated in its anterior part, forming on each side a large wing-like expansion somewhat similar in shape to the epimeral lappets of the trunk-segments. Caudal rami short, being scarcely longer than they are broad; outermost seta at some distance from the apex and about the length of the innermost, the 2 median setæ not much prolonged. Anterior antennæ not nearly attaining half the length of the cephalic segment, and composed of only 8 joints, the 2nd much the longest, terminal joint scarcely longer than the 2 preceding joints combined. Posterior antennæ very small, with the terminal joint somewhat longer than the penultimate one, middle apical seta not much prolonged. Siphon rather coarse, extending about midway between the insertion of the posterior maxillipeds and that of 1st pair of legs. Maxillæ with the inner lobe almost twice as long as the outer and narrowly exserted distally, apical seta comparatively short, those of the outer lobe subequal in length. Anterior maxillipeds remarkably powerful, with the dactylus exceedingly strong and hamiformly curved at the tip, secondary spine very small. Posterior maxillipeds likewise rather strongly built, and having the terminal claw of the dactylus densely clothed with small denticles. 1st pair of legs, as usual, somewhat smaller than the 2 succeeding ones, which are rather strongly built, with the 2nd basal joint triangularly produced inside. 4th pair of legs with the outer ramus normal, inner ramus, however, very imperfectly developed, forming a small incurved stem composed of only 2 subequal joints, each carrying a single short seta. Free joint of last pair of leg extremely minute and apparently only provided with a single small bristle.

Colour not yet ascertained.

Length of adult female about 2 mm.

Male unknown.

Remarks.—This form may be readily recognised from the other members of the present family by its very broad depressed body, and the greatly expanded genital segment. Only the female sex is as yet known.

Occurrence.—Only 2 female specimens of this form have hitherto come under my notice. They were taken, many years ago, at Hammerfest, western Finmark, from a depth of about 20 fathoms.

Gen. 31. **Bradypontius**, Giesbr., 1895.

Syn: *Artotrogus*, Brady (part).

Generic Characters.—Anterior division of body more or less expanded, with the cephalic segment large and considerably produced at the postero-lateral corners; epimeral lappets of the trunk-segments well defined and successively diminishing in size behind. Tail somewhat more produced than in the 3 preceding genera, with the genital segment moderately dilated. Anterior antennæ more or less slender, and composed of a somewhat varying number of joints in the different species. Posterior antennæ of the usual structure. Siphon comparatively slender, with the basal part somewhat thickened. Maxillæ with the lobes more or less unequal. Maxillipeds comparatively slender. Natatory legs rather strongly built; terminal joint of outer ramus in 1st pair with 3 spines outside and 3 setæ inside; 4th pair with the inner ramus distinctly 3-articulate, though in most cases rather feebly developed, with some of the setæ reduced. Last pair of legs somewhat less rudimentary than in the preceding genera, the free joint being provided with 3 bristles, 2 apical and one lateral.

Remarks.—The chief character by which this genus is distinguished, as compared with the 3 preceding ones, is the presence on the 4th pair of legs of a distinctly 3-articulate inner ramus, which however in most cases is rather feebly developed. Otherwise it exhibits on the whole a rather close relationship to the typical genus *Dyspontius*. 4 species referable to the present genus will be described below, and a 5th species has been recorded by Giesbrecht from the Bay of Naples under the name of *B. siphonatus*.

69. Bradypontius magniceps (Brady).

(Pl. LXXIII).

Artotrogus magniceps, Brady, Monograph of British Copepoda, Vol. III, p. 61, Pl. XCIII, figs. 1—9.

Syn: *Artotrogus orbicularis*, Brady & Roberts. (not Boeck).
„ ? — *Normanni*, Canu (not Brady).
„ ? *Bradypontius Canui*, Giesbrecht.

Specific Characters.—Female. General form of body somewhat similar to that in *Dyspontius striatus*, the anterior division being rather expanded, with the greatest width almost equalling the length. Cephalic segment very large, occupying about half the total length, and having the free edges evenly arched, postero-lateral corners rather produced, frontal part rounded, without any dorsal crest. Epimeral lappets of the 3 succeeding segments well defined and pointing obliquely backwards; those of penultimate segment of same shape as the preceding ones, though

somewhat smaller. Tail not attaining half the length of the anterior division; genital segment moderately dilated in its anterior part; anal segment exceeding in length the 2 preceding ones combined. Caudal rami rather produced, being more than twice as long as they are broad, and fully attaining the length of the anal segment; outermost seta not far from the apex and somewhat shorter than the innermost; the 2 middle setæ of moderate length. Anterior antennæ about half the length of the cephalic segment, and composed of 8 (or 9) joints, the 2nd being much the largest; terminal joint almost the length of the 2 preceding ones combined. Posterior antennæ with the terminal joint longer than the penultimate one, middle apical seta of moderate length, the other 2 very small. Siphon rather slender, extending beyond the limits of the cephalic segment. Mandibles narrow styliform, and distinctly denticulated at the apex. Maxillæ with the lobes comparatively narrow and somewhat unequal in length, apical seta of the inner one quite short, those of the outer slender and subequal. Maxillipeds well developed, dactylus of the anterior ones moderately slender, with a small secondary spine at some distance from the end; terminal claw comparatively short. 1st pair of natatory legs not much smaller than the 2 succeeding ones, seta at the inner corner of the 1st basal joint conspicuously thickened. 4th pair of legs with the inner ramus much narrower than the outer and only slightly exceeding in length the 2 first joints of this ramus combined, setæ present in the usual number, but rather reduced in size. Free joint of last pair of legs small, and as in the other species provided with 3 bristles, the innermost one the longest. Ovisacs rather large and globular in form.

Colour not yet ascertained.

Length of adult female 1.80 mm.

Male unknown.

Remarks.—I think I am right in identifying the above-described form with Brady's species, as it agrees fairly well in its outward appearance with the figure given by that author. The apparent differences found in some of the structural details may indeed be due to a less careful examination by the said author. It appears to me somewhat more doubtful, if the form described by Canu as *Artotrogus Normani*, and subsequently named by Giesbrecht *Bradyponlius Canui*, is in reality identical with the present species, as set forth by the last-named author in his Monograph of the *Asterocheridæ;* and the form briefly described and figured by Giesbrecht in the same Monograph as *B. magniceps*, also seems to differ in some respects.

The present species was at first erroneously identified by Brady and Robertson with *Artotrogus orbicularis* Boeck; and though this mistake was sub-

sequently corrected, it was still referred by Brady in his Monograph to Boeck's genus, which in reality is so very different, that in my opinion it cannot even be included in the present family.

Occurrence.—Only a few female specimens of this form have hitherto come under my notice. They were taken free in the sea in two widely-distant localities, viz., at Aalesund, west coast of Norway, and at Hammerfest, western Finmark.

Distribution.—British Isles (Brady), ? coast of France (Canu).

70. Bradypontius papillatus (Scott).

(Pl. LXXIV).

Artotrogus papillatus, Scott, Sixth Annual Report of the Fishery Board for Scotland, Appendix, p. 232, Pl. VIII, figs. 7—12.

Syn: *Bradypontius chelifer*, Giesbr.

Specific Characters.—Female. Anterior division of body rather broad in its posterior part, greatest width however not quite equalling the length. Cephalic segment very large, occupying more than half the total length, and gradually contracted anteriorly, postero-lateral corners very prominent, frontal part narrowly produced, with a very distinct crest running along its dorsal face; rostral projection well marked, incurved. Epimeral lappets of the 2 succeeding segments well developed and considerably divergent; those of penultimate segment, however, rather small and conically pointed. Tail only slightly exceeding in length $^1/_3$ of the anterior division; genital segment moderately dilated in front; anal segment not attaining the length of the 2 preceding ones combined. Caudal rami about twice as long as they are broad, and equal in length to the anal segment; outermost seta at some distance from the apex, and shorter than the innermost; the 2 middle setæ of moderate size. Anterior antennæ about half the length of the cephalic segment, and composed of 9 joints, 2nd joint the largest, terminal joint exceeding in length the 2 preceding joints combined. Posterior antennæ resembling in structure those in *B. magniceps*, except that the outermost apical seta is comparatively longer. Siphon scarcely extending beyond the insertion of the 1st pair of legs. Maxillæ with the lobes less slender than in *B. magniceps*, apical seta of the inner one short, those of outer lobe very coarse, spiniform, and finely denticulated. Anterior maxillipeds with the dactylus rather strong and provided at some distance from the end with 2 small thumb-like prominences, against which the curved terminal claw may admit of being impinged; secondary spine very small and placed outside the said prominences. Posterior maxillipeds normal. Natatory legs resembling in structure those in *B. magniceps*, except that the inner

ramus in 4th pair is much smaller, scarcely attaining the length of the 2 first joints of the outer one combined, and very narrow, with some of the setæ aborted. Last pair of legs about as in the preceding species.

Colour dark yellow or orange.

Length of adult female amounting to 1.60 mm.

Remarks.—I cannot doubt that the above-described form is that originally recorded by Scott as *Artotrogus papillatus*, and that Giesbrecht's *Bradypontius chelifer* is the same species. It is true, that the number of joints in the anterior antennæ is indicated by both these authors to be only 8, and that the terminal part of the dactylus in the anterior maxillipeds is represented much shorter and thicker than in the specimen examined by me; but these apparent differences are in all probability due to the circumstance that the specimens examined by those authors had not arrived at full maturity, as proved by their much inferior size (1.15—1.20 mm.). In all other respects the agreement seems to be perfect. From the type species, *B. magniceps*, the present one is easily distinguished by the rather different form of the cephalic segment and of the epimeral lappets, as also by the comparatively shorter caudal rami. The very feeble development of the inner ramus on the 4th pair of legs forms another rather characteristic specific mark.

Occurrence.—Some few female specimens of this form were collected, many years ago, in 2 localities on the west coast of Norway, viz., at Aalesund and Eggesbønæs. The specimens were taken free in the sea, at depths ranging from 20 to 40 fathoms.

Distribution.—British Isles (Scott), Bay of Naples (Giesbrecht).

71. Bradypontius major, G. O. Sars, n. sp.

(Pl. LXXV).

Specific Characters.—Female. General form of body somewhat similar to that in *B. papillatus*, the cephalic segment being very large and gradually contracted anteriorly, with a well-marked dorsal crest running along its frontal part. Epimeral lappets of the 3 succeeding segments more closely crowded together and less unequal than in the said species; those of penultimate segment well developed, though somewhat narrower than the others. Tail comparatively short, only slightly exceeding in length $^1/_3$ of the anterior division; genital segment considerably dilated in its anterior part; anal segment equalling in length the 2 preceding ones combined. Caudal rami scarcely twice as long as they are broad, and shorter than the anal segment, apical setæ about as in the preceding species. Anterior antennæ not very elongated, but composed (in the specimen examined) of no less

than 13 well-defined joints, a short joint being divided off from the elongated 2nd joint both at the base and at the end, and moreover each of the 2 joints preceding the terminal one being distinctly subdivided; terminal joint about the length of these 4 joints combined. Posterior antennæ a little more slender than in *B. papillatus*, but otherwise of a very similar structure. Siphon rather produced, extending considerably beyond the limits of the cephalic segment. Mandibles very slender and distinctly denticulated at the tip. Maxillæ with the lobes narrow and rather unequal in length; apical seta of the inner one much produced, those of the outer rather slender. Anterior maxillipeds with the dactylus much more slender than in *B. papillatus*, with only a single small thumb-like process rather far from the apex, secondary spine well marked. Natatory legs with the rami comparatively less slender than in that species; inner ramus of 4th pair more fully developed, exceeding in length the first 2 joints of the outer one combined. Free joint of last pair of legs a little larger than in *B. papillatus*.

Male considerably smaller than female, and having the anterior division less expanded. Anterior antennæ, as in female, composed of 13 joints, 6th and 7th joints very short and less sharply defined, 10th joint conspicuously dilated and armed anteriorly with 2 slender spines, movable terminal part distinctly biarticulate. Inner ramus of 4th pair of legs comparatively longer than in female, terminal joint produced at the outer distal corner to an outward-curving dentiform projection, outer apical seta, as also that of the outer edge replaced by a short club-like spine.

Body in female of a dark yellowish grey colour, and ornamented on the dorsal face with a reddish branching pigment.

Length of adult female amounting to 2.40 mm., of male to 1.95 mm.

Remarks.—This form is closely allied to *B. papillatus*, but of much larger size, and moreover differs conspicuously in the shape of the epimeral lappets of the trunk-segments, as also in some of the structural details, as indicated in the above diagnosis.

Occurrence.—Solitary specimens of this large species have been taken at Aalesund, west coast of Norway, and in the Trondhjem Fjord, at Rødbjerget, in both localities from considerable depths.

72. Bradypontius caudatus, G. O. Sars, n. sp.

(Pl. LXXVI).

Specific Characters.—Female. Body comparatively more slender than in the other species, with the anterior division moderately expanded. Cephalic

segment large, though scarcely occupying half the total length, and only slightly contracted anteriorly, frontal crest only faintly indicated, postero-lateral corners of the segment fairly prominent. Epimeral lappets of the 3 succeeding segments moderately produced; those of penultimate segment rather smaller than the preceding ones. Tail comparatively more produced than in the other species, attaining nearly half the length of the anterior division; genital segment not much expanded in its anterior part; anal segment scarcely as long as the 2 preceding ones combined. Caudal rami about twice as long as they are broad, and slightly dilated in the middle; outermost seta rather far from the apex and much shorter than the innermost, the 2 middle setæ of moderate length. Anterior antennæ unusually slender and elongated, considerably exceeding half the length of the cephalic segment, and composed of 12 well-defined joints, the last of which is the longest. Posterior antennæ likewise rather slender, with the terminal joint nearly twice as long as the penultimate one. Siphon moderately produced, extending about to the insertion of the 1st pair of legs. Maxillæ with the lobes not very unequal; apical seta of the inner one quite short, those of the outer very coarse, spiniform and densely spinulose. Maxillipeds resembling in structure those in *B. major*, the dactylus of the anterior ones being very slender, with only a single small thumb-like process at some distance from the end, terminal claw much curved, secondary spine small. Natatory legs rather strongly built, with the exterior edge of the outer ramus coarsely serrate; inner ramus of 4th pair not much shorter than the outer, but rather narrower. Free joint of last pair of legs somewhat more produced than in the other species.

Colour reddish brown.

Length of adult female reaching to 2.90 mm.

Male unknown.[1])

Remarks.—This form grows to a still larger size than *B. major*, and is indeed the largest of all the siphonostomous Cyclopoida with which I am acquainted. It moreover exhibits several well-marked differences from the other species, both as to its outward appearance and the structural details. The specific name alludes to the unusually produced tail.

Occurrence.—2 female specimens only of this form have come under my notice. They were taken, many years ago, at Tjøtø on the Nordland coast, from the considerable depth of 150 fathoms

[1]) It may be, however, that the male specimen mentioned above as belonging to *B. major*, should more properly be referred to the present species, though it was found in company with the former. Indeed, on a closer examination, I have found that the caudal rami in that specimen, as also the mutual relations of the joints in the inner ramus of the 4th pair of legs, agree better with the present species.

Gen. 32. **Cribropontius**, Giesbr. 1899.

Syn: *Artotrogus*, Brady (part).

Generic Characters.—Body robust, with strongly chitinised integuments, and with some of the epimeral lappets very prominent. Tail somewhat produced and having the genital segment in female less expanded than in the other genera. Caudal rami lamellar, with comparatively short apical setæ. Anterior antennæ comparatively stout and scarcely at all attenuated distally. Posterior antennæ with the terminal joint comparatively short. Siphon rather strong and not much produced. Maxillæ with the lobes very unequal in size and each provided with 2 slender apical setæ. Both pairs of maxillipeds, but especially the posterior ones, very powerfully developed. Natatory legs on the whole agreeing in structure with those in *Bradypontius:* inner ramus of 4th pair, as in that genus, distinctly 3-articulate. Last pair of legs somewhat more fully developed than in the other *Dyspontiidæ*.

Remarks.—This genus, established by Giesbrecht, is allied to *Bradypontius*, agreeing with it in the presence of a distinctly 3-articulate inner ramus on the 4th pair of legs. It differs however in some points rather conspicuously, both as regards the outward appearance and some of the structural details, and therefore ought evidently to be supported. We do not know at present more than a single species, to be described below.

73. Cribropontius Normani, (Brady).

(Pl. LXXVII).

Artotrogus Normani, Brady, Monograph of British Copepoda, Vol. III, p. 63, Pl. XCI, figs. 12—15, Pl. XCII, fig. 14, Pl. XCIII, fig. 10.

Syn: *Dyspontius Normani*, Brady & Roberts.
" *Bradypontius Normani*, Giesbrecht.

Specific Characters.—Female. Anterior division of body moderately expanded and somewhat depressed, with the greatest width slightly exceeding $^2/_3$ of the length. Cephalic segment large, though not occupying quite half the total length, free edge evenly curved, frontal part rounded, without any dorsal crest, postero-lateral corners divided into 2 short lappets; rostral projection well defined, incurved. Epimeral lappets of the 3 succeeding segments rather unequal, those of antepenultimate trunk-segment much the largest, and greatly projecting to each side; those of penultimate segment well developed, though smaller than the 2 preceding pairs. Tail attaining nearly half the length of the anterior division; genital segment gradually somewhat dilated anteriorly; anal segment about the

length of the 2 preceding ones combined, and conspicuously widening distally. Caudal rami rather broad, and somewhat shorter than the anal segment, with the inner edge finely ciliated, outer edge exhibiting, at some distance from the end, a distinct ledge, to which the outermost seta and the very small accompanying dorsal bristle are attached; apical setæ comparatively short, but rather coarse and densely ciliated. Anterior antennæ not nearly attaining half the length of the cephalic segment, and composed of 9 joints rather densely clothed with short, but rather coarse, curved setæ, 3rd joint much the largest, terminal joint club-shaped and about the length of the 2 preceding joints combined. Posterior antennæ with the terminal joint shorter than the penultimate one, apical setæ spiniform, the middle one, as usual, the longest. Siphon extending about midway between the insertion of the posterior maxillipeds and that of 1st pair of legs. Mandibles minutely denticulated at the apex. Maxillæ with the outer lobe scarcely half as long as the inner, apical setæ on both lobes very slender and curved. Anterior maxillipeds with the dactylus very strong and evenly curved in its distal part, terminating in a blunt point; secondary spine of moderate size. Posterior maxillipeds still more powerful than the anterior ones, with the dactylus exceedingly strongly built, its proximal joints being unusually stout, with the spines issuing inside very coarse, terminal claw occupying rather more than half the length of the dactylus. Natatory legs well developed, with the rami comparatively broad; inner ramus of 4th pair, however, considerably narrower than the outer and also somewhat shorter. Free joint of last pair of legs slightly produced, oblong quadrangular in form, and carrying at the tip one long and 2 short bristles. Ovisacs of moderate size and globular in shape.

Body of a light yellowish grey colour and ornamented with a number of very conspicuous brick-red patches, 2 median, the one occupying the front part of the cephalic segment, the other the dorsal face of the 3 succeeding segments, and 3 lateral on each side, the 2 anterior pairs occurring on the cephalic segment, the posterior pair on the projecting epimeral lappets of the 3rd segment; ova in the ovisacs of a yellowish red colour.

Length of adult female amounting to 1.70 mm

Remarks.—This form was at first recorded by Brady and Robertson as a species of the genus *Dyspontius*, and was subsequently by the first-named author erroneously referred to the genus *Artotrogus* of Boeck. This mistake was corrected by Giesbrecht, who found it to agree much better with the genus *Bradypontius*, to which it was indeed at first referred by that author. After having examined more closely a specimen sent to him by Scott, he felt however justified in excluding it also from this genus as the type of a new nearly-

allied genus. The present form is indeed, easily distinguishable from any of the species of that genus, and is, moreover, in the living state at once recognised by its peculiar colour, which has also been mentioned by Scott.

Occurrence.—I have met with this handsome form occasionally in 2 or 3 places on the west coast of Norway in depths ranging from 20 to 50 fathoms.

Distribution.—British Isles (Brady), Madeira (Thompson).

Fam. 8. Artotrogidæ.

Characters.—Body very broad, more or less clypeiform, with the 2 posterior trunk-segments imperfectly developed. Tail quite short, and composed in female of 4, in male of 5 segments. Antennæ and oral parts on the whole built on the same type as in the *Dyspontiidæ*. Only 3 pairs of natatory legs present, the 4th pair being wholly absent Last pair of legs not defined from the corresponding segment. Ovisacs in female more or less concealed beneath the body.

Remarks.—This family, as here defined, does not answer at all to the family *Artotrogidæ* of Brady, which, like the family *Asterocheridæ* of Giesbrecht, was established to include all the siphonostomous Cyclopoida. In the restriction here adopted, this family only comprises 2 genera, viz., *Artotrogus* Boeck and *Dystrogus* Giesbrecht, both of which agree in one very essential character, viz., in the total absence of the 4th pair of legs, in this respect exhibiting an approach to the next family, the *Cancerillidæ*. The exact comparison of these 2 genera is rendered somewhat difficult by the circumstance that of the one *(Artotrogus)* we only know the female sex, of the other *(Dystrogus)* only the male sex. It is evident, however, that they represent two distinct generic types.

Gen. 33. Artotrogus, Boeck, 1859.

Generic Characters.—Body greatly expanded, rounded in form, with the epimeral lappets of the cephalic segment and the 2 anterior trunk-segments well developed, imbricate. The last 2 trunk-segments almost wholly concealed, with no epimeral lappets. Tail very short, projecting only slightly beyond the anterior

division; genital segment (in female) with a lamellar, posteriorly-pointing expansion on each side. Caudal rami short. Anterior antennæ comparatively small and resembling in structure those in the *Dyspontiidæ*. Posterior antennæ still smaller, 4-articulate, with the outer ramus rudimentary. Siphon well developed and rather coarse, gradually tapered distally. Mandibles without any palp. Maxillæ with the lobes rather unequal in size. Both pairs of maxillipeds powerfully developed. Natatory legs strongly incurved, with the rami subequal in length, and on the whole built on the same type as in the *Dyspontiidæ*, except that the 4th pair is wholly wanting.

Remarks.—This genus was established as early as the year 1859 by Boeck, to include a peculiar Copepod found by him on the south coast of Norway. As only a solitary specimen was observed by that author, the generic characters were not made out satisfactorily, and several errors were indeed introduced, which however have partly been corrected by subsequent authors. The genus comprises as yet only a single species, to be described below.

74. Artotrogus orbicularis, Boeck.

(Pl. LXXVIII).

Artotrogus orbicularis, Boeck. Tvende nye parasitiske Krebsdyr: Chr. Vid. Selsk. Forhandl. f. 1859, p. 171, Pl. I, figs. 1—10.

Specific Characters.—Female. Body pronouncedly clypeiform, and nearly orbicular in outline, with the dorsal face evenly vaulted, the ventral flattened or concaved. Cephalic segment very large, occupying rather more than half the total length, and having the free edges evenly arched; postero-lateral corners triangularly produced and curved backwards; frontal part scarcely prominent and without any dorsal crest; rostral prominence imperfectly defined and blunted at the end. Epimeral lappets of the 2 succeeding segments large and recurved. Tail extremely short, being almost wholly received within the deep emargination formed behind between the epimeral lappets of the 2nd free trunk-segment; genital segment sub-quadrate in form, and produced on each side behind to a narrow lamella flanking the 2 succeeding very short segments; anal segment larger than those segments combined and somewhat widening distally. Caudal rami scarcely longer than they are broad, and rather wide apart, outermost seta at some distance from the end and about the length of the innermost; the 2 middle setæ not much produced. Anterior antennæ scarcely attaining in length $^1/_3$ of the cephalic segment, and composed of 9 joints clothed with moderately long setæ, 1st and 3rd joints the longest; terminal joint club-shaped and about the length of the 2 preceding ones combined; the æsthetask, attached to this

joint, at some distance from the end, of moderate length. Posterior antennæ with the outer ramus very small and provided with only a single minute bristle; terminal joint longer than the penultimate one and somewhat curved in its outer part, seta of outer edge attached at a short distance from the end. Siphon extending only slightly beyond the insertion of the posterior maxillipeds. Maxillæ with the outer lobe scarcely half as long as the inner; apical setæ of both lobes rather slender. Anterior maxillipeds with the dactylus exceedingly strong and hamiformly curved at the end; secondary spine small. Posterior maxillipeds more normally developed, terminal claw of the dactylus occupying about half its length, and finely denticulate inside. 1st pair of natatory legs somewhat smaller than the 2 succeeding ones, and having the terminal joint of outer ramus of moderate size and provided outside with 3 spines and inside with 3 setæ. Inner ramus of 3rd pair differing from that of 2nd pair in the absence of the usual apical spine. Not even the slightest rudiment of a 4th pair present. Last pair of legs only represented by 3 small bristles, all issuing immediately from the sides of the corresponding segment. Lateral cœca of intestine very fully developed, extending along the sides of the cephalic segment and also penetrating into the adjacent part of the trunk, being divided outside into numerous narrow lobules. Ovisacs globular in form and wholly concealed beneath the posterior part of the trunk.

Body of a light yellowish brown colour, with the intestine and its lateral cœca of a darker hue; ova in the ovisacs orange-coloured.

Length of adult female about 2 mm.

Male (at least in its adult state) unknown.[1])

Remarks.—The present Copepod cannot be confounded with any of the other siphonostomous Cyclopoida, being clearly distinguished by the pronouncedly clypeiform shape of the body and its nearly circular form. It is however not improbable that the hitherto unknown female of *Dystrogus* will be found to approach nearer to *Artotrogus* in the general form of the body than does the male.

Occurrence.—This peculiar form was observed by my late father at a very early period, at Manger, north of Bergen, where several specimens were taken by him from nudibranchiate Mollusca. The specimen described by Boeck was found by him on a species of *Doris* taken at Farsund, south coast of Norway. I have myself met with this form in two widely distant localities of the Norwegian coast, viz., at Kleven, near Mandal, and at Hasvig, western Finmark. In both

[1]) It is very questionable if the specimen described by Scott as the male of the present form was in reality of that sex, and I think that Giesbrecht was right in believing it to be quite an immature form, in which the sexual characters had not yet appeared.

localities the specimens were taken in the free state among algæ and other marine growths.

Distribution.—British Isles (Scott), Kara Sea (Hansen), Ceylon (A. Scott).

Fam. 9. Cancerillidæ.

Characters.—Body of rather different shape in the different genera, but scarcely clypeiform. The 2 or 3 posterior trunk-segments imperfectly developed, without any epimeral plates. Tail short or moderately produced, with a somewhat varying number of segments. Anterior antennæ normal. Posterior antennæ, however, very unlike those in the preceding families, being transformed into strong prehensile organs terminating in a powerful curved claw. Siphon imperfectly developed, in some cases obsolete. Mandibles short, mucroniform, extending straight inwards, palp absent Maxillæ likewise incurved and terminating in one or 2 setiferous lobes. Maxillipeds on the whole built in the usual manner; though attached at a somewhat greater distance from the median line than in the other families. Some of the posterior pairs of legs imperfectly developed or quite wanting, this imperfect development in some cases even extending to all the legs (in female).

Remarks.—This family answers to the subfamily *Cancerillinæ* of Giesbrecht, and contains as yet only 2 genera, to be treated of below. These genera, it is true, differ considerably, both as to the outward appearance of the body and to some of the structural details, but yet exhibit some well-marked features in common, the most essential of which are the prehensile character of the posterior antennæ, and the imperfect development of the siphon and of some of the legs.

Gen. 34. **Parartotrogus**, Scott. 1893.

Generic Characters.—General form of body not deviating much from the usual type, the anterior division being moderately dilated and somewhat flattened. Cephalic segment more or less expanded in the middle, with the frontal part somewhat produced, but without any true rostrum; postero-lateral corners not produced. The 2 succeeding segments well developed, with rounded epimeral

plates; the 2 posterior trunk-segments, however, very small and not produced at all laterally. Tail normally developed, and composed in female of 4, in male of 5 segments. Caudal rami comparatively small. Anterior antennæ resembling in structure those in *Artotrogus*, though somewhat coarser; those in male (according to Scott) distinctly hinged, but without supplementary æsthetasks. Posterior antennæ very powerfully developed and strongly clawed at the end, outer ramus present as a delicate setiferous lamella. Siphon obsolete, the 2 lips being scarcely at all produced. Mandibles terminating in a simple point. Maxillæ with 2 very unequal lobes. Maxillipeds comparatively slender, and of quite normal structure. Only 3 pairs of natatory legs present, 1st pair with both rami only composed of 2 joints. 4th pair of legs wanting, or only present as a very slight rudiment. Last pair of legs represented by a small bisetose joint accompanied outside by the usual bristle.

Remarks.—This genus was established in the year 1893 by Scott, to include a peculiar Copepod, *P. Richardi*, found by him on the Scottish coast; and subsequently also observed by Giesbrecht. The generic name proposed by Scott is somewhat inappropriate, as the affinity of this genus to *Artotrogus* is a very remote one. The genus comprises as yet 2 nearly-allied species, one of which will be described below.

75. Parartotrogus arcticus, Scott.

(Pl. LXXIX).

Parartotrogus Richardi, var. *arctica*. Scott, On some Entomostraca collected in the Arctic Seas; Ann. Mag. Nat. Hist., Ser. 7. Vol. VIII, p. 352, Pl. VI.

Specific Characters.—Female. Body comparatively more slender than in the type species, with the anterior division less dilated, and oval in outline. Cephalic segment very large, occupying about half the total length, but not nearly so much expanded in the middle as in *P. Richardi*, the lateral edges being evenly arcuate; frontal part conspicuously exserted and broadly truncated at the end. Epimeral plates of the 2 succeeding segments well defined and rounded at the end. The last 2 trunk-segments abruptly much narrower and subequal in size. Tail about equalling in length half the anterior division; genital segment fully as long as the 3 succeeding segments combined, and gradually widening anteriorly, forming on each side in front a somewhat projecting angle; anal segment longer than the preceding one. Caudal rami somewhat longer than they are broad and rather far apart, apical setæ comparatively short, the inner mediate one scarcely exceeding half the length of the tail. Anterior antennæ not quite attaining half the length of the cephalic segment, and somewhat bent at the base,

being composed of 9 joints rather densely clothed with short curved setæ; 2nd joint the largest and rather broad at the base; terminal joint nearly as long as the 2 preceding ones combined, and carrying at some distance from the end the usual æsthetask. Posterior antennæ exceedingly powerful and exhibiting a somewhat sigmoid curvature, penultimate joint much the largest, terminal joint short and thick, carrying on the end a very strong curved claw accompanied inside by another much smaller claw; outer ramus forming a narrow, lancet-shaped lamella attached near the end of the 2nd (basal) joint, and provided with 3 small bristles. Mandibles comparatively short, and terminating in a simple point. Maxillæ with the outer lobe very small and provided at the tip with 3 comparatively short subequal setæ; inner lobe widening considerably distally, spatulate in form, and carrying on the transversely truncated extremity 3 ciliated spines and 2 abruptly recurved slender and densely ciliated setæ. Anterior maxillipeds with the dactylus rather slender, biarticulate, and provided beyond the middle with a small secondary spine, tip sharply pointed. Posterior maxillipeds with the hand somewhat fusiform, and provided at about the middle of the inner edge with a ciliated seta; dactylus slender, triarticulate, with no spine inside the 1st joint, terminal claw occupying about half the length of the dactylus. 1st pair of legs with no seta inside the proximal joint of the outer ramus, distal joint of this ramus with 3 very slender spines outside; distal joint of inner ramus rather large, with 7 setæ, one of which issues from the outer edge. The 2 succeeding pairs of legs with both rami distinctly 3-articulate and rather slender, spines of outer ramus dagger-shaped; inner ramus with the terminal joint produced at the end into 2 dentiform projections, between which in the 2nd pair 2 subequal setæ are affixed, in the 3rd pair only a single dagger-like spine; number of setæ on the inner ramus of the latter pair somewhat reduced, the middle joint having only a single seta and the terminal joint 2 setæ inside. 4th pair of legs present as a small bisetose joint attached to each side of the corresponding segment and accompanied outside by a small bristle. Free joint of last pair of legs of somewhat larger size and provided with 3 setæ, 2 apical and one lateral.

Male (according to Scott) very like the female in its outward appearance, but of smaller size.

Colour in female pale yellow, with darker translucent ovarial tubes and with some slight ochraceous pigmentary patches on each side of the cephalic segment and trunk; eye bright red and occurring unusually far back.

Length of adult female 0.80 mm.

Remarks.—This form is closely allied to the type species, *P. Richardi* Scott, and was indeed regarded by that author as merely a variety of this species.

It ought, evidently however, in my opinion to be considered as specifically distinct, as it differs conspicuously not only in the more slender form of the body and the far less expanded cephalic segment, but also in some of the structural details. Thus the inner ramus of the 3rd pair of legs is distinctly 3-articulate, whereas in the type species it is composed of only 2 joints; and the 4th pair of legs, which in *P. Richardi* is wholly absent, is represented by a well-marked, though very small rudiment. Finally, the distal joint of the inner ramus in the 1st pair of legs has 2 setæ more than in *P. Richardi*.

Occurrence.—Two or three female specimens of this form were collected, many years ago, at Kvalø, on the Nordland coast, from a depth of 40—50 fathoms.

Distribution.—Arctic Sea, off Spitsbergen and Novaja Zemlia (Scott).

Gen. 35. **Cancerilla**, Dalyell, 1851.

Syn: *Caligidium*, Claus (male).

Generic Characters.—Form of body very dissimilar in the two sexes, being exceedingly short and stout in female, in male much more slender. Cephalic segment in female greatly inflated, in male sub-depressed; rostral projection in both sexes obsolete. The succeeding segment well marked, with the epimeral parts less distinctly defined in female than in male; the 3 remaining trunk-segments in both sexes imperfectly developed, without any epimeral plates. Tail in female very short and composed of only 3 segments, in male more produced and 5 articulate. Caudal rami smaller in female than in male. Anterior antennæ in female comparatively short, with the number of joints considerably reduced; those in male not at all hinged, but of larger size and composed of a greater number of joints, being moreover provided with numerous recurved sensory filaments. Posterior antennæ in both sexes distinctly prehensile, terminating in a strong claw, outer ramus absent. Siphon faintly indicated by a slight prolongation of the lips, and turned anteriorly. Mandibles with the extremity slightly dilated and indistinctly denticulated. Maxillæ with only a single lobe turned inwards. Both pairs of maxillipeds short and stout, especially in female. 4th pair of legs absent in both sexes. All the remaining legs in female reduced, and unfit for swimming; the 2 anterior pairs in male natatory, 1st pair smaller and less perfectly developed than 2nd, which are quite normal, with both rami 3-articulate. Last pair of legs in both sexes small, uniarticulate.

Remarks.—This genus was established as early as the year 1851 by the English naturalist Dalyell, to include a peculiar parasite found by him on a species of brittle-stars. The systematic position of the genus has long remained very uncertain; but Giesbrecht clearly pointed out its near relationship to the siphonostomous Cyclopoidæ (Asterocheridæ) and particularly to the genus *Parartotrogus* of Scott. I also fully agree with Giesbrecht, that the genus *Caligidium* of Claus ought to be regarded as a synonym, being founded on adult males belonging to this genus.

76. Cancerilla tubulata, Dalyell.

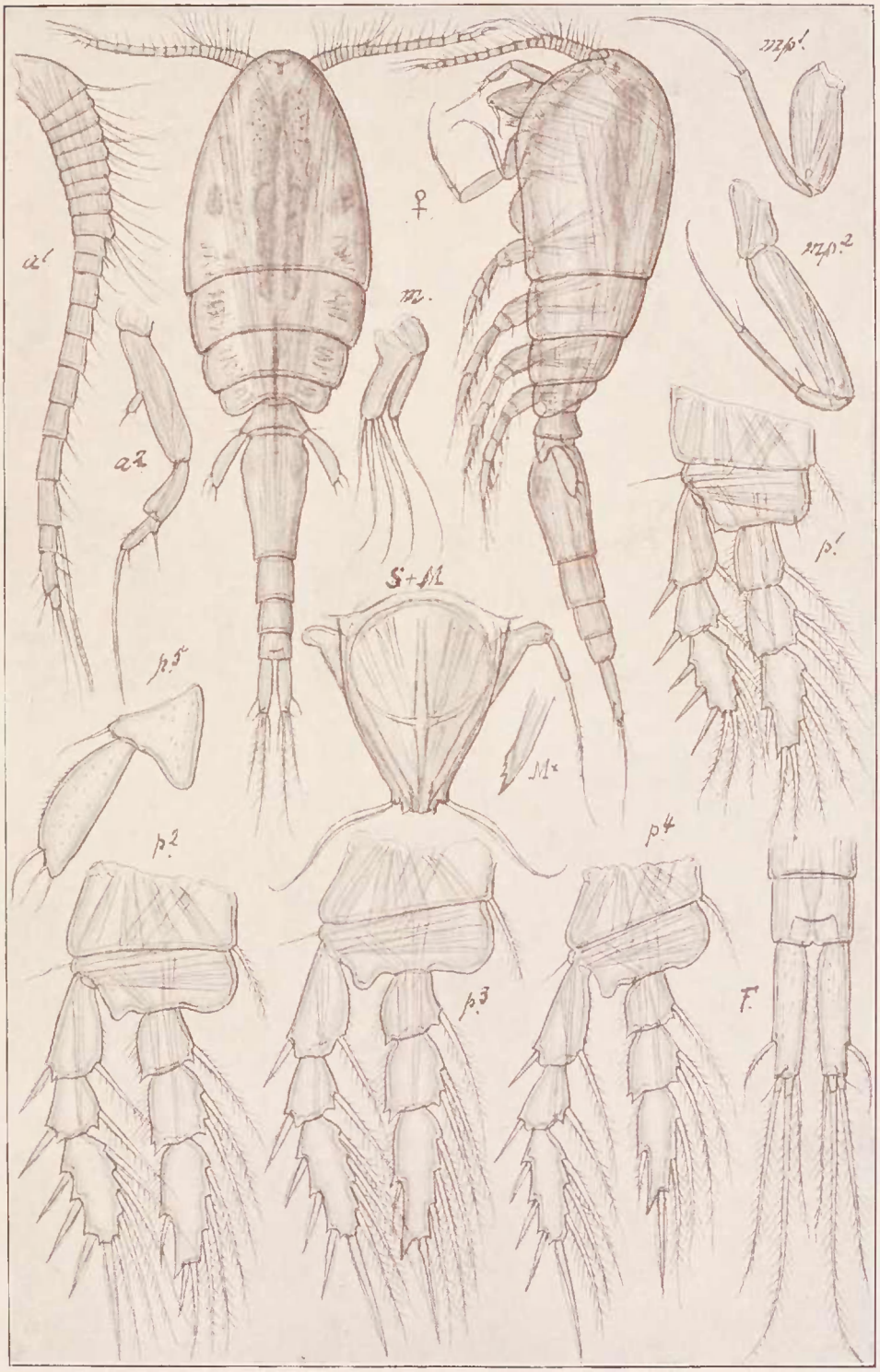
(Pl. LXXX).

Cancerilla tubulata, Dalyell, The powers of the Creator, Vol. 1, p. 233, Pl. LXII, figs. 1—5.
Syn: *Caligidium vagabundum*, Claus. (adult male).

Specific Characters.—Female. Body very short and stout, almost cordiform in shape, with the anterior division greatly inflated, transversely ellipsoid in outline, the width considerably exceeding the length. Cephalic segment occupying by far the greater part of the body, free edges strongly curved and minutely hairy in their anterior part, front very slightly produced. The succeeding segment with the epimeral parts less distinctly defined, forming part of the hind boundary of the anterior division; the remaining trunk-segments imperfectly developed and only visible as narrow stripes. Tail very short, with the genital segment exceedingly dilated, being nearly 3 times as broad as it is long, and projecting behind on each side in an angular corner: anal segment larger than the preceding segment, and somewhat contracted distally. Caudal rami comparatively small and rather far apart, apical setæ short, the inner mediate one being, as usual, the longest. Anterior antennæ comparatively small and composed of only 6 joints clothed with short curved setæ; 1st joint much the largest and rather broad; terminal joint about the length of the 2 preceding ones combined, and carrying near the end a comparatively small æsthetask in addition to the setæ. Posterior antennæ very strong and highly chitinized; 1st joint rather short, the 2 succeeding ones of about equal size, terminal joint somewhat shorter, but conspicuously widening distally, apical claw exceedingly strong and curved. Maxillæ with the terminal lobe oblong in form and provided with 3 spreading non-ciliated setæ of moderate length and accompanied by a small bristle. Both pairs of maxillipeds short and stout, with the dactyli not much produced, but rather coarse. 1st pair of legs consisting each of a thickish basal part carrying outside a small bristle, and 2 uniarticulate rami, the outer one lamelliform and edged with 6 comparatively short simple setæ, one inside, 2 at the tip, and 3 outside;

inner ramus very small, cylindric in form, and carrying 2 minute setæ on the tip. 2nd pair of legs much smaller than the 1st and farther from the median line, basal part less perfectly defined, though carrying outside the usual bristle; outer ramus represented by a narrow oblong joint edged outside with 6 very minute and somewhat unequal bristles; inner ramus reduced to a minute conical process. 3rd pair of legs extremely small and rudimentary, being only represented by a minute bisetose joint, without any accompanying bristle outside. 5th pair of legs likewise uniarticulate, but slightly larger than 3rd, and accompanied outside by the usual bristle. Ovisacs globular, projecting on each side, and rather large, in some cases almost attaining the size of the whole body.

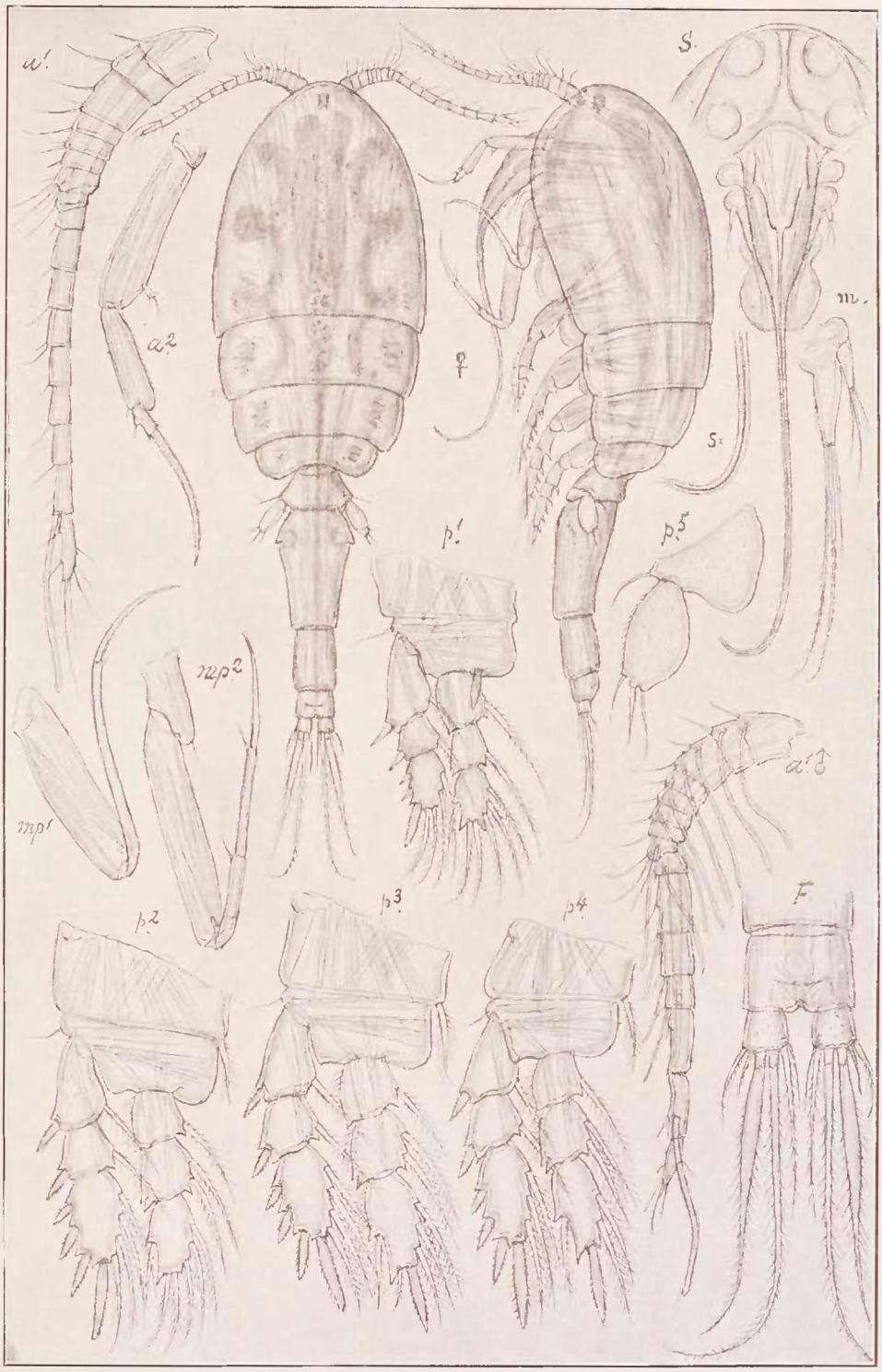
Male very unlike the female in its outward appearance, and of much more slender form of body. Cephalic segment occupying about half the total length, and oval in outline, being scarcely as broad as it is long, lateral edges evenly curved, frontal part obtusely truncated. 2nd segment normally developed, with the epimeral plates well defined and triangularly pointed behind. The 3 succeeding trunk-segments very small and narrow, not being at all expanded laterally. Tail nearly half as long as the anterior division and composed of 5 well-defined segments, the 1st of which (the genital segment) is much the largest and almost quadrate in outline, containing, as a rule, on each side a rounded spermatophore; anal segment somewhat larger than the preceding one. Caudal rami considerably more produced than in female, being more than twice as long as they are broad, and slightly tapered distally; inner mediate seta very long, attaining almost half the length of the body; the other setæ comparatively short. Anterior antennæ much larger than in the female and composed of 10 well defined joints, being not at all hinged, but provided with numerous delicate sensory filaments curving backwards and especially densely crowded on the 1st very large joint. Posterior antennæ of exactly the same structure as in the female, though somewhat less strong. Oral parts likewise very similar, except that the maxillipeds are a little less robust. Legs, however, rather dissimilar, the 2 anterior pairs being much more fully developed and adapted for swimming. 1st pair of legs with the basal part of normal appearance, and distinctly biarticulate; outer ramus resembling in shape and armature that in female, but comparatively larger and having the marginal setæ distinctly ciliated; inner ramus distinctly biarticulate and nearly as long as the outer, proximal joint small, with a single seta inside, distal joint oblong oval, and edged with 5 ciliated setæ. 2nd pair of legs quite normally developed, with both rami 3-articulate and armed in the usual manner with spines and setæ. 3rd pair of legs exhibiting exactly the same rudimentary condition as in the female. Last pair of legs with the free joint



G. O. Sars, del.

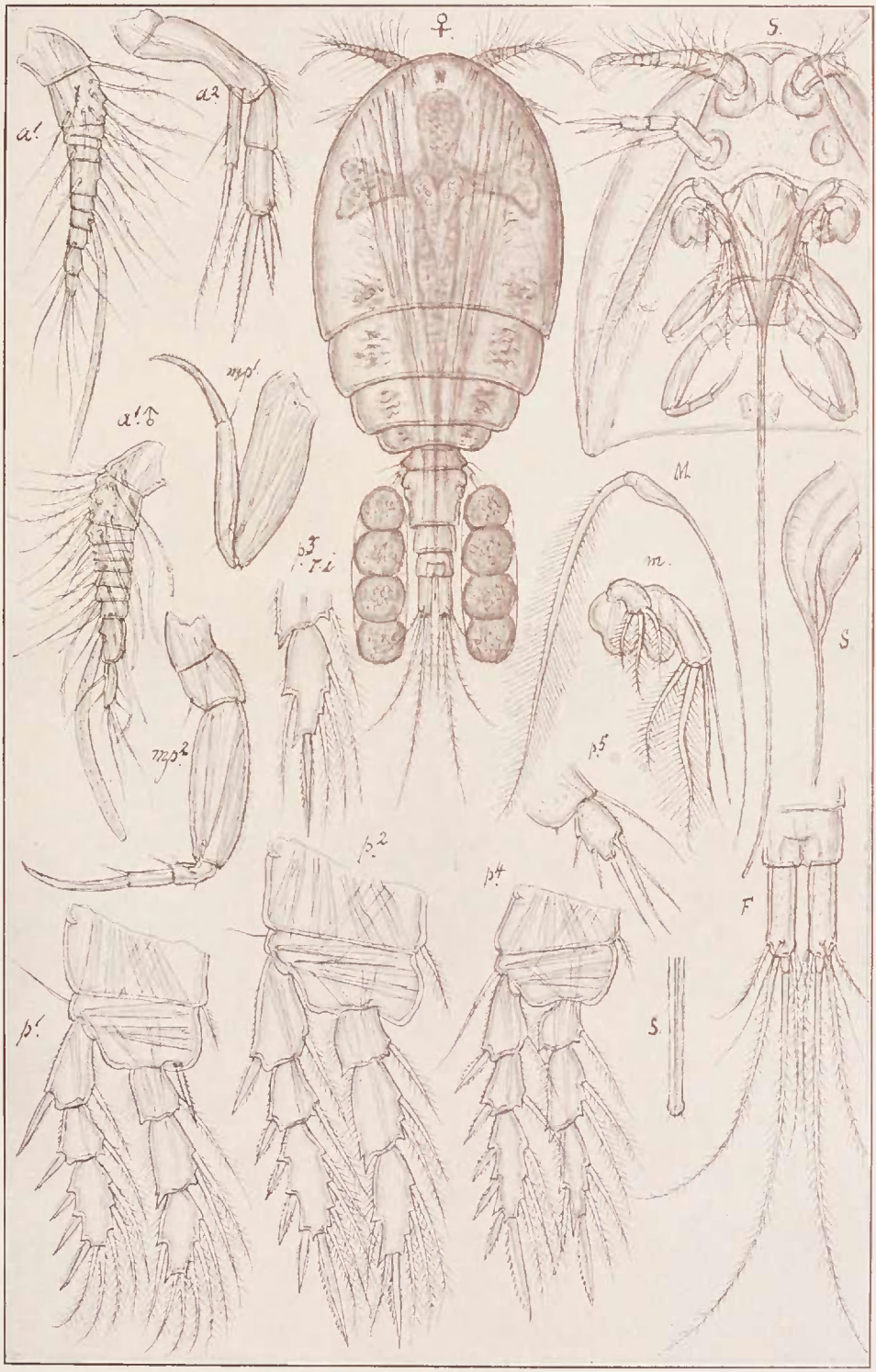
Leptomyzon elegans, (A. Scott).

Copepoda



G. O. Sars, del.

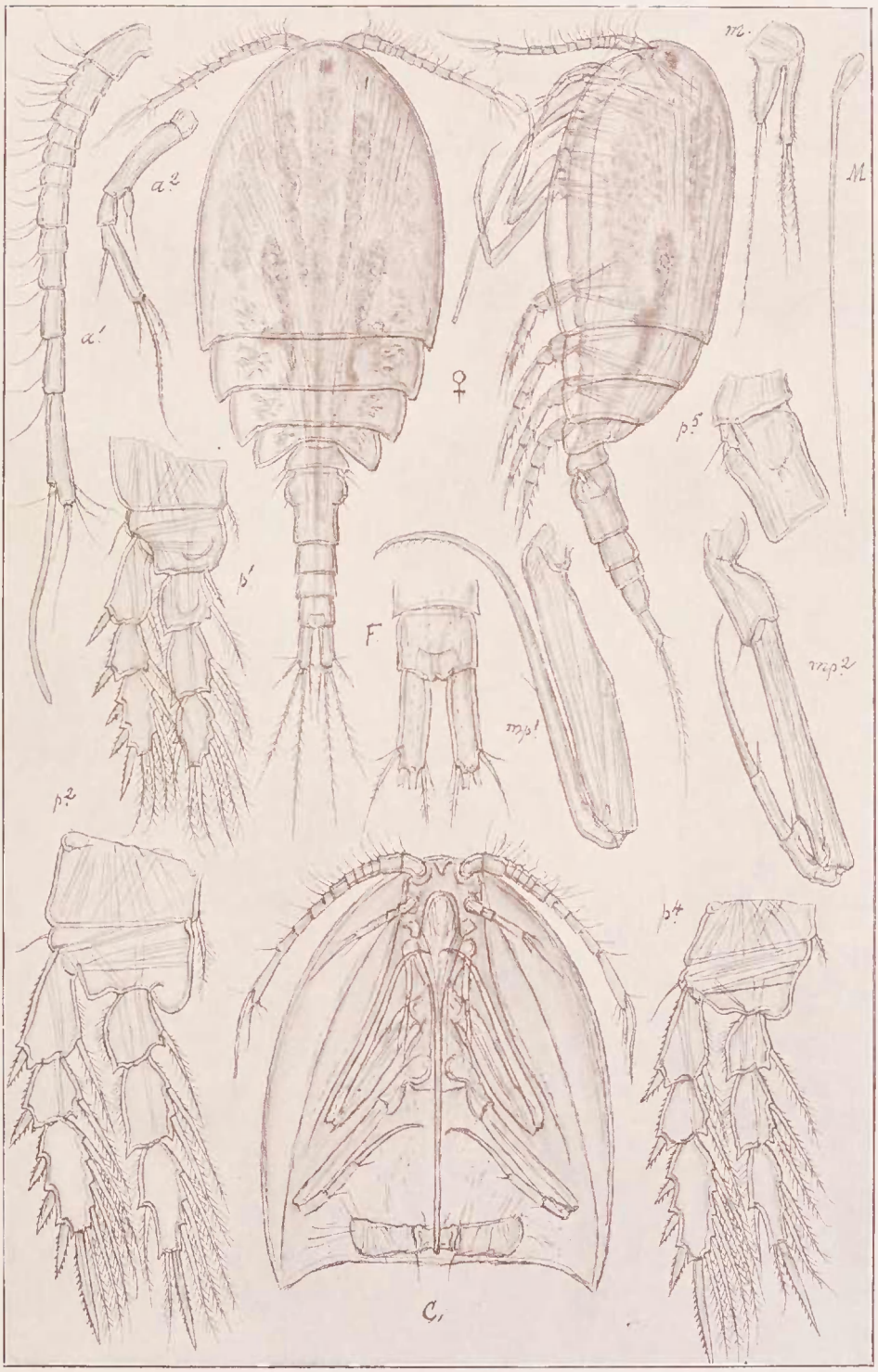
Scottocheres elongatus, Scott.



G. O. Sars, del.

Acontiophorus scutatus, Brady.

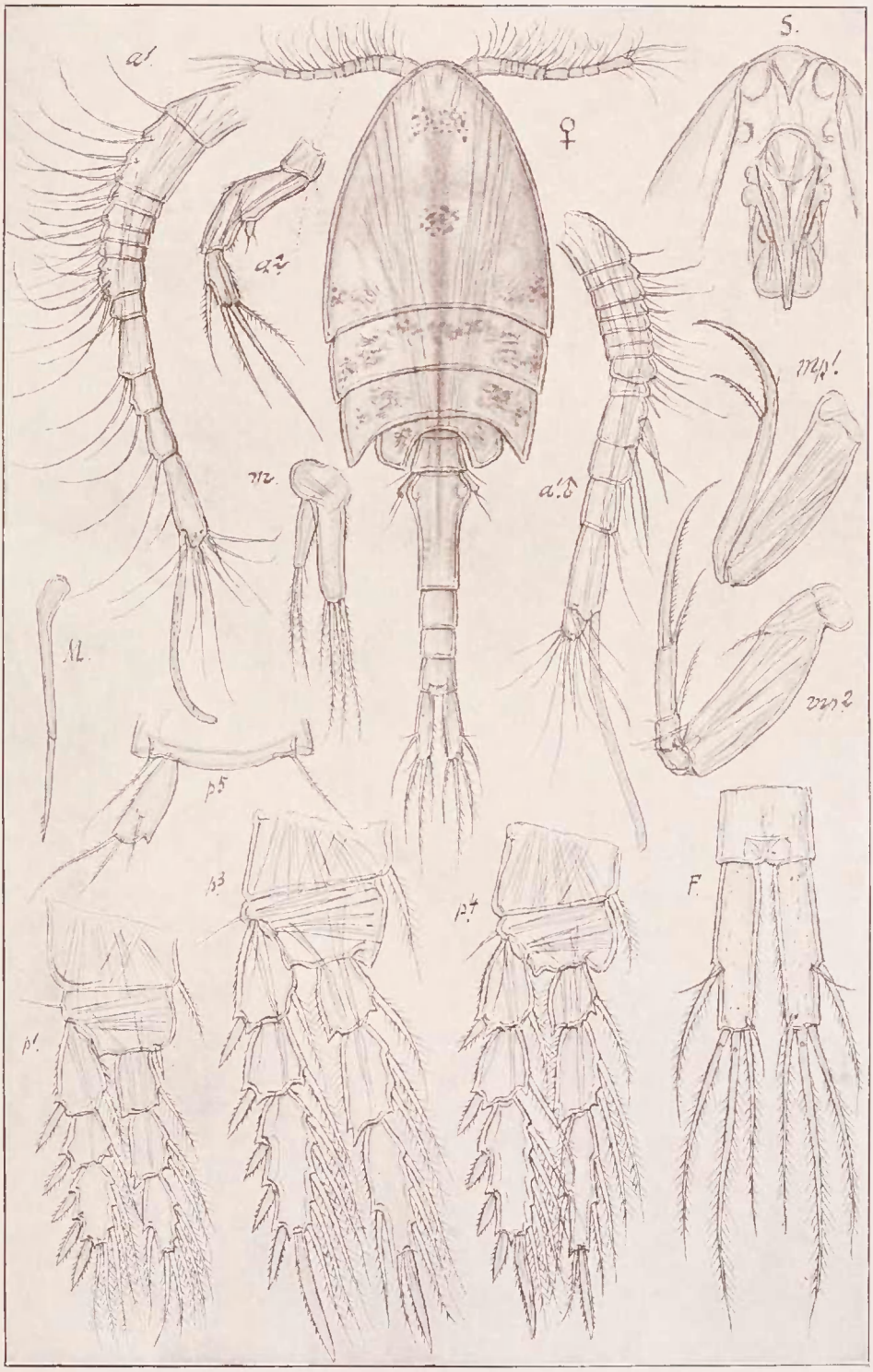
Copepoda



G. O. Sars. del.

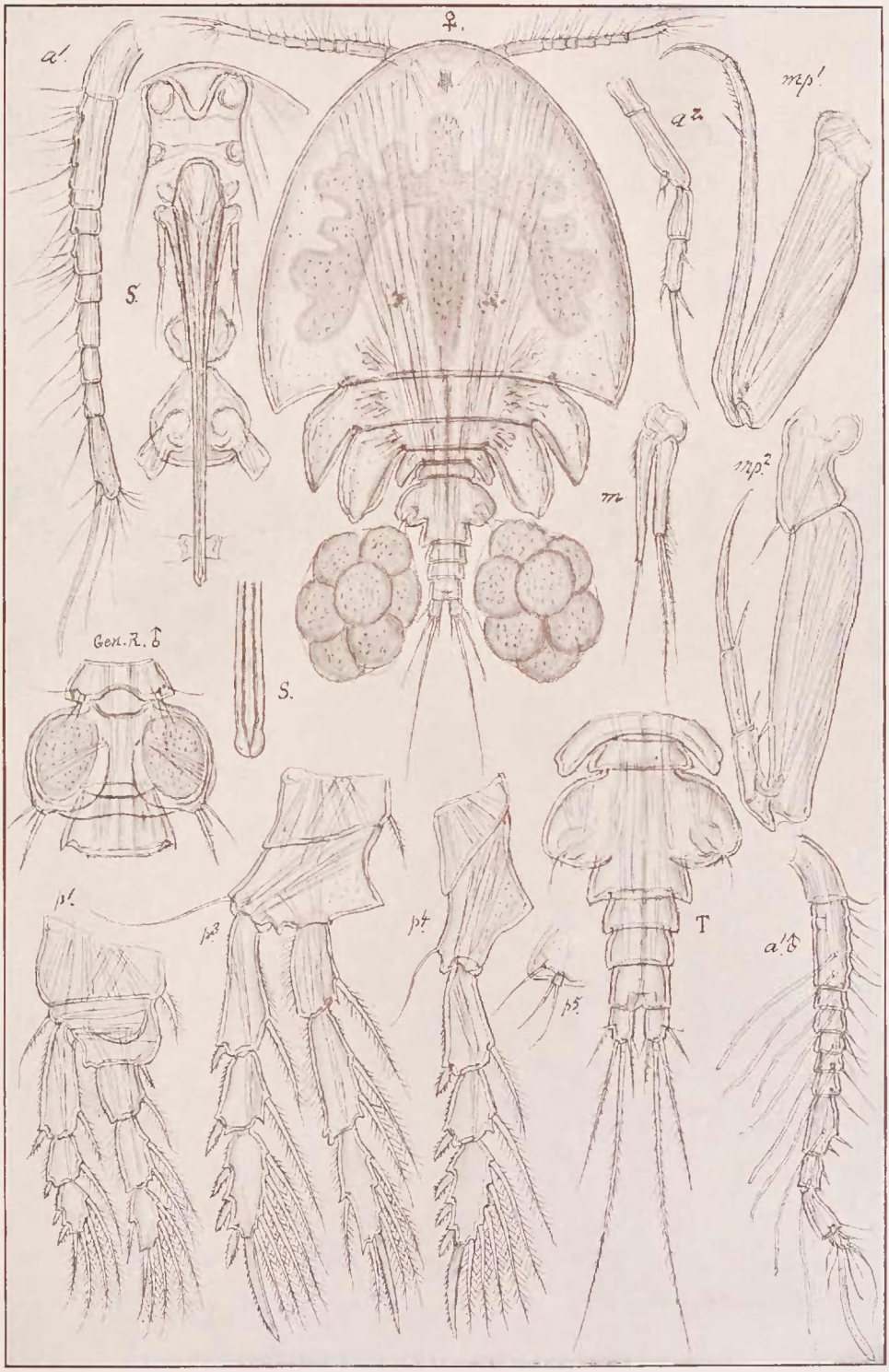
Myzopontius pungens, Gsbr.

Copepoda



G. O. Sars, del.

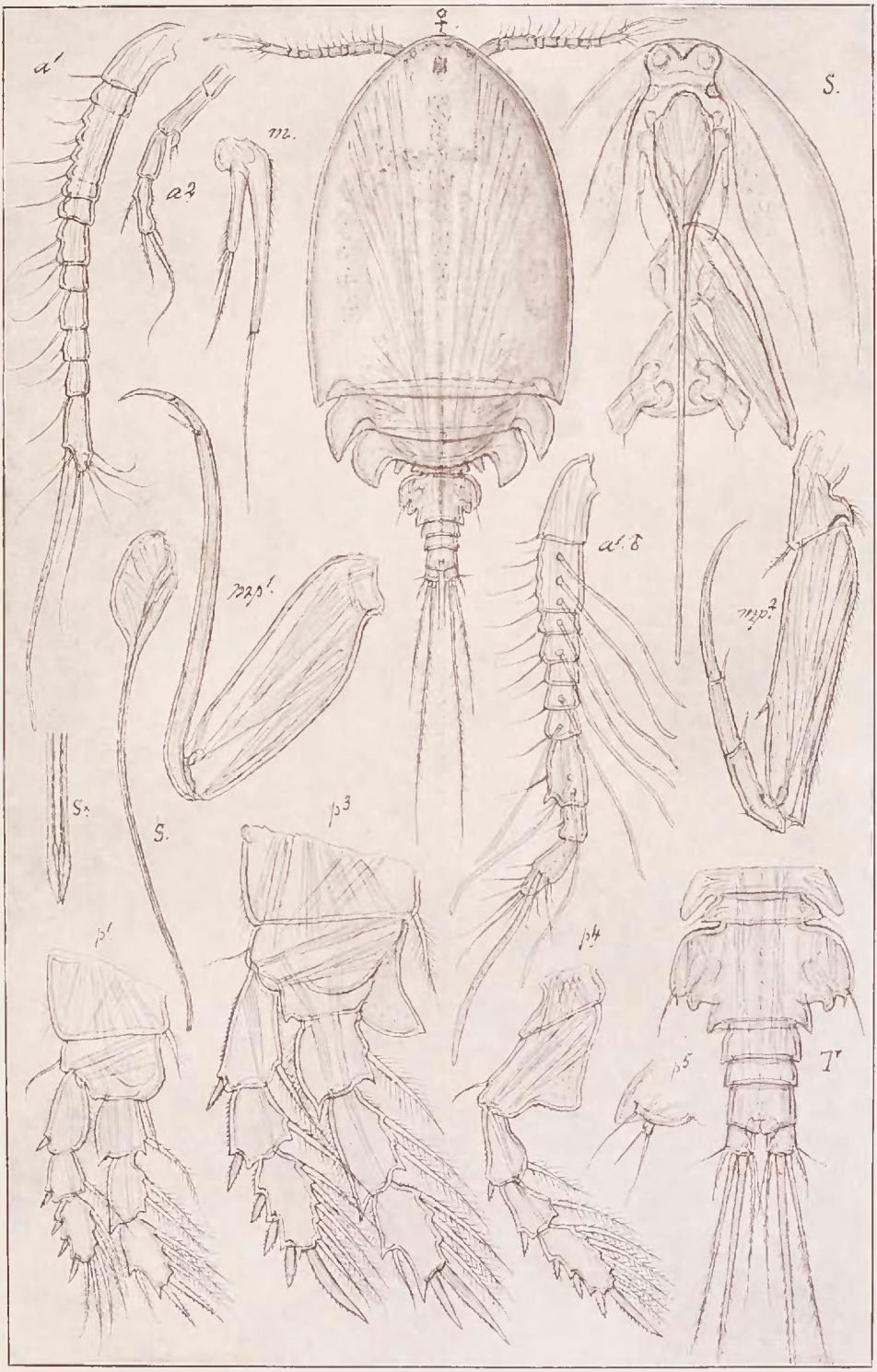
Neopontius angularis, Scott.



G. O. Sars, del.

Dyspontius striatus, Thorell.

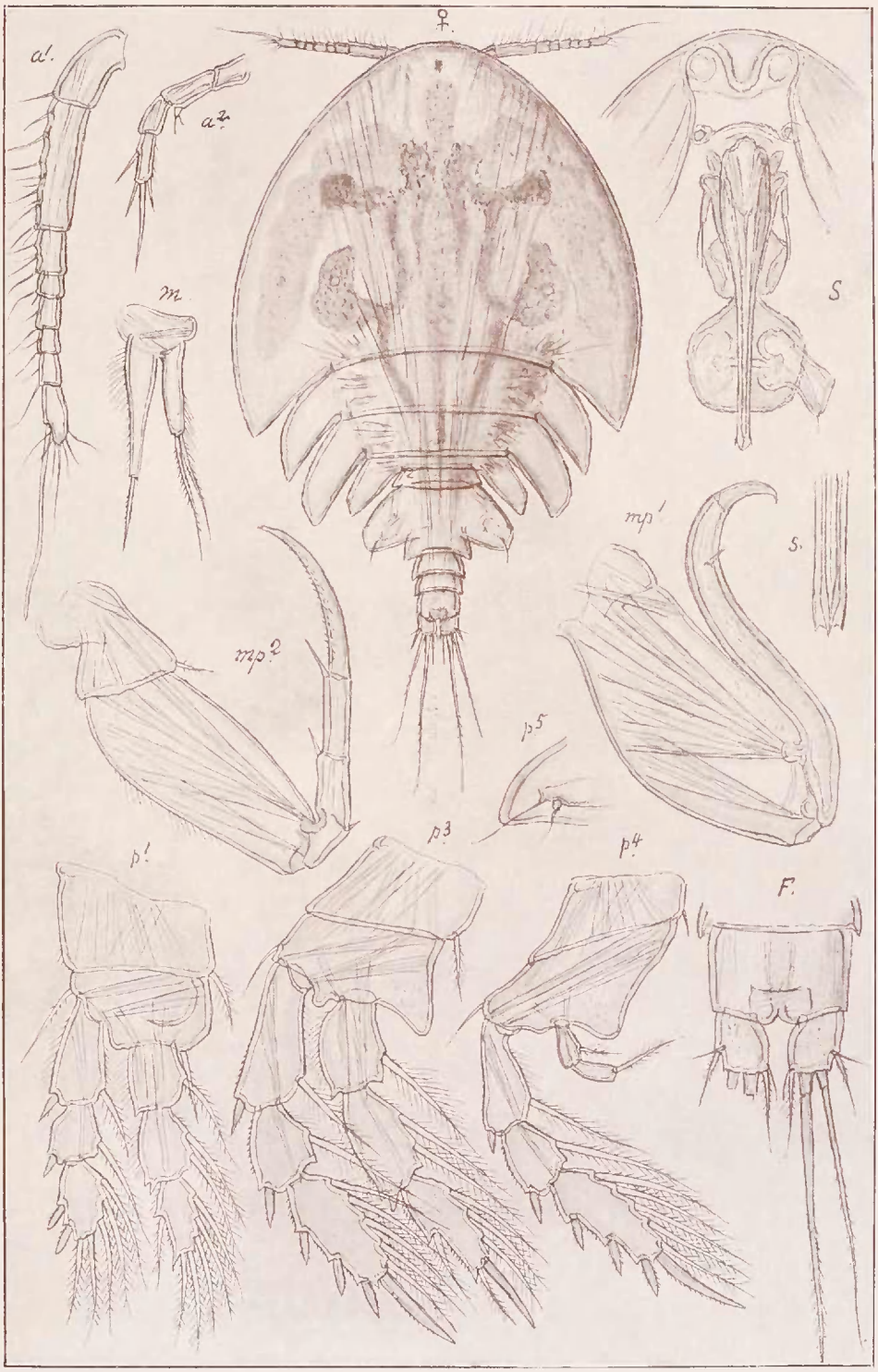
Copepoda



G. O. Sars, del.

Cryptopontius brevifureatus, Gsbr.

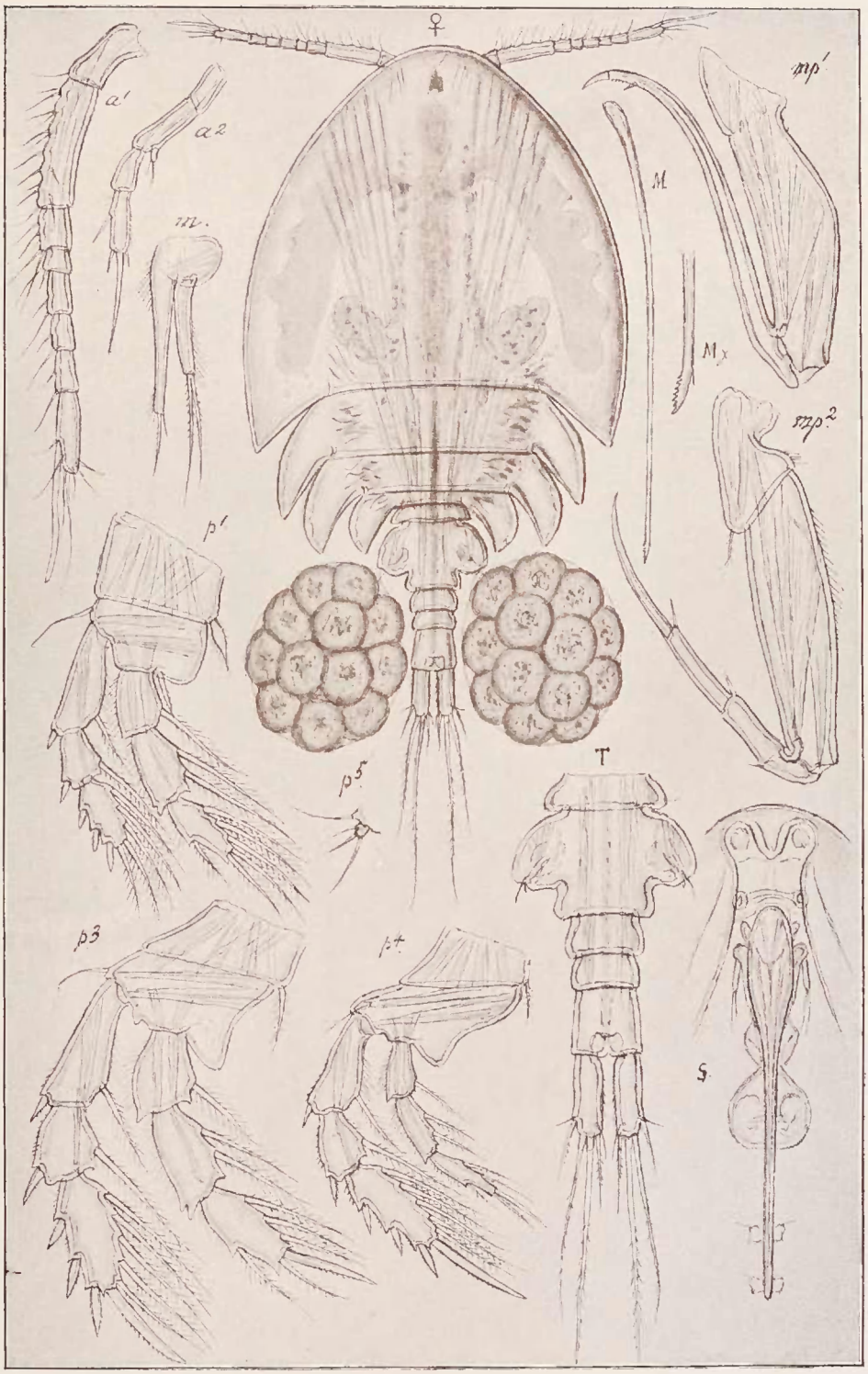
Copepoda



G. O. Sars, del.

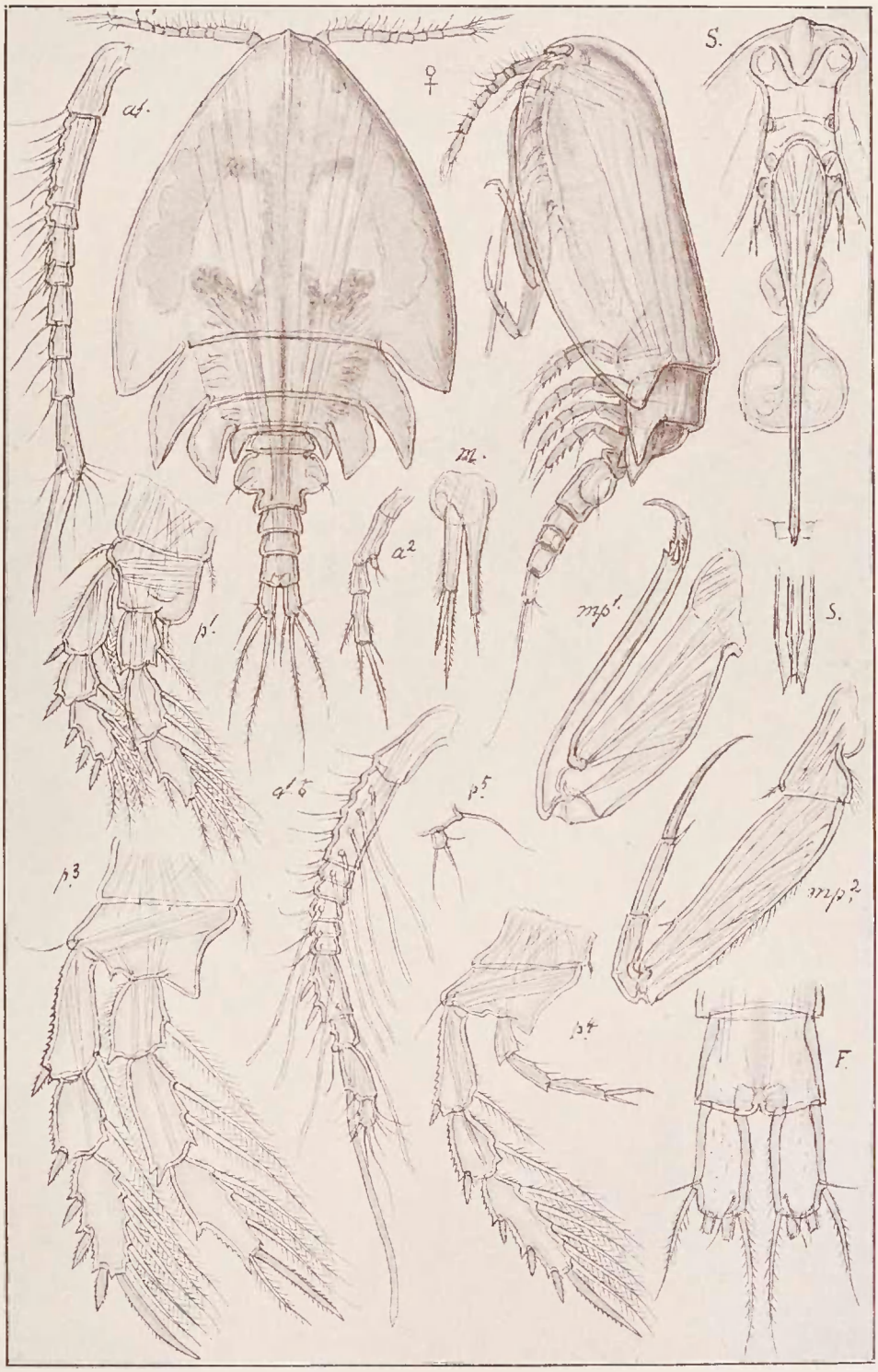
Arctopontius expansus, G. O. Sars.

Copepoda



G. O. Sars, del.

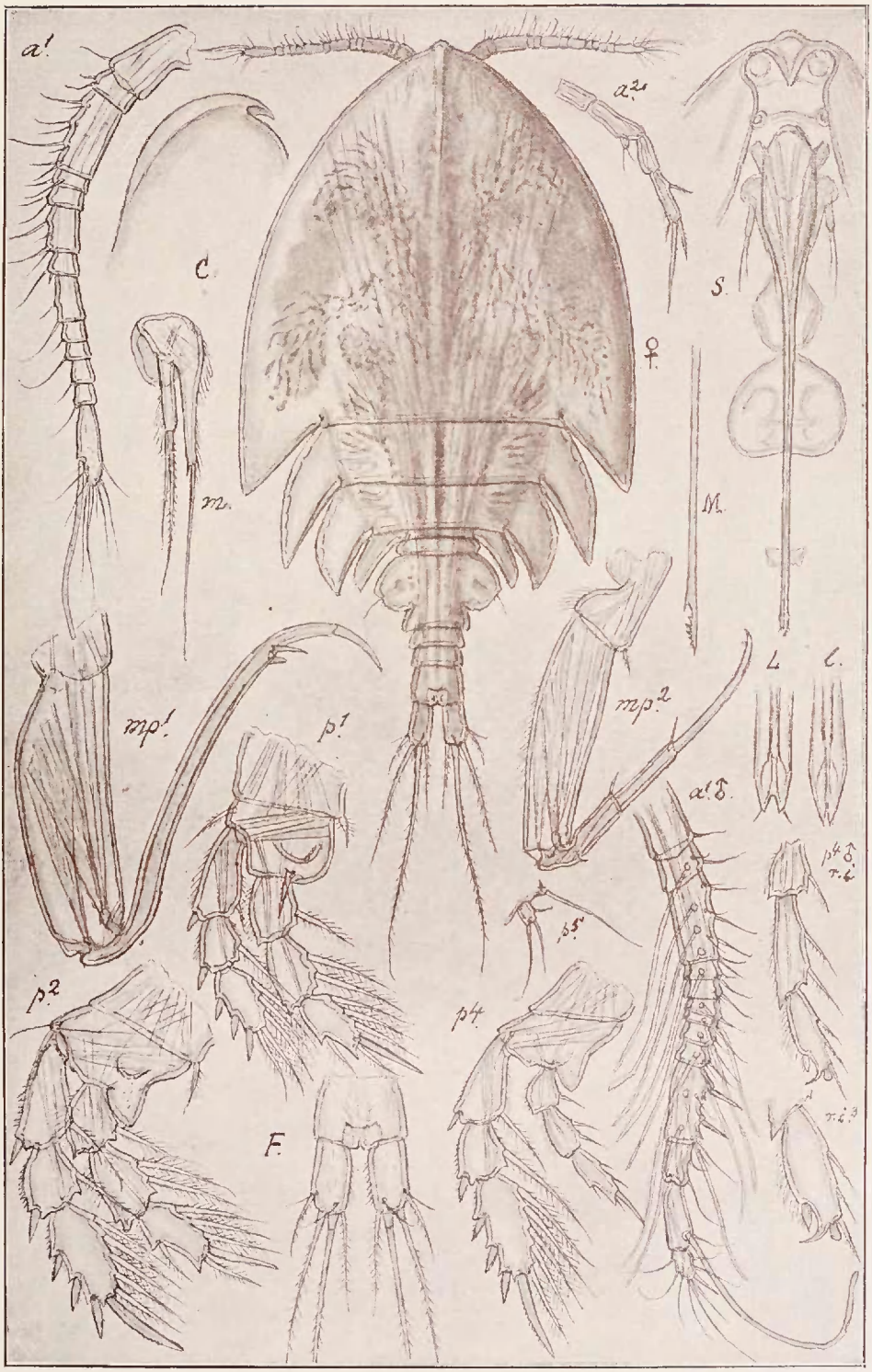
Bradypontius magniceps (Brady).



G. O. Sars, del.

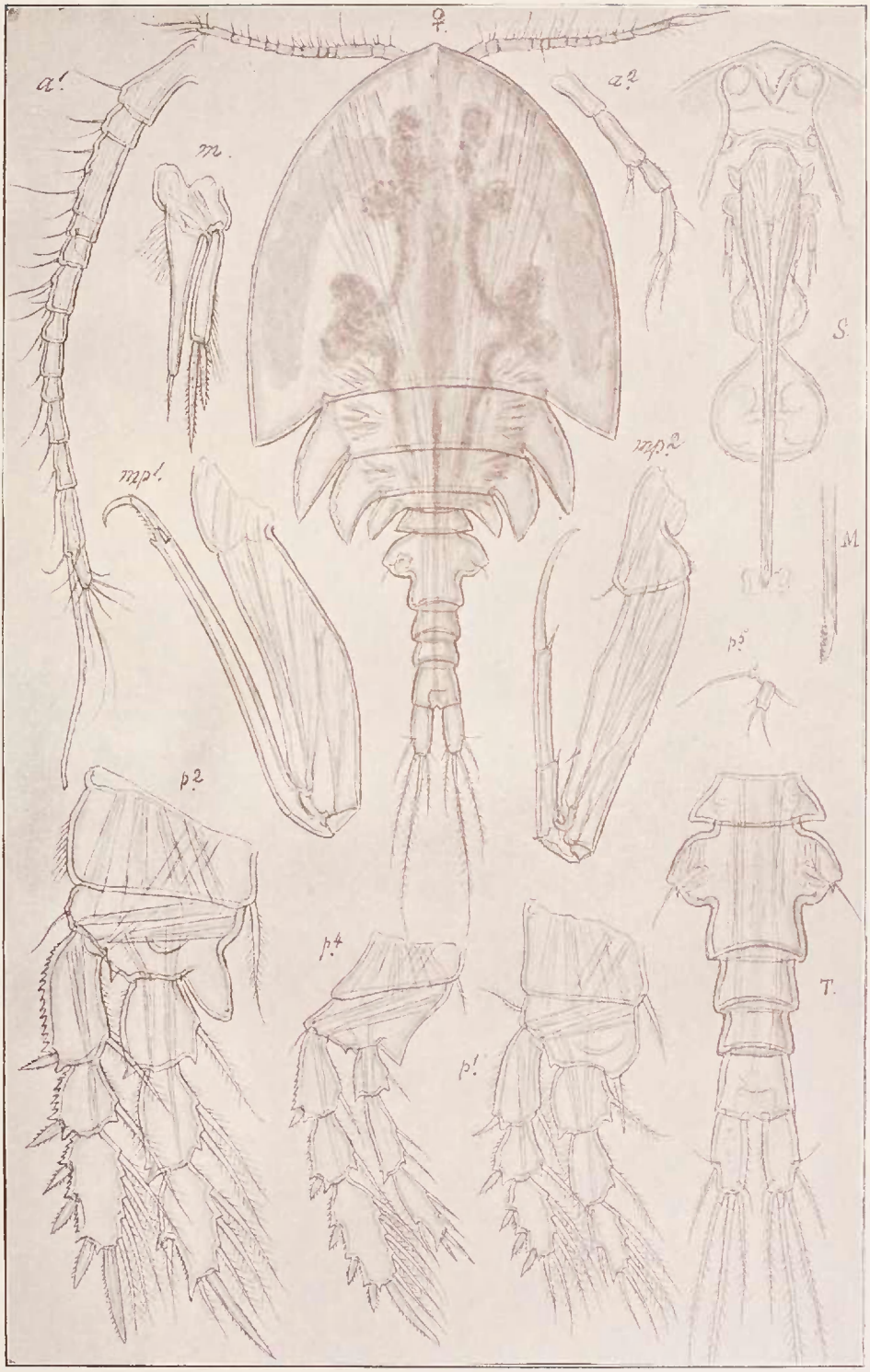
Bradypontius papillatus (Scott).

Copepoda



G. O. Sars, del.

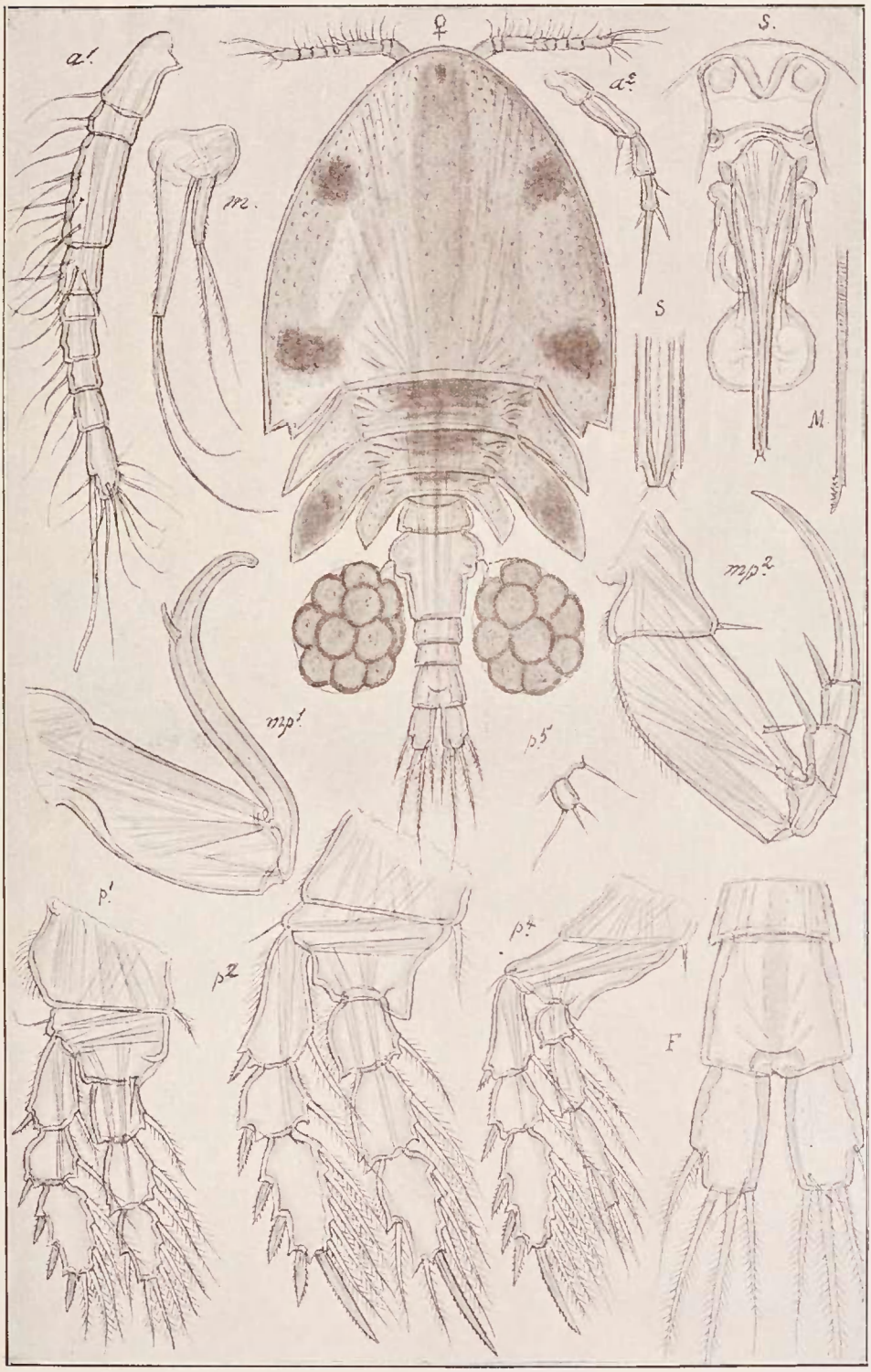
Bradypontius major, G. O. Sars, n. sp.



G. O. Sars, del.

Bradypontius caudatus, G. O. Sars, n. sp.

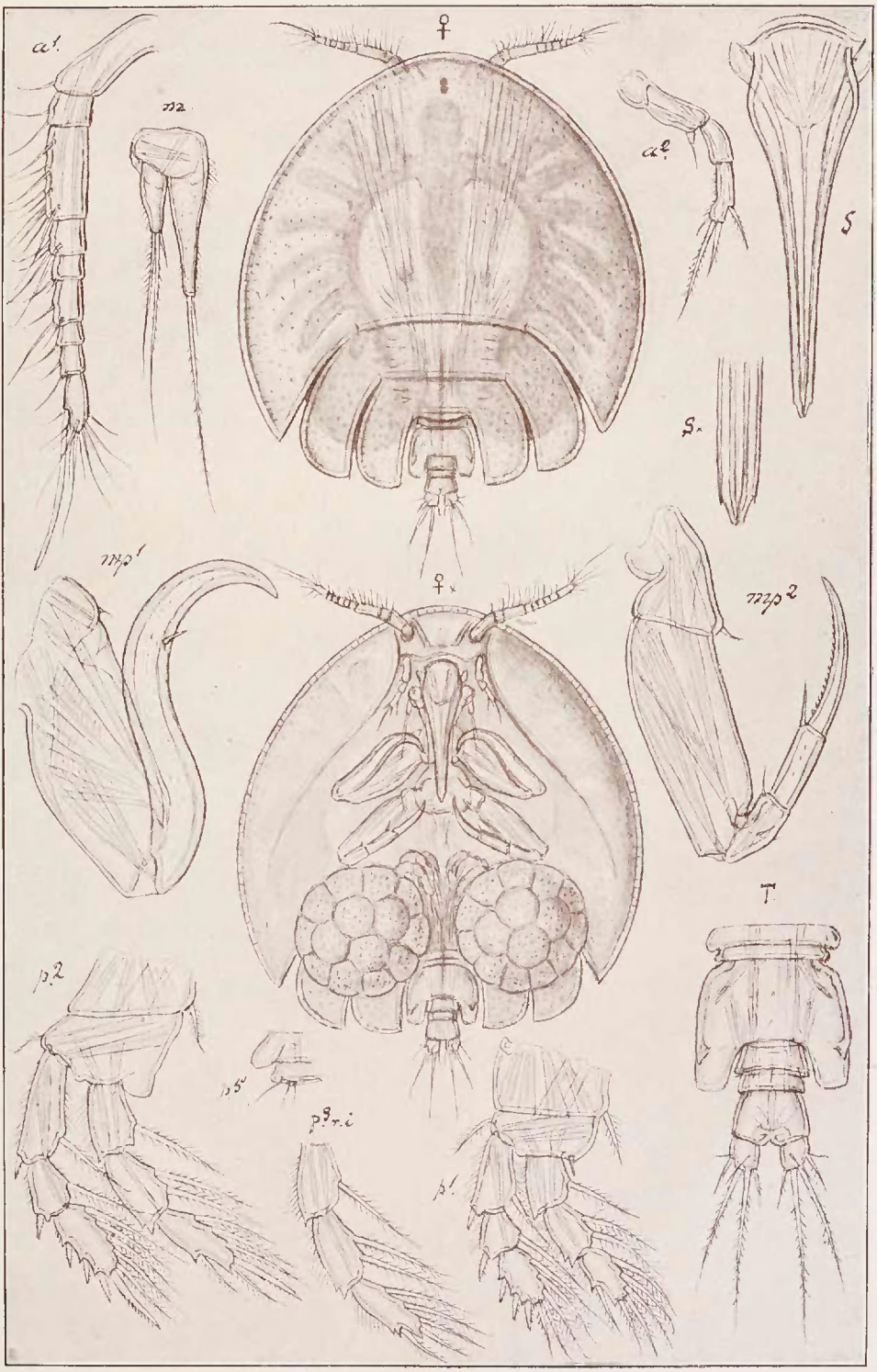
Copepoda



G. O. Sars, del.

Cribropontius Normani (Brady).

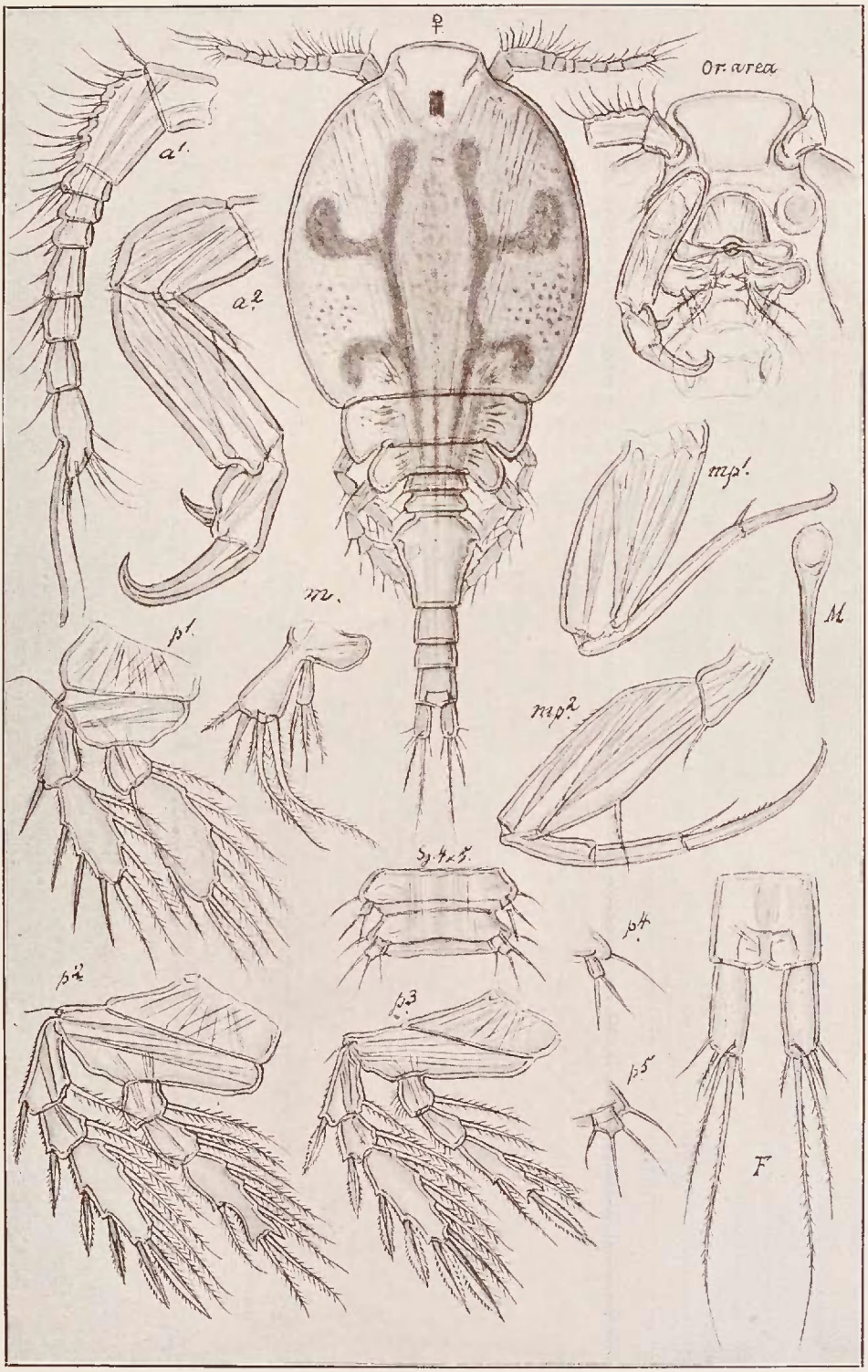
Copepoda



G. O. Sars, del.

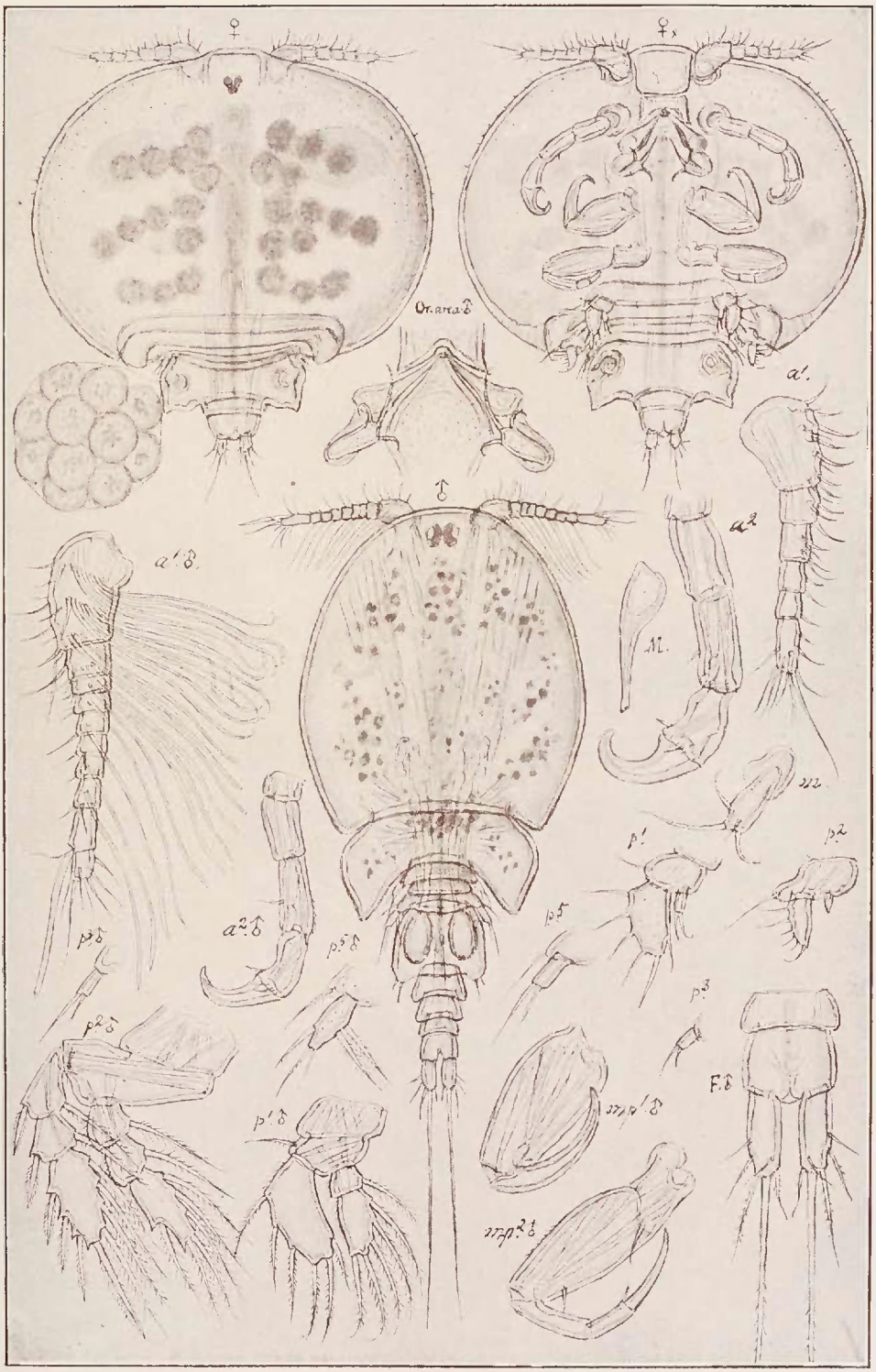
Artotrogus orbicularis, Boeck.

Copepoda



G. O. Sars, del.

Parartotrogus arcticus, Scott.



G. O. Sars, del.

Cancerilla tubulata, Dalyell.

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 XI & XII

CLAUSIDIIDÆ, LICHOMOLGIDÆ (part)

WITH 16 AUTOTYPIC PLATES

BERGEN
PUBLISHED BY THE BERGEN MUSEUM

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ALB. CAMMERMEYERS'S FORLAG, CHRISTIANIA
1917

oblong oval in form, and, in addition to the apical bristles, provided with 2 finely ciliated setæ on the inner edge.

Body in female of a clear yellowish grey colour, with translucent olive-green ovarial cells and likewise greenish ovisacs; that of male highly pellucid, exhibiting within the anterior part scattered reddish-orange oil-bubbles; eye much larger than in female, and bright red.

Length of adult female amounting to 1.10 mm., of male to 0.90 mm.

Remarks.—The female sex of this peculiar Copepod has long been known; but it is only in recent times that the existence of the male sex has been satisfactorily ascertained. True, a male specimen was observed by Claus as early as the year 1889; but its relation to *Cancerilla tubulata* of Dalyell was not recognised by that author, who did not hesitate to establish for it, not only a new species, but even a new genus. There cannot in my opinion be any doubt, that Giesbrecht was quite right in considering *Caligidium vagabundum* of Claus to be the adult male of *Cancerilla tubulata,* and that the description and figure given by Canu of the supposed male *Cancerilla* only refer to a quite immature specimen. The remarkable sexual dimorphism occurring in the present form may be easily explained from the sedentary habits of the female, causing in the latter a considerable reduction of the sensory and locomotory apparatus, and at the same time affecting the general form of the body.

Occurrence.—I have met with the female of this curious form occasionally, off both the south and west coasts of Norway, and always attached in the very same manner ventrally to the base of one of the arms of the common brittle-star, *Amphiura squamata.* Its attachment is effected by the strongly hooked posterior antennæ, and is so firm that it is very difficult to detach it without breaking off those appendages. It is indeed very probable that the animal remains attached in the place it has chosen for the rest of its life, being quite unable to move about in the water. The adult male I have taken free in the sea in 3 different localities of the Norwegian coast, viz., at Risor and Korshavn, on the south coast, and at Magero, outside the Trondhjem Fjord, only a single specimen being found in each locality.

Distribution.—British Isles (Dalyell), coast of France (Canu), Mediterranean, at Trieste (Claus) and Naples (Giesbrecht).

Section 3. Poecilostoma.

General Characters.—Anterior antennæ in male not hinged. Posterior antennæ without any outer ramus, and generally adapted for prehension. Oral parts not adapted either for mastication or for suction. Mandibles wanting. Maxillæ with the terminal part variously modified for conveying food to the mouth, and provided outside with a flap-shaped setiferous palp or exopodite. Anterior maxillipeds never prehensile. Posterior maxillipeds transformed in male to powerful grasping organs. Natatory legs, as a rule, well developed. Last pair of legs, when present, extended laterally, uni-or biarticulate.

Remarks.—The Cyclopoids comprised within this section differ materially from those included in the 2 preceding sections by the structure of the mouth-organs, which are not adapted either for mastication or for suction, but more properly for licking up finely dissipated nourishing particles from the surface of various organisms or from the wall of their inner (branchial) cavities. In accordance therewith the chief masticating organs, the mandibles, are entirely wanting, and the number of oral appendages of course reduced to 3 pairs only, viz., the maxillæ and the 2 pairs of maxillipeds. I am well aware that the above interpretation of the mouth-organs, which agrees, as will be seen, with that originally set forth by Thorell, is quite at variance with the view generally adopted by recent carcinologists on the authority of Claus, according to which the usual number of oral limbs should be present, the foremost of them representing the true mandibles. There are, however, several serious objections to be urged against the correctness of this altered view of the oral apparatus. Indeed, on a careful examination of the mouth-organs in various types of the present section, I am led to the conclusion that the view insisted on by Claus and accepted by most recent authors cannot be maintained, and that we must recur to the interpretation originally given by Thorell as the only one acceptable.

As to the number of oral limbs, only 3 pairs are in reality distinguishable, as stated by Thorell. The assumption of the presence of a 4th pair between the 2 anterior ones rests entirely on a miscomprehension, a part of the foremost pair having been erroneously taken for an independent limb. This part, generally described as a maxilla, is always found firmly attached to the outer side of the foremost pair of limbs, and represents in reality, as opined by Thorell, the palp or exopodite of those limbs. Though in a few cases this exopodite may assume a somewhat maxilla-like appearance, it presents

itself in the great majority of forms as an insignificant appendage turned backwards, or from the mouth, and attached in much the same manner as in other Copepoda. That this foremost pair of oral limbs, together with their palpiform appendage, cannot be regarded as the mandibles, but must represent, as justly opined by Thorell, the true maxillæ, is evident not only from their place far behind the antennal area, but also from their relation to the oral aperture. The exact position of the latter is not always easy to determine, because it is more or less completely covered by a lamellar anterior lip; on a closer examination, however, it will invariably be found that the said limbs are not placed, like the mandibles, at the sides of that aperture, but decidedly behind it, turning their extremities more or less forwards, precisely as do the maxillæ in other Copepoda. The armature also of these limbs is very different from that generally met with in the mandibles, and in some cases at least (Clausidiidæ) exhibits an unmistakable resemblance to that found in some of the gnathostomous Cyclopoida, for instance in those belonging to the family *Cyclopidæ*. It will finally be noticed that whereas the mandibles in several cases are quite destitute of palps, these appendages are almost invariably found in the maxillæ. Thorell describes all the oral limbs as maxillæ (m^1—m^3); but, according to the usual terminology, the 2 posterior pairs should more properly be named maxillipeds.

About the parasitic nature of the Copepods belonging to the present section there cannot be any doubt; but in many instances the hosts infested by them have not yet been ascertained. The parasitism is in every case, like that of most of the siphonostomous Cyclopoida, rather incomplete or merely temporary, the animals being able easily to change their place and to move freely through the water. Somewhat more sedentary are of course the habits of such forms as live in the branchial cavity of Ascidians or within the valves of different Mussels; though these forms also may at times be able to leave their hosts. Only a few forms are stated to be true fish-parasites, viz., the species of the genera *Bomolochus, Ergasilus* and *Thersitina;* but by far the greater number seem to be confined to invertebrate animals belonging to many different groups e. g. Echinoderms, Worms, Mollusca, Tunicata. A number of forms belonging to this section lead a true pelagic life, being constantly found in the open sea, and probably at times infesting some of the larger pelagic animals. This is the case with all the known forms belonging to the 3 families *Oncæidæ, Corycæidæ* and *Sapphirinidæ.*[1])

[1]) The parasitism of some species of *Sapphirina* on Salpæ has long been known.

The poecilostomous Cyclopoida which up to the present are stated to belong to the Fauna of Norway, may be referred to 6 well-defined families, to be treated of in the succeeding pages.

Fam. 10. Clausidiidæ.

Characters.—Anterior division of body more or less expanded, having the first trunk-segment wholly consolidated with the cephalon. Tail composed of the usual number of segments. Anterior antennæ 6—7-articulate. Posterior antennæ scarcely prehensile, being clothed at the tip with long curved setæ. Anterior lip short and broad, lamellar, with the terminal edge entire and fringed with fine spinules. Maxillæ with the terminal part only slightly curved and armed at the tip with 2 stout claw-like spines distinctly articulated at the base, and accompanied inside by one or two coarse ciliated setæ; palp generally well developed, incurved. Anterior maxillipeds short and stout, biarticulate; 1st joint very massive, 2nd small and terminating in 2 claw-like spines accompanied by one or 2 ciliated setæ. Posterior maxillipeds more slender and 3-articulate, being generally clothed with rather long setæ; those in male very powerfully developed. Ventral face forming between the oral parts in front 2 juxtaposed hairy lappets (lateral lips). Natatory legs, as a rule, of normal structure, though the 1st pair in some cases (Clausidium) may be peculiarly modified. Last pair of legs uni- or bi-articulate, distal joint more or less lamellar.

Remarks.—The present family was established by E. Canu, to comprise the genus *Hersilia* Philippi and allied forms. As however the generic name *Hersilia* has been preoccupied, it must be replaced by the name *Clausidium* proposed by Kossman, and the family accordingly be named *Clausidiidæ* instead of *Hersiliidæ*. It is chiefly characterised, as compared with the other families, by the non-prehensile posterior antennæ, the form of the anterior lip, the peculiar armature of the maxillæ, and partly also by the structure of the maxillipeds. To the Norwegian Fauna belong 2 well-defined genera referable to this family, each represented by only a single species.

Gen. 36. **Hemicyclops,** Boeck, 1873.

Syn: *Hersiliodes,* Canu (part).
„ *Platycheiron,* Scott.

Generic Characters.—Body cyclopoid in shape, with the anterior division sharply marked off from the posterior, and more or less flattened. Tail comparatively slender, with the caudal rami not much produced. Anterior antennæ of moderate length and composed of 7 joints, none of which are expanded in front. Posterior antennæ with the terminal joint very short. Maxillæ provided with 2 setæ inside the apical spines; palp produced inside at the end to a well-defined small setiferous lobule. Anterior maxillipeds with several ciliated setæ in addition to the 2 apical spines. Posterior maxillipeds in female moderately strong, but scarcely prehensile, being clothed with rather long, partly spiniform setæ; those in male powerfully developed, with the propodos very broad and flattened and coarsely denticulated inside. Natatory legs all of normal structure, with both rami 3-articulate. Last pair of legs biarticulate; distal joint broad, lamellar, and edged with 3 spines and a delicate apical bristle.

Remarks.—This genus was established as early as the year 1873 by Boeck, to include a peculiar Copepod found by the present author in the upper part of the Christiania Fjord. Its true relationship to the other Cyclopoida was however not recognised by Boeck, who placed the genus near *Cyclops* within the group of gnathostomous Copepoda. The genus *Hersiliodes* of Canu agrees in most characters with that here under question; but of the 3 species recorded by him only the two, viz., *H. Thompsoni* and *H. puffini* can with full certainty be adduced to Boeck's genus; the 3rd species *H. Pelseneeri*[1]) seems to me to be so different from the other 2, both as to the general form of the body an to the structure of some of the appendages, that it hardly can be combined with them in the same genus. If the generic name *Hersiliodes* is to be retained, it must of course be restricted to that species. Of the various species described by T. Scott, and provisionally referred to the genus *Lichomolgus* Thorell, there are two which unquestionably belong to the present genus, viz., *L. littoralis* and *L. aberdonensis,* the first of them being apparently identical with the Norwegian species here described. Scott himself was well aware of the considerable differences which these two species exhibit, as compared with the typical Lichomolgi, and in a supplementary note[2]) suggested

[1]) According to Giesbrecht, this species is identical with the form described at an earlier date by Grube as *Antaria latericia.*

[2]) Annals of Scottish Nat. Hist. 1892, p. 153.

the desirability of transferring them to a particular genus or subgenus, for which he proposed the name *Platycheiron*, referring to the broad and flattened form of the propodos in the male posterior maxillipeds. This name cannot however be accepted, as it is of much more recent date than that proposed by Boeck.

77. Hemicyclops purpureus, Boeck.

(Pl. LXXXI).

Hemicyclops purpureus, Boeck, Nye Slægter og Arter av Saltvandscopepoder, Chr. Vid. Selsk. Forhandl. f. 1872, p. 42.

Syn: *Lichomolgus littoralis*, Scott.

Specific Characters.—Female. Body moderately slender, with the anterior division rather broad, oval in outline, and pronouncedly applanated. Cephalic segment fully as long as the 4 succeeding segments combined and narrowly rounded in front; rostral prominence incurved and obtuse at the tip. Epimeral plates of the 3 succeeding segments expanded laterally and closely imbricate; those of the 4th segment scarcely smaller than the others. Last trunk-segment abruptly much smaller than the preceding ones, and not much broader than the genital segment. Tail rather slender, equalling in length about $^2/_3$ of the anterior division, and sub-cylindric in form; genital segment about as long as the 3 succeeding segments combined, and only very slightly dilated in front; anal segment rather small. Caudal rami comparatively short, though a little longer than they are broad at the base, and slightly narrowed distally; seta of outer edge small and attached near the end; apical setæ rather unequal, the inner mediate one being, as usual, the longest, and almost attaining the length of the tail, seta of outer corner scarcely half as long as that of the inner. Anterior antennæ about equal in length to the cephalic segment, and gradually attenuated distally, being somewhat abruptly bent at the base, 2nd and 4th joints the longest. Posterior antennæ well developed, penultimate joint almost as long as the preceding one and ciliated along the anterior edge, distal corner scarcely produced and provided with a strong curved seta and 2 bristles, one of which is ciliated; terminal joint much shorter than the penultimate one and almost quadrangular in form, carrying on the tip 4 strong curved setæ accompanied by a few short bristles. Anterior maxillipeds with 2 coarse setæ at the end of the proximal joint inside and 2 others on the distal joint, apical spines very strong, claw-like, the outer one armed in the middle with a well-marked denticle. Posterior maxillipeds rather fully developed, with the middle joint angularly produced inside, and, like the

preceding joint, carrying 2 ciliated setæ; terminal joint small, with 2 remarkably incurved setæ accompanied by a number of thin bristles. Natatory legs with the inner ramus considerably longer than the outer. Last pair of legs with the proximal joint well defined and carrying outside the usual bristle; distal joint broadly ovate, or almost spatulate in form, and densely ciliated on both edges, marginal spines rather strong and attached to distinct ledges; apical bristle thin and slender. Ovisacs of moderate size, narrow fusiform in shape, and considerably divergent.

Body of a clear whitish hue, with the ovarial tubes and the ovisacs bright red.

Length of adult female 1.15 mm.

Remarks.—This form, as above mentioned, was briefly characterised by Boeck as early as the year 1873, and is the type of the present genus. I have little doubt that the *Lichomolgus littoralis* of Scott, originally described from a solitary male specimen, is the very same species, and this is indeed still more confirmed by the figure subsequently given by the same author of an adult female specimen. It is an easily recognisable form, and in the living state highly distinguished by the bright red colour of the ovarial tubes and the ovisacs, a character which has given rise to the specific name proposed by Boeck.

Occurrence.—Only very few specimens of this pretty form have hitherto come under my notice, all of the female sex. One of these specimens, that from which Boeck's description was made, was taken many years ago in the upper part of the Christiania Fjord from a depth of about 20 fathoms; the other specimens were procured in the middle part of the Fjord, at Moss, and in about the same depth.

Distribution.—Scottish coast (Scott).

Gen. 37. **Hippomolgus,** G. O. Sars, n.

Generic Characters.—Body less pronouncedly cyclopoid in shape, the anterior division being only slightly dilated and not very sharply marked off from the posterior. Caudal rami much produced. Anterior antennæ short and robust, 6-articulate. Posterior antennæ comparatively feeble in structure. Maxillæ armed in a much similar manner to those in *Hemicyclops,* palp however of somewhat simpler structure, with the sub-apical lobule very small and pro-

vided with only 2 unequal setæ. Maxillipeds also less fully developed, with the setæ rather reduced both in size and number. Natatory legs very coarsely developed, with some of the setæ transformed in to slender spines; 1st pair not peculiarly modified. Last pair of legs uniarticulate, the proximal joint being wholly coalesced with the corresponding segment; distal joint comparatively narrow, but armed in a manner similar to that in *Hemicyplops*.

Remarks.—This is a very distinct genus, differing in several points rather markedly from the other known *Clausidiidæ*. It ought however evidently to be referred to that family, as the oral parts are built on much the same type. It comprises as yet only a single species, to be described below.

78. Hippomolgus furcifer, G. O. Sars, n. sp.

(Pl. LXXXII).

Specific Characters.—Female. Body moderately slender, with the anterior division oblong oval in outline and scarcely applanated. Cephalic segment occupying about half the length of the anterior division, and gradually narrowed anteriorly; rostral prominence small, but well defined. The 3 succeeding segments gradually diminishing in width, and having the epimeral plates only slightly expanded. Last trunk-segment well developed, and almost at broad as the preceding segment. Tail exceeding in length $^2/_3$ of the anterior division, and rapidly tapering behind; genital segment rather massive, and exhibiting on each side, close to the base, a small dentiform prominence; anal segment attaining the length of the 2 preceding segments combined. Caudal rami exceedingly slender and narrow, being more than twice as long as the anal segment and slightly divergent, outer edge provided close to the base with a small bristle, and at about the middle with another somewhat larger bristle, the 2 middle apical setæ well developed, the other 2 however very small. Eye apparently wholly absent. Anterior antennæ unusually short and robust, being scarcely half as long as the cephalic segment, and clothed with numerous diverging setæ, some of which are short and curved, almost spiniform and coarsely spinulose, others very long and slender; 1st joint rather broad and produced in front to a short dentiform projection, behind to a strong mucroniform spine; the 4 succeeding joints gradually diminishing in size and lamellarly expanded in front; terminal joint simple, cylindric and provided at the tip, in addition to the setæ, with a strongly developed slender æsthetask; a similar æsthetask being moreover attached to each of the 2 preceding joints. Posterior antennæ comparatively feeble, though built

on the same type as in the other *Clausidiidæ*, penultimate joint scarcely half as long as the preceding one, and provided with 3 curved setæ accompanied by a thin bristle; last joint considerably longer and carrying on the tip 6 very long and curved setæ. Anterior lip and maxillæ not much differing in their structure from those parts in other *Clausidiidæ*. Lateral lips only slightly indicated. Anterior maxillipeds with no setæ on the proximal joint; apical spines comparatively slender and nearly straight, being only accompanied by a single seta. Posterior maxillipeds rather feeble in structure, and provided with only a few comparatively short setæ; terminal joint very small, with only 2 minute spines on the tip. Natatory legs with the rami nearly equal in size; spines of outer ramus much elongated, especially in the 1st pair. Last pair of legs with the free joint narrow oblong in shape, and produced at the inner distal corner to a recurved dentiform projection, marginal spines moderately strong, 2 of them being attached to the end of the joint, the 3rd to a distinct ledge at about the middle of the outer edge; apical bristle rather slender. Ovisacs of moderate size, oblong oval in form, and scarcely at all divergent.

Colour whitish grey.

Length of adult female 1.40 mm.

Male unknown.

Remarks.—The present form is easily recognisable from any of the other known *Clausidiidæ*, both by the general appearance of the body and by the structure of the several appendages. The anterior antennæ in particular are highly distinguished by their short and stout form and the coarse setæ clothing them.

Occurrence.—Only 3 female specimens of this remarkable form have hitherto come under my notice. Two of them were taken in the outer part of the Stavanger Fjord, at Bukken, from a depth of about 60 fathoms, muddy bottom. The 3rd specimen was found at Risør, south coast of Norway, in about the same depth.

Fam. II. Lichomolgidæ.

Characters.—Body more or less pronouncedly cyclopoid in shape, the anterior division being generally considerably dilated and sharply marked off from the slender posterior one. Anterior antennæ slender, and composed of

7 joints, the 2nd of which is invariably the longest. Posterior antennæ more or less pronouncedly prehensile, being armed at the tip with a varying number of curved claws. Oral area far remote from the antennal one, and occupying about the centre of the ventral face of the cephalic segment. Anterior lip deeply cleft in the middle or bilobate, edges of the lobes smooth. Lateral lips absent. Maxillæ terminating in a lamellar falciform lappet curving anteriorly and exserted to a thin flexible point; palp in most cases of inconsiderable size. Anterior maxillipeds with the proximal joint naked, distal joint provided inside with a slender spine, its end being, as a rule, exserted to a thin setiform lash abruptly bent at the base and turned anteriorly, with the outer edge finely spinulose. Posterior maxillipeds more or less imperfectly developed in female, but transformed in male to strong grasping organs. Natatory legs, as a rule, of normal structure, though the inner ramus of the 4th pair may in some cases be more or less reduced. Last pair of legs, as a rule, represented on each side by a single joint extended laterally.

Remarks.—The type of the present family is the genus *Lichomolgus* of Thorell, with which in recent times a number of more or less nearly allied genera have been associated, to form a quite natural group. From the *Clausidiidæ* this family is pretty well distinguished by the generally pronouncedly prehensile character of the posterior antennæ, as also by the rather different structure of the oral parts. In these respects it agrees much more closely with another family, viz., the *Sapphirinidæ,* and indeed, for this reason, Thorell referred his genus *Lichomolgus* to that family. The external appearance of the body is however very unlike that met with in the said family, being perfectly cyclopoid. Nor are there any traces of the peculiar ocular lenses so characteristic of the *Sapphirinidæ*. The present family is well represented in the Fauna of Norway, several genera and species having been observed, to be described in the succeeding pages.

Gen. 38. **Lichomolgus,** Thorell, 1860.

Generic Characters.—Anterior division of body rather dilated and pronouncedly applanated, with the 1st trunk-segment in most cases defined from the cephalon by a well-marked suture dorsally. Tail slender and composed of the usual number of segments; the genital one in male greatly inflated. Integuments, as a rule, very thin and soft. Anterior antennæ slender and

narrow, 7-articulate. Posterior antennæ pronouncedly prehensile, being armed at the tip with 2 or 3 curved claws. Maxillæ with the terminal lappet much produced and densely hairy on both edges; palp forming a small bi—or tri—setose lobe turning backwards. Anterior maxillipeds with the apical lash long and slender. Posterior maxillipeds in female short and stout, 3-articulate, and almost naked, last joint conically produced; those in male well developed, subcheliform, dactylus very slender and more or less strongly curved in the middle. Natatory legs with the rami comparatively broad and nearly equal-sized in the 3 anterior pairs; inner ramus of 4th pair however somewhat reduced in size, and composed of only 2 joints, the distal one provided with 2 unequal spines on the tip. Last pair of legs with the free joint comparatively small, bisetose. Ovisacs in female very large.

Remarks.—This genus was established by Thorell as early as the year 1860, to include 4 species found by him in the branchial cavity of various Ascidians. I have been enabled to identify all these species, and they will be here described and figured in detail, together with 4 additional forms, making in all no less than 8 different species belonging to the Norwegian Fauna. In spite of this considerable number of species, the genus is here taken in a much more restricted sense than is done by most other authors, who refer to it forms which in my opinion evidently are not congeneric. Some of these aberrant forms have certainly been separated by Claus and Canu as types of nearly-allied genera; but I think that this generic separation must be carried still further. The peculiar rudimentary condition of the caudal setæ observed in the species described by Thorell cannot however properly be regarded as a character of generic value, but is evidently due to the sedentary habits of these forms within the branchial cavity of Ascidians. In 3 of the species described below, these setæ, as shown by the figures, are quite normally developed; and it is very likely that the said species do not at all have their abode within Ascidians, but are true ecto-parasites, as has indeed been proved as regards at least one of them *(L. agilis)*.

79. Lichomolgus albens, Thorell.

(Pl. LXXXIII).

Lichomolgus albens, Thorell, Bidrag til Kännedomen om Krustaceer som lefva i Arter af slägtet Ascidia, p. 69, Pl. X, XI, XII: 15.

Specific Characters—Female. Body moderately slender, with the anterior division rather dilated in front and pronouncedly applanated. Cephalic segment broadly expanded, and exhibiting in its posterior part dorsally a

well-marked transverse suture, indicating the boundary between the 1st trunk-segment and the cephalon. The 3 succeeding segments gradually diminishing in size, with the epimeral plates rounded off and, as a rule, discontiguous, being separated by well-marked lateral incisions. Last trunk-segment very small, not nearly as broad as the genital segment. Tail somewhat exceeding half the length of the anterior division; genital segment fully as long as the 3 succeeding segments combined, and having its anterior part considerably dilated and rather sharply marked off from the posterior; anal segment not attaining the length of the 2 preceding segments combined, and scarcely longer than it is broad. Caudal rami of moderate length and sublinear in form, equalling in length about the last 2 segments combined, and scarcely at all divergent; seta of outer edge well marked and attached near the middle; apical setæ much reduced in size, the 2 middle ones terminating in a very delicate smooth filament obtuse at the tip. Anterior antennæ rather slender, about equal in length to the cephalon, and clothed with scattered curved setæ of moderate length; 1st joint considerably dilated; 2nd joint about the length of the 2 succeeding joints combined; 4th joint longer than the 5th, which equals the 6th in length; last joint very small. Posterior antennæ moderately strong, with the 2nd joint longer than the outer 2 combined; penultimate joint short and very oblique, with 3 small bristles in front; terminal joint slightly dilated in the middle and armed on the tip with 2 somewhat unequal claws, the outer one shorter, but stronger, than the inner. Maxillæ with the terminal lappet very slender and finely ciliated on both edges, palp rather small, bisetose, with a slight notch inside the tip. Anterior maxillipeds with the proximal spinule of the apical lash much coarser than the others. Natatory legs with the rami rather broad; terminal joint of the outer one carrying outside in the 2 anterior pairs 3, in the 2 posterior pairs 2 spines, those in the 1st pair coarsely denticulate in front; terminal joint of inner ramus with only a single spine in the 1st pair and 3 spines in the 2 succeeding pairs; inner ramus of 4th pair somewhat longer than the first 2 joints of the outer combined; distal joint attenuated, with the apical spines rather slender. Last pair of legs extremely small, being represented on each side by a minute sub-cylindric joint with 2 slightly unequal bristles on the tip. Ovisacs very large, extending far beyond the end of the tail, and oblong, or nearly cylindric in form.

Male of much smaller size than female, and having the anterior division of the body less dilated. Tail, as usual, composed of 5 well-defined segments, the foremost of which (the genital segment) is very large and tumid for the reception of the 2 spermatophores. Posterior maxillipeds powerfully developed,

with the dactylus very long and abruptly curved in the middle, tip minutely hamate.

Body in both sexes semipellucid, of a whitish hue; ovarial tubes and ovisacs in female of an opaque pure white colour; eye bright red.

Length of adult female amounting to 1.50 mm.; that of male scarcely attaining 1 mm.

Remarks.—This form has been very carefully described and figured by Thorell in his above-mentioned paper, and, as it is that species which is placed at the head, it ought to be regarded as the type of the present genus.

Occurrence.—I have taken this form from the branchial cavity of various Ascidians captured on the south and west coasts of Norway, most frequently perhaps from that of *Corella paralellogramma*. It is generally found attached between the lamellæ of the branchial sac; but it may easily change its place. When detached, it swims about in the usual cyclopoid manner, though by no means very rapidly. Owing to its pale semipellucid body, it is not easy to detect, except when loaded with the large ovisacs, the opaque white colour of which at once strikes the eye.

Distribution.—Bohuslän (Thorell), British Isles (Scott), ? coast of France (Canu), Mediterranean (Della Valle).

80. Lichomolgus forficula, Thorell.

(Pl. LXXXIV).

Lichomolgus forficula, Thorell, l. c. p. 73, Pl. XII, XIII: 19.

Specific Characters.—Female. Body comparatively more slender than in the type species, with the anterior division more regularly oval in outline, the greatest width occurring at about the middle, 1st trunk-segment very distinctly defined from the cephalon; last segment small, though scarcely narrower than the genital segment. Tail very slender, even exceeding in length the anterior division; genital segment slightly dilated in front of the middle, with the anterior part not sharply marked off from the posterior; anal segment very long and narrow, attaining half the length of the preceding part of the tail, and more than twice as long as it is broad. Caudal rami exceedingly slender and elongated, considerably exceeding half the length of the remainder of the tail, and somewhat bent in front of the middle, carrying at this place dorsally 2 juxtaposed delicate bristles, one of them apparently answering to the seta of the outer edge in *L. albens;* distal part of the rami very narrow and attenuated, curving generally slightly outwards; apical setæ, as in *L. albens,*

much reduced in size. Anterior antennæ comparatively shorter than in that species, scarcely attaining the length of the cephalon, but having some of the setæ rather longer; 1st joint less broad; 2nd somewhat longer than the 2 succeeding joints combined, and slightly curved; 4th joint about the length of the 5th, which equals in length the 2 outer joints combined. Posterior antennæ shorter and stouter than in *L. albens*, with the 2nd joint rather thick and not attaining the length of the 2 outer joints combined; apical claws 2 in number, both rather strong, the outer one being much the longer. Maxillæ with the terminal lappet abruptly bent at the base and edged with rather long cilia, especially at the basal curvature; palp with a small additional seta inside the other 2. Anterior maxillipeds with none of the spinules of the apical lash particularly strong. Natatory legs on the whole resembling in structure those in the type species; spines of outer ramus in 1st pair however broadly marginate, dagger-shaped. Inner ramus of 4th pair of legs scarcely longer than the first 2 joints of the outer combined; distal joint oblong oval in form, with the inner edge evenly curved, apical spines comparatively short, the outer one scarcely half as long as the inner. Last pair of legs with the free joint small, though a little more produced than in *L. albens*, and slightly curved. Ovisacs oblong oval in form and extending scarcely as far as the caudal rami.

Male exhibiting the usual sexual differences from the female.

Colour whitish, pellucid.

Length of adult female amounting to 1.40 mm.; that of male to about 1 mm.

Remarks.—This form is at once recognised by the very slender tail, the elongate anal segment, and the peculiar structure of the caudal rami. It also differs conspicuously from *L. albens* in some of the structural details, and more particularly in the form and armature of the posterior antennæ.

Occurrence.—I have taken this form not unfrequently from the branchial cavity of *Ascidia mentula* and *canina* captured in different places on the south and west coasts of Norway. Thorell obtained it only from the last-named Ascidian.

Distribution.—Bohuslän (Thorell), British Isles (Brady).

81. Lichomolgus marginatus, Thorell.

(Pl. LXXXV).

Lichomolgus marginatus, Thorell, l. c., p. 71, Pl. XII: 18.

Specific Characters.—Female. General form of body somewhat resembling that of *L. albens,* the cephalic segment being considerably expanded and much broader than the succeeding ones. No trace however of any subdivision of this segment is to be detected. Tail rather slender, though not fully attaining the length of the anterior division; genital segment sub-fusiform in shape, being slightly dilated in the middle, with no sharp demarcation between the anterior and posterior parts; anal segment somewhat exceeding in length the 2 preceding segments combined, and considerably longer than it is broad. Caudal rami slender and narrow, attaining about half the length of the remainder of the tail, and only slightly divergent, tapering gradually to an obtuse point, each of them having in front of the middle a very delicate bristle arising from the dorsal face; apical setæ extremely small and rudimentary, almost obsolete. Anterior antennæ of moderate length, and on the whole agreeing in structure with those in *L. forficula.* Posterior antennæ also rather similar, though somewhat more elongated; apical claws longer and thinner, the anterior one, as in that species, fully twice as long as the posterior. Maxillæ with the terminal lappet less abruptly bent at the base, and having the marginal cilia shorter and more densely crowded; palp very small with only 2 setæ on the tip. Maxillipeds scarcely differing in structure from those in *L. forficula.* Natatory legs also very similar; distal joint of inner ramus in 4th pair, however, somewhat less broad. Last pair of legs with the free joint rounded oval in form. Ovisacs large, though extending only slightly beyond the caudal rami.

Body of the usual whitish colour.

Length of adult female 1.30 mm.

Remarks.—The present species somewhat resembles in the general form of the body *L. albens,* from which it is however at once distinguished by the absence of any dorsal suture on the cephalic segment, as also by the form of the genital segment (in female) and of the caudal rami. In the structural details it evidently comes nearer to *L. forficula* than to *L. albens,* as shown by the figures given on the accompanying plate.

Occurrence.—Only a few female specimens of this form have as yet come under my notice. They were selected from a number of specimens of *L. forficula,* collected at different times and in different localities. I cannot,

of course, state from which form of Ascidians these specimens were derived. Thorell, who is the only author by whom this species has hitherto been observed, obtained it from the branchial cavity of *Ascidia venosa,* and more rarely from that of *A. canina.*

Distribution. Bohuslän (Thorell).

82. Lichomolgus furcillatus, Thorell.

(Pl. LXXXVI).

Lichomolgus furcillatus, Thorell, l. c., p. 74, Pl. XIII: 20.

Specific Characters.—Female. Body comparatively less slender than in the 3 preceding species, with the anterior division sub-pyriform in outline. Cephalic segment moderately expanded, and exhibiting behind a well-marked transverse suture. Tail scarcely exceeding half the length of the anterior division; genital segment comparatively large and somewhat dilated in the middle, with the anterior and posterior parts well marked off from each other laterally; anal segment rather small, broader than it is long. Caudal rami not much produced, scarcely exceeding in length the last 2 segments combined, and of nearly equal width throughout; seta of outer edge well marked and attached at about the middle; apical setæ less rudimentary than in the preceding species, though scarcely ciliated, the inner mediate one almost as long as the corresponding ramus; dorsal bristle well marked and attached near the end. Anterior antennæ about the length of the cephalon, and of the usual appearance. Posterior antennæ resembling in structure those in *L. albens,* except that the proximal bristle of the penultimate joint is replaced by a strong spine. Oral parts on the whole normal. Natatory legs likewise built on the very same type as in the preceding species. Inner ramus of 4th pair of legs somewhat longer than the first 2 joints of the outer combined; distal joint, as in *L. albens,* attenuated in its outer part, and having the inner apical spine rather long. Last pair of legs with the free joint comparatively larger than in the preceding species, and exhibiting a well-marked notch in the middle of the outer edge; both apical setæ spiniform, the posterior one the longer. Ovisacs rather large, extending far beyond the end of the tail.

Male with the posterior maxillipeds very powerfully developed, inner edge of the propodos produced in the middle to a small papilliform prominence; dactylus long and slender, being abruptly curved at some distance from the base.

Colour whitish.

Length of adult female 1.30 mm.

Remarks.—I cannot doubt that the above-described form is that recorded by Thorell as *L. furcillatus,* though the figure he gives of the female looks somewhat different from that here reproduced. On the other hand the form described (though rather imperfectly) by Brady under that name is certainly very different, and would seem, judging from the figure given of the posterior part of the body in a female specimen, to be more properly referable to the genus *Macrocheiron,* to be treated of farther on. Though nearly related to the 3 preceding species, the present one may be easily distinguished by the comparatively much shorter caudal rami and the form of the genital and anal segments. The free joint of the last pair of legs also differs conspicuously both in shape and armature.

Occurrence.—I have only met with this form in a single locality situated in the upper part of the Christiania Fjord. All the specimens were taken from the branchial cavity of *Styela intestinalis.* Thorell obtained his specimens from the same Ascidian.

Distribution.—Bohuslän (Thorell), ? Scottish coast (Scott).

83. Lichomolgus Canui, G. O. Sars, n. sp.

(Pl. LXXXVII).

Syn: *Lichomolgus albens,* Canu (not Thorell).

Specific Characters.—Female. Body of shorter and stouter form than in any of the preceding species, with the anterior division oblong oval in outline. Cephalic segment not much expanded, being scarcely broader than the succeeding segment, and exhibiting behind a well-marked transverse suture. Tail about equalling in length the cephalic segment, and of a somewhat robust appearance; genital segment rather large and massive, being considerably tumified, with the anterior part slightly marked off from the posterior; anal segment scarcely larger than the preceding one. Caudal rami about twice as long as the anal segment, and somewhat divergent, being of almost equal width throughout; seta of outer edge attached a little beyond the middle; apical setæ somewhat resembling those in *L. furcillata,* being less rudimentary than in the type species. Anterior antennæ about the length of the cephalon, and somewhat less slender than in *L. albens.* Posterior antennæ resembling in structure those in the said species, but having the apical claws comparatively longer. Oral parts scarcely differing in structure from those in *L. albens.* Natatory legs also rather similar; distal joint of inner ramus in 4th pair how-

ever less attenuated in its outer part. Last pair of legs with the free joint comparatively broader than in *L. albens,* its posterior edge forming a conspicuous bulge; apical setæ more unequal, the inner one rather short and spiniform. Ovisacs oblong oval in form and somewhat divergent, extending only slightly beyond the end of the tail.

Colour whitish.

Length of adult female about 1 mm.

Remarks.—The above-described species agrees pretty well with the description and figures given by Canu of the form regarded by him as *L. albens* Thorell. That however this identification is erroneous, is at once proved by the figure he gives of the female, which is very unlike that given by Thorell, whereas it agrees much better with the species here described. The present form, it is true, is nearly allied to *L. albens*, but is evidently specifically distinct, as it differs not only in the general form of the body, but also in some of the structural details. It is also rather inferior in size.

Occurrence.—I have only recently become acquainted with this species, 2 or 3 female specimens of which were picked out from a number of *L. albens* collected in different localities and from various Ascidians. It is of course impossible for me to state from which form of Ascidian the said specimens were derived, or at which locality they occurred. Canu states its occurrence in 3 different Ascidians from the French coast, viz., *Styela intestinalis, Molgula socialis* and *Cynthia lurida.* In none of these Ascidians has the true *L. albens* as yet been found.

Distribution.—Coast of France (Canu).

84. Lichomolgus Poucheti, Canu.

(Pl. LXXXVIII).

Lichomolgus Poucheti, Canu, Copépodes du Boulonnais, p. 231, Pl. XXIII, figs. 5–12.

Specific Characters.—Female. Body somewhat resembling in shape that in *L. Canui,* though having the anterior division comparatively broader and regularly oblong oval or elliptical in outline. Cephalic segment large, though not much expanded, and narrowly rounded in front, exhibiting behind dorsally a well-marked transverse suture. Tail comparatively short, only slightly exceeding half the length of the anterior division; genital segment not attaining the length of the 3 succeeding segments combined, and rather tumid in its anterior part, the greatest width equalling the length; anal segment about as long as the 2 preceding segments combined. Caudal rami not much produced,

scarcely exceeding in length the anal segment, and slightly divergent; seta of outer edge attached about in the middle; apical setæ normally developed and finely ciliated, the inner mediate one about the length of the tail without the caudal rami; seta of inner corner considerably longer than that of the outer. Anterior antennæ moderately slender, about equalling in length the cephalon, and of the usual structure. Posterior antennæ with the 2nd joint scarcely as long as the outer 2 combined; penultimate joint with the distal bristle transformed into a claw-like spine; apical claws not particularly strong and 4 in number, increasing successively in length inwards, the innermost one rather slender, almost setiform. Maxillæ with the terminal lappet rather slender and edged inside with a finely striated lamella, at the base of which a small denticle is attached; palp comparatively larger than in most other species and projecting at the end, inside the apical setæ, to an angular corner, in front of which a very small additional seta is attached. Anterior maxillipeds with the proximal spinules of the apical lash much coarser than the others. Natatory legs with the spines attached outside the outer ramus rather small, 3 such spines occurring on the terminal joint, except in the 4th pair; inner ramus of this pair scarcely as long as the first 2 joints of the outer combined, and having the distal joint considerably narrowed in its outer part; apical spines very unequal in length. Last pair of legs with the free joint short cylindric in form; inner apical seta spiniform and much shorter than the outer. Ovisacs large, narrow oblong, or almost cylindric in form, and extending far beyond the end of the tail.

Body pellucid, with a slight yellow or orange tinge.

Length of adult female 0.90 mm.

Male unknown.

Remarks. I cannot doubt that the above-described form is identical with the species recorded by Canu as *L. Poucheti*, though some small differences may be found, on comparing the figures here given with those reproduced by Canu. It differs from all the 5 preceding species in the perfectly normal development of the caudal setæ, indicating its freer existence as a true ectoparasite.

Occurrence.—Only 2 female specimens of this form have as yet come under my notice. The one of them was taken many years ago off the west coast of Norway, at Skjerjehavn, the other at Risör on the south coast. Both specimens were found in the free condition among dredged material procured from moderate depths. Canu found this form as a semi-parasite on the sur-

face of large colonies of *Morchallium argus* M. Edw. and *Fragarium arcolatum* Giard.

Distribution.—Coast of France (Canu).

85. Lichomolgus tenuifurcatus, G. O. Sars, n. sp.

(Pl. LXXXIX).

Specific Characters.—Female. Body a little more slender than in the last-described species, with the anterior division broadly oval in outline and pronouncedly depressed. Cephalic segments rather broad behind, but gradually narrowed in front, and exhibiting dorsally a well-marked transverse suture, as a boundary between the cephalon and the 1st trunk-segment, this boundary being also indicated by a slight instriction of the lateral edges. Tail rather slender, considerably exceeding half the length of the anterior division; genital segment fully as long as the 3 remaining segments combined, and rather tumid in its anterior part; anal segment about the length of the 2 preceding segments combined. Caudal rami considerably produced, being more than twice as long as the anal segment and slightly divergent, their distal part conspicuously narrowed; seta of outer edge atttached somewhat beyond the middle; apical setæ normally developed, the inner mediate one more than twice as long as the outer, and having its distal part somewhat bent outwards; seta of inner corner only slightly longer than that of the outer. Integuments rather thin and soft. Anterior antennæ scarcely as long as the cephalon, and built in the usual manner, last joint very small. Posterior antennæ resembling in structure those in *L. Poucheti,* having a claw-like spine at the end of the penultimate joint, and 4 apical claws, the innermost long and narrow. Oral parts and legs likewise rather similar. Ovisacs very large, oblong in form, and extending far beyond the end of the tail.

Body of a dark grey colour, with a slight yellow tinge, and the ovarial tubes more opaque.

Length of adult female 1.40 mm.

Male unknown.

Remarks.—The present new species is nearly related to *L. Poucheti,* as regards its structural details, but is of considerably larger size, and moreover at once distinguished by the much more produced and narrower caudal rami, a character which indeed has given rise to the specific name here proposed.

Occurrence.—Some few female specimens of this form were taken many years ago on the west coast of Norway, at Eggesbønæs, and last summer I

obtained 2 additional specimens, the one ovigerous, at Risör on the south coast. All the specimens were found in the free condition among dredged material procured from moderate depths. Although the integuments are of a rather thin and soft consistency, somewhat similar to that found in the species which live in Ascidians, I have little doubt that the present form, like *L. Poucheti*, is in reality ectoparasitic in habits, since the caudal setæ do not, as in those species, exhibit any obliteration, but are quite normally developed. It remains to be ascertained, however, what animals are at times infested by the present species.

86. Lichomolgus agilis, (Leydig).

(Pl. XC).

Doridicola agilis, Leydig, Zeitschr. f. wissensch. Zoologie, Vol. IV, p. 377, Pl. XIV.

Syn: *Eolidicola tenax*, M. Sars.
" *Lichomolgus doridicola*, Claus.
" " *chromodoridis*, Della Valle.
" " *coccinnus*, Scott.

Specific Characters.—Female. Body comparatively short and stout, with the anterior division very much dilated, and rounded oval in outline. Cephalic segment large and evenly rounded in front, exhibiting behind a well marked transverse suture. Tail scarcely attaining half the length of the anterior division; genital segment considerably dilated in its anterior part, and about the length of the 3 succeeding segments combined; anal segment scarcely larger than the preceding one. Caudal rami quite short, not even attaining the length of the anal segment and scarcely longer than they are broad; seta of outer edge attached near the end; apical setæ well developed, the inner mediate one being fully as long as the tail; seta of inner corner about twice the length of that of the outer. Anterior antennæ very slender, exceeding in length the cephalon, and having the outer 4 joints remarkably long and narrow. Posterior antennæ exceedingly powerful, 2nd joint large and muscular, exceeding a little in length the outer 2 joints combined; penultimate joint, as usual, short and oblique, with the middle bristle transformed into a claw-like spine; apical claws 2 in number, the interior one very strong and curved. Maxillæ with the terminal lappet rather produced, and forming at the base a slight expansion edged with small denticles; palp comparatively small, trisetose. Anterior maxillipeds with the apical lash less abruptly bent at the base than usual, and edged with rather slender spinules rapidly diminishing in size distally. Posterior maxillipeds with the dactylar joint short and provided outside with a well-

marked ciliated spine. Natatory legs built on the very same type as in the 2 preceding species; inner ramus of 4th pair somewhat longer than the first 2 joints of the outer combined; distal joint narrowed in its outer part, with the apical spines of moderate length. Last pair of legs with the free joint more produced than in the other species and having the apical setæ of nearly equal length, none of them spiniform. Ovisacs large, oblong in form, and extending far beyond the end of the tail.

Male, as usual, smaller than female, and having the anterior division of the body somewhat less broad, being moreover easily recognised by the greatly inflated genital segment. Posterior maxillipeds powerfully developed, with a dense row of delicate spinules along the inner edge of the propodos; dactylus slender and abruptly curved in the middle.

Body in both sexes semipellucid, with a violaceous or in some cases orange tinge.

Length of adult female about 1.20 mm., of male 0.90 mm.

Remarks.—This form was described as early as the year 1853 by Leydig under the name of *Doridicola agilis.* It has subsequently been observed by several authors, and recorded under different names. In the year 1862 my late father described it as a new form under the name *Eolidicola tenax*, being unaware of Leydig's paper, and Claus, who found that Leydig's species ought to be referred to Thorell's genus *Lichomolgus*, recorded it as *L. doridicola.* The specific name *agilis*, originally given to this form by Leydig, must however be retained, and this has also been done by Canu. The *L. concinnus* of Scott is unquestionably identical with the present species.

It is a very distinct and easily recognisable form, being especially distinguished by the very broad anterior division of the body, the comparatively short tail, and the unusually powerful posterior antennæ.

Occurrence.—I have met with this form in several places, both on the south and west coasts of Norway, and in most cases I have been enabled to prove its parasitism on various nudibranchiate Mollusca, for instance *Doris, Eolis, Polycera.* By other authors it has also been found on species belonging to the genera *Doto* and *Antiopa.*

Distribution.—Bohuslän (Aurivillius), British Isles (Scott), coast of France (Canu), Mediterranean (Claus).

Gen. 39. **Macrocheiron,** Brady, 1872.

Generic Characters.—Anterior division of body less pronouncedly depressed than in *Lichomolgus*; cephalic segment without any distinctly defined transverse suture dorsally. Tail slender, with the apical setæ normally developed. Anterior antennæ, as in *Lichomolgus,* 7-articulate. Posterior antennæ differing somewhat in structure in the various species, being generally provided with 2 apical claws, the inner of which, however, may be setiform. Maxillæ with the terminal lappet conspicuously expanded at the base, and the apical lash more or less sharply marked off; palp with 3 or 4 small setæ on the end. Anterior maxillipeds with the apical lash less slender and less abruptly bent at the base than in *Lichomolgus.* Posterior maxillipeds in female comparatively small, in male very powerfully developed, with the dactylus slender falciform. Natatory legs with the inner ramus in the 3 anterior pairs well developed and longer than the outer, in the 4th pair, however, much reduced in size and composed of only 2 joints, which in some cases may be wholly confluent. Last pair of legs with the free joint very long and slender, curving backwards, and provided at the end inside with a slender spine, outside with a much shorter simple bristle. Ovisacs much smaller than in *Lichomolgus.*

Remarks.—This genus was proposed in the year 1872 by Brady, to include a species (*M. fucicolum*) found by him on the coast of Northumberland. The genus was subsequently withdrawn by the same author, and the species upon which it was founded referred to the genus *Lichomolgus* of Thorell. I think however that there are reasons for restoring the genus in question, as it exhibits several well-marked distinguishing characters indicated in the above diagnosis. Two well-defined Norwegian species referable to this genus will be described in the sequel, and I have also had an opportunity of examining a 3rd species obtained during the Monaco-Expedition from the Sargasso Sea. Moreover several of the exotic species described by A. Scott and referred by him some to the genus *Lichomolgus* and some to the genus *Pseudanthessius,* may more properly be included in the present genus.

87. Macrocheiron fucicolum, Brady.

(Pl. XCI).

Macrocheiron fucicolum, Brady, Nat. Hist. Trans. Northumberland and Durham, Vol. IV, p. 434, Pl. XVIII, figs. 9—18.

Syn: *Lichomolgus fucicolus,* Brady.

Specific Characters.—Female. Body moderately slender, with the anterior division not much dilated, being regularly oblong oval in outline, and

rather strongly vaulted dorsally. Cephalic segment about twice as long as the 3 succeeding segments combined, and scarcely exhibiting the slightest trace of a dorsal suture; rostral prominence well defined and pointed at the end. Tail only slightly exceeding half the length of the anterior division; genital segment rather large, occupying almost half the length of the tail, and conspicuously dilated in front of the middle; anal segment scarcely as long as the preceding one. Caudal rami not much produced, though somewhat longer than the anal segment, and only very slightly divergent; seta of outer edge attached at a short distance from the end; apical setæ not much produced, the inner mediate one only slightly exceeding half the length of the tail. Anterior antennæ moderately slender and clothed with scattered comparativeiy short setæ; 2nd joint, as usual, the longest, though scarcely attaining the length of the 2 succeeding joints combined; last joint fully as long as the penultimate one. Posterior antennæ unusually short and stout, and apparently composed of only 3 joints, the outer 2 being wholly confluent; 1st and 2nd joints very massive and of about equal size, each having outside a well-marked seta; distal part of the antenna (the combined 2 outer joints) rather narrower than the proximal part, but of about the same length, and provided outside with a denticulated spine and 2 unequal setæ, at the tip with several curved setæ, one of which is somewhat stronger than the others and may represent the inner claw, the outer claw being exceedingly strong, knife-shaped and irregularly denticulate along the outer sharpened edge. Maxillary palp comparatively small but provided with 4 setæ. Anterior maxillipeds with the distal joint larger than usual; apical lash comparatively short and having the margin coarsely dentate at the base. Posterior maxillipeds rather feeble, but exhibiting a very conspicuous armature, 2 rather strong, almost claw-like spines being attached to the inner edge of the propodal joint and a similar, though smaller spine inside the dactylar joint. Natatory legs with the rami comparatively slender and having the spines narrow dagger-like; terminal joint of inner ramus in 1st pair obliquely oval in form, with the spine of the outer edge attached close to the apex. Inner ramus of 4th pair rather small, not nearly attaining the length of the first 2 joints of the outer combined, and biarticulate, proximal joint without any seta inside, distal joint slightly attenuated, with the apical spines very unequal in length. Last pair of legs with the free joint very long and narrow, slightly curved and quite smooth outside. Ovisacs oval in form and slightly divergent, extending scarcely beyond the tail.

Male, as usual, of smaller size than female, and moreover easily recognisable by the greatly inflated genital segment. Posterior maxillipeds very

powerfully developed, with the propodos large and fringed inside with a dense row of delicate spinules; dactylus slender falciform and abruptly bent at the base.

Body in female semipellucid, with a more or less distinct yellowish brown tinge, and the segments partly edged behind with a light rosy pigment; ovarial tubes and ovisacs dark green.

Length of adult female amounting to 1.20 mm., of male to 0.90 mm.

Remarks. This form was recorded as early as the year 1872 by Brady under the above name, and was subsequently redescribed by the same author in his well-known Monograph as a species of the genus *Lichomolgus*. It is an easily recognisable form, differing from most other Lichomolgidæ, both as to the general appearance and to the structure of some of the appendages, for instance the posterior antennæ.

Occurrence. I have taken this form in many places, both on the west and south coasts of Norway, as also in the upper part of the Christiania Fjord. It is generally found in moderate depths among algæ and other marine growths, and always in the free condition. Indeed, it is not improbable that, as suggested by Brady, it derives its food to a great extent from the juices of the algæ or from small particles licked up from the surface of their fronds.

Distribution—British Isles (Brady).

88. Macrocheiron hirsutipes (Scott).

(Pl. XCII).

Lichomolgus hirsutipes, Scott, Eleventh Ann. Rep. of the Fishery Board for Scotland, Part III, p. 206, Pl. IV, figs. 1—12.

Specific Characters.—Female. Body a little more slender than in the preceding species, though having the anterior division comparatively broader and less vaulted. Cephalic segment large, fully twice as long as the 3 succeeding segments combined, and exhibiting a very slight indication of a transverse suture behind. Last trunk-segment very narrow and sharply marked off form the preceding one. Tail rather slender, considerably exceeding half the length of the anterior division; genital segment comparatively large and dilated in front of the middle, with the posterior cylindric part sharply marked off from the anterior; anal segment a little larger than the preceding one. Caudal rami resembling in structure those in the type species. Anterior antennæ also rather similar, though somewhat more elongated, with the penultimate joint longer than the terminal one. Posterior antennæ rather unlike those in the

type species, being much more slender, and having all 4 joints well defined; 2nd joint considerably longer than the 1st, and about equal in length to the last 2 combined; penultimate joint, as usual, quite short and provided at the outer distal corner with a slender spine and 2 unequal setæ; terminal joint narrow cylindric in form, and armed at the tip with 2 simple subequal claws accompanied by a number of small setæ. Maxillar palp with only 3 setæ. Anterior maxillipeds with the distal joint less robust than in the type species. Posterior maxillipeds comparatively thicker, with only 2 simple unequal setæ inside the propodal joint. Natatory legs on the whole resembling in structure those in the type species; inner ramus of 4th pair, however, comparatively larger, exceeding in length the first 2 joints of the outer combined, and having a well-marked, though rather short seta inside the proximal joint. Last pair of legs with the free joint considerably produced and strongly curved, its outer face densely hairy.

Body semipellucid with a slight yellow or orange tinge.

Length of adult female 1.30 mm.

Remarks.—The present form, described by Scott as a species of the genus *Lichomolgus,* is unquestionably congeneric with the preceding species, though differing conspicuously in the structure of the posterior antennæ. The specific name given to it refers to the peculiar hairy coating, in the female, of the free joint of the last pair of legs.

Occurrence.— Only 3 female specimens of this form have hitherto come under my notice. One of them was taken many years ago on the west coast of Norway, at Eggesbønæs, the other 2 at Risør, on the south coast. All 3 specimens were found in the free condition among dredged material taken up from moderate depths.

Distribution.—Scottish coast (Scott), Novaja Zemlja (Scott).

Gen. 40. **Pseudanthessius,** Claus, 1889.

Generic Characters.—Body of rather varying form in the different species, with the anterior division more or less expanded and well marked off from the posterior. Cephalic segment with only slight traces of a subdivision. Anterior antennæ of normal structure, 7-articulate. Posterior antennæ distinctly 4-articulate, with 3 apical claws, which in some cases are short, in other cases very slender, almost setiform. Maxillæ with the terminal lappet blade-like,

gradually attenuated towards the end; palp tri-setose. Maxillipeds of normal structure. Inner ramus of 4th pair of legs uniarticulate. Last pair of legs quite rudimentary, each being replaced by a simple spine accompanied by 2 small bristles.

Remarks. This genus, established by Claus, is chiefly characterised by the rudimentary condition of the last pair of legs. Another character on which still more stress has been laid by recent authors, is the reduction of the inner ramus of the 4th pair of legs to a single joint. This character is, however, not peculiar to the genus *Pseudanthessius,* but is also found in some species of the genus *Macrocheiron.* Thus in the species mentioned above from the Sargasso Sea, which in all other respects is closely allied to *M. fusicolum,* the 2 joints of this ramus are wholly coalesced; and the same is also the case with some of the Ceylon species described by A. Scott and, on account of that character, erroneously referred to the genus *Pseudanthessius.* though from the structure of the last pair of legs and other characters they must evidently be included in the genus *Macrocheiron,* as here defined. 4 Norwegian species referable to the present genus will be described below.

89. Pseudanthessius gracilis, Claus.

(Pl. XCIII).

Pseudanthessius gracilis, Claus, Arbeiten d. zool. Inst. Wien, Vol. VIII, p. 314, Pl. IV, figs. 1—7.

Specific Characters. Female. Body rather slender, with the anterior division moderately dilated and oblong oval in outline, greatest width in front of the middle. Cephalic segment large, fully twice as long as the 3 succeeding segments combined, and narrowly rounded in front. Last trunk-segment slightly produced on each side. Tail very slender, somewhat exceeding half the length of the anterior division; genital segment scarcely longer than the 3 succeeding segments combined, and gradually widening posteriorly for about $^2/_3$ of its length, then abruptly contracted, the hind third part being cylindric in form and scarcely broader than the succeeding segment; anal segment nearly twice as long as the preceding one. Caudal rami very slender and narrow, equalling in length about half the remaining part of the tail, and scarcely at all divergent; seta of outer edge attached near the middle; apical setæ rather unequal in length, the 2 middle ones being much longer than the other 2. Anterior antennæ comparatively slender and clothed with moderately long setæ; 2nd joint, as usual, the longest; terminal joint scarcely more than half as long as the penultimate one. Posterior antennæ moderately strong, with the 2nd joint

the largest, and considerably exceeding in length the outer 2 combined; apical claws rather slender and of nearly equal length, though successively coarser inwards. Maxillæ with the terminal lappet evenly attenuated and almost quite smooth. Anterior maxillipeds with the apical lash coarsely denticulated in its proximal part; lateral spine of distal joint attached near the base of the joint and accompanied by a short seta. Posterior maxillipeds rather coarse, with the 1st joint fully as long as the other 2 combined; propodal joint armed with a strong ciliated spine inside in the middle; dactylar joint claw-like, with a well-marked spine outside the base. The 3 anterior pairs of natatory legs normally developed, with the rami slightly unequal in length, the inner one being the longer; all spines coarsely denticulate. 4th pair of legs with the outer ramus more slender than in the preceding pairs, and wanting one of the spines on the terminal joint; inner ramus shorter than the first 2 joints of the outer combined, and exhibiting outside in the middle a well-marked notch; apical spines narrow dagger-shaped and rather unequal in length, the inner one being nearly twice as long as the outer. Last pair of legs, as in the other species of the present genus, replaced on each side by a spine inserted directly on the corresponding segment and accompanied by 2 small setæ, the spine in the present species being rather slender and exhibiting at the base a slight dilatation. Ovisacs not very large, fusiform in shape, and considerably divergent.

Colour yellowish brown.

Length of adult female amounting to 1.30 mm.

Male unknown.

Remarks.—This is the species upon which Claus founded his genus *Pseudanthessius,* and it ought accordingly to be regarded as the type of the present genus. In the slender form of the tail and the narrowly-produced caudal rami, this species bears much resemblance to the form recorded by Brady as *Lichomolgus Thorelli,* and indeed I at first believed the two to be identical. T. Scott, however, regards them as distinct, and the detail-figures given by Brady exhibit in reality some points of difference, especially as regards the form of the genital segment and the relative size of the inner ramus of the 4th pair of legs. A redescription of Brady's species would however be very desirable.

Occurrence.—I have met with this form occasionally in several places, both on the south and west coasts of Norway. All the specimens were of the female sex, and were found in the free condition among dredged material taken up from moderate depths.

Distribution.—British Isles (Scott), Mediterranean (Claus), Ceylon (A. Scott).

90. Pseudanthessius liber, (Brady).

(Pl. XCIV).

Lichomolgus liber, Brady, Monogr. of British Copepoda, Vol. III, p. 44, Pl. LXXXVI, figs. 1—13.

Specific Characters. Female. Body comparatively robust, with the anterior division considerably tumefied and rounded oval in outline, greatest width about in the middle. Cephalic segment very large, with a slight indication of a transverse suture behind the middle. Last trunk-segment, as usual, very sharply marked off from the preceding one and rather narrow. Tail comparatively short, scarcely attaining half the length of the anterior division; genital segment about as long as the 3 succeeding segments combined and slightly dilated in its anterior part; anal segment about the length of the preceding segment. Caudal rami rather short, scarcely longer than the anal segment, and slightly divergent; seta of outer edge attached near the end; apical setæ less unequal than in the type species, those of the outer and inner corner being well developed, though somewhat shorter than the 2 middle ones. Anterior antennæ not much elongated and only slightly attenuated, being clothed with comparatively short and thick setæ; the outer 2 joints rather small, and combined about the length of the antepenultimate one. Posterior antennæ scarcely shorter than the anterior ones and comparatively strongly built, the first 2 joints rather thick and massive, subequal in size, and combined occupying about half the length of the antenna; last joint cylindric in form, and provided at the end with several setæ in addition to the claws; the latter rather short, but somewhat unequal in size, one of them being much stronger than the other 2. Maxillæ with the terminal lappet rather produced, and fringed along the posterior edge with delicate spinules; palp with a very small seta inside, in addition to the 3 apical ones. Anterior maxillipeds with the apical lash less abruptly bent at the base than in the type species, and less coarsely denticulate at the edge. Posterior maxillipeds comparatively smaller, with only a simple seta inside the propodal joint; dactylar joint conically produced. 1st pair of natatory legs with the proximal joint of the basal part remarkably expanded outside, 1st joint of outer ramus much broader than the other 2, and having the spine of the outer edge rather produced. Inner ramus of this and the 2 succeeding pairs somewhat longer than the outer; that of 4th pair, however, scarcely as long as the first 2 joints of the outer combined, and forming a single oblong fusiform joint without any notch outside, apical spines rather unequal, the inner one being much

the longer. Last pair of legs exhibiting a rudimentary condition similar to those in the preceding species, the spine being however less slender, almost knife-shaped, and pointing backwards. Ovisacs of moderate size, oblong oval in form, and closely applied to the sides of the tail.

Male much smaller than female, and exhibiting the usual sexual differences. Dactylus of the posterior maxillipeds very slender and abruptly curved in the middle, terminating in a small knob-like dilatation.

Body in both sexes of a whitish grey colour, with a more or less distinct violaceous tinge.

Length of adult female amounting to 1.30 mm., of male to 0.90 mm.

Remarks.—This form was announced as early as the year 1875 by Brady and Robertson, and was subsequently more fully described and figured by the former author in this well-known Monograph as a species of the genus *Lichomolgus*. Canu was the first to recognise the true systematic position of this form within the genus *Pseudanthessius* of Claus. From the type of this genus, *P. gracilis*, it is at once distinguished by the short, compact shape of the body, in which respect it exhibits a perplexing similarity to an otherwise very different form, viz., *Echinocheres violaceus* belonging to the siphonostomous Cyclopoida (compare the figure here given with that of the latter form on Pl. LVIII).

Occurrence.—I have met with the present form in several places, both on the west and south coasts of Norway, as also in the upper part of the Christiania Fjord. It is not unfrequently found in the free condition among dredged material, and this indeed induced Brady to give it the rather inappropriate specific name liber. I have however, in several instances been enabled to ascertain its parasitic nature, having found it not unfrequently in considerable numbers clinging to the surface of various Echinids, for instance *Echinus sphæra* and *Strongylocentrotus dröbakiensis*.

Distribution.—British Isles (Brady), Ceylon (A. Scott).

91. Pseudanthessius assimilis, G. O. Sars, n. sp.

(Pl. XCV).

Specific Characters. Female. Very like the preceding species, but of much larger size, and having the anterior division broader in front than behind. Tail considerably exceeding half the length of the anterior division; genital segment comparatively large, and of a similar form to that in *P. liber;* anal segment, however, much (nearly twice) larger than the preceding segment.

Caudal rami also considerably more produced, being fully 3 times as long as they are broad, and scarcely at all divergent; seta of outer edge rather slender, and attached at a short distance from the end; apical setæ well developed and not very unequal. Anterior antennæ, as in *P. liber*, rather robust, and clothed with comparatively short and thick curved setæ. Posterior antennæ built on the very same type as in that species, though having the distal part comparatively more slender. Oral parts and legs almost exactly as in *P. liber*. Ovisacs comparatively large, extending considerably beyond the end of the tail.

Male with the genital segment greatly inflated and terminating on each side in an acuminate lappet. Posterior maxillipeds transformed in an altogether similar manner to that in the male of *P. liber*.

Body in both sexes of whitish colour, with a slight rosy or orange tinge.

Length of adult female amounting to 1.85 mm., of male to 1.35 mm.

Remarks.—The above-described form is closely allied to *P. liber*, and indeed at first I regarded it as only a variety of that species. On a closer examination, however, I have found that it differs in some points so decidedly as to be more properly considered specifically distinct. It is also of much larger size, as is seen from the habitus-figures of both, which are drawn on the very same scale.

Occurrence.—I have met with this form in 2 rather remote places on the Norwegian coast, viz., in the outer part of the Romsdal Fjord, at some distance from Molde, and in the inner part of Hardanger Fjord, at Sunde. In both places it was found in considerable numbers clinging to the surface of the beautiful deep-water Echinid, *Echinus elegans*, taken up from the great depth of 150–200 fathoms.

92. Pseudanthessius Sauvagei, Canu.

(Pl. XCVI).

Pseudanthessius Sauvagei, Canu, Copépodes de Boulonnais, p. 243, Pl. XXV.

Specific Characters. Female. Body comparatively short and stout, with the anterior division sub-compressed, being greatly vaulted above and, viewed dorsally, narrow oblong in outline, the greatest width scarcely exceeding half the length. Cephalic segment occupying almost $^2/_3$ of the length of the anterior division, and exhibiting scarcely any trace of a subdivision. Last trunk-segment very small. Tail not attaining half the length of the anterior division, and almost perfectly cylindrical in form; genital segment scarcely at all dilated, but rather long, occupying about half the length of the tail; anal

segment of about the same size as the preceding one. Caudal rami comparatively short, but rather broad and transversely truncated at the end, being scarcely at all divergent; seta of outer edge attached near the end; apical setæ well developed and not very unequal in length. Anterior antennæ scarcely exceeding half the length of the cephalic segment, and distinguished by the great length of some of the setæ clothing them; 2nd joint comparatively shorter and thicker than in the other species; last joint very small. Posterior antennæ rather feeble in structure, though not much shorter than the anterior; 2nd joint not attaining the length of the outer 2 combined, and finely ciliated on the inner edge; apical claws very slender and not much stronger than the accompanying setæ, the outermost being the longest. Maxillæ agreeing in structure with those in the type species. Anterior maxillipeds also rather similar. Posterior maxillipeds however less strong, with the propodal joint the longest and somewhat curved at the base, carrying inside beyond the middle a very long recurved plumose seta; dactylar joint conical in form. The 3 anterior pairs of natatory legs with the rami rather coarse and of about equal length. 4th pair with the outer ramus much more slender than in the preceding pairs and, as usual, wanting one of the spines on the terminal joint; inner ramus somewhat exceeding the length of the first 2 joints of the outer combined, and rather broader, with a small, but distinct notch outside a little in front of the middle; apical spines rather thin and nearly equal-sized, or the outer one a little longer than the inner. Last pair of legs, as in the other species, replaced on each side by a rather strong posteriorly-pointing spine and 2 small setæ.

Colour not yet ascertained.

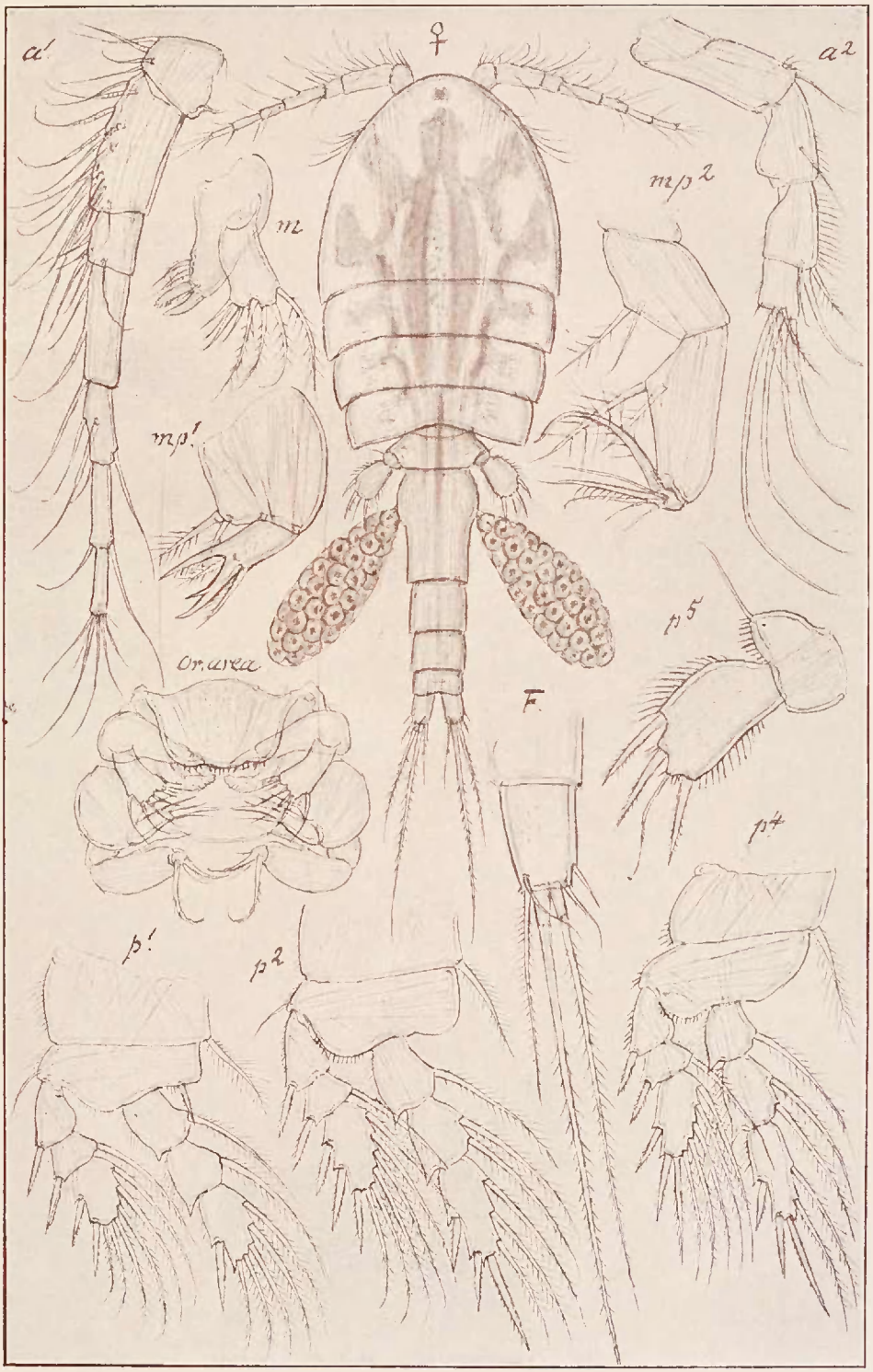
Length of the specimen examined about 1 mm.

Remarks. The above-described form agrees on the whole pretty well with the description and figures given by Canu of his species, and I cannot therefore doubt the identity of the two. It is an easily recognisable species, being especially distinguished by the peculiar compressed form of the anterior division of the body, making it rather difficult to get a dorsal view of the animal. In some of the structural details also it exhibits well-marked differences from the other species.

Occurrence. Only a solitary female specimen of this form has as yet come under my notice. It was found, some years ago, at Risör, south coast of Norway, being selected from some dredged material obtained from a depth of about 20 fathoms. Canu has stated the occurrence of this species as a parasite on the well-known Spatangoid, *Echinocardium cordatum*.

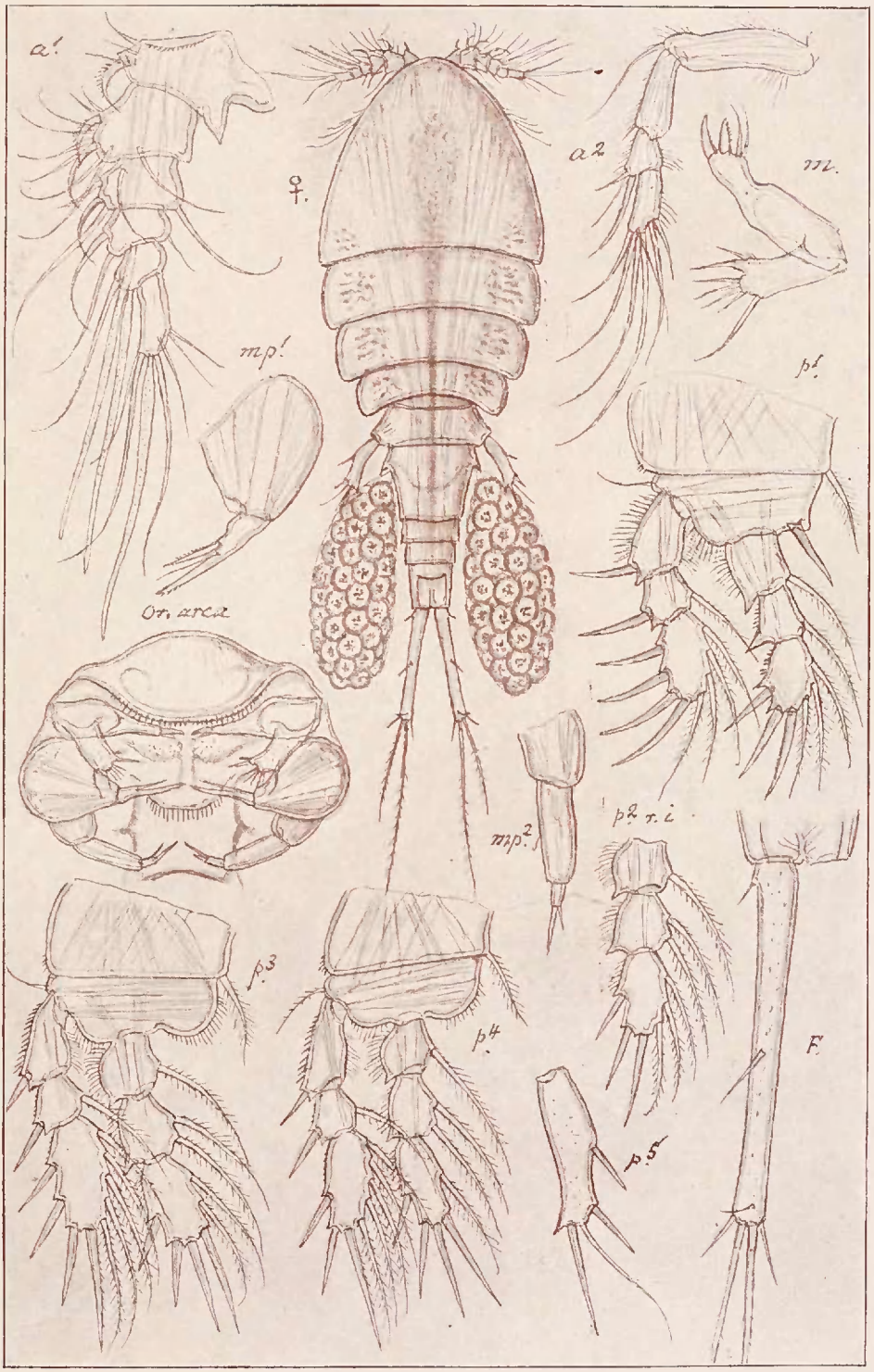
Distribution. Coast of France (Canu).

Copepoda.



G. O. Sars, del.

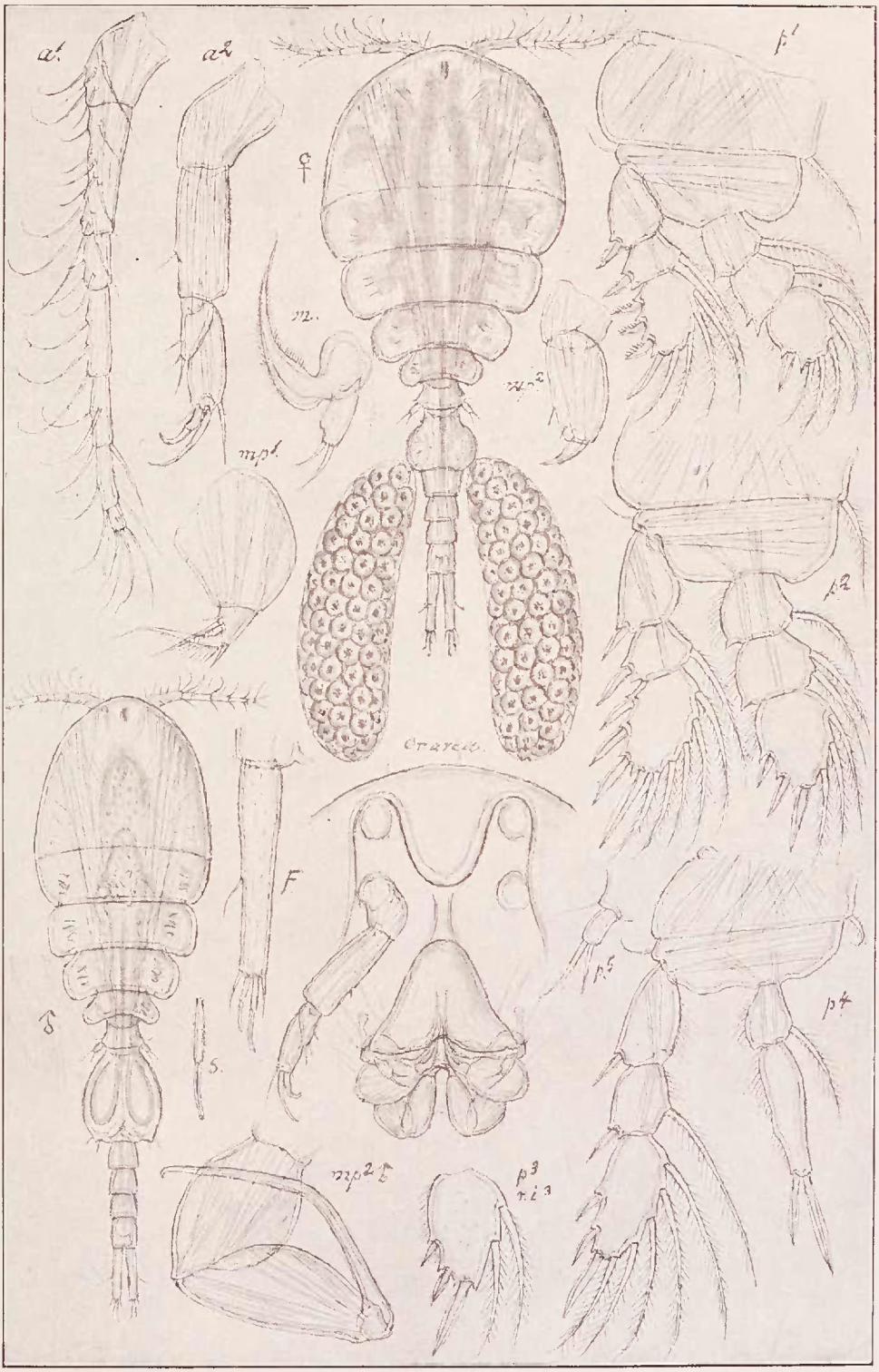
Hemicyclops purpureus, Boeck.



G. O. Sars, del.

Hippomolgus furcifer, G. O. Sars.

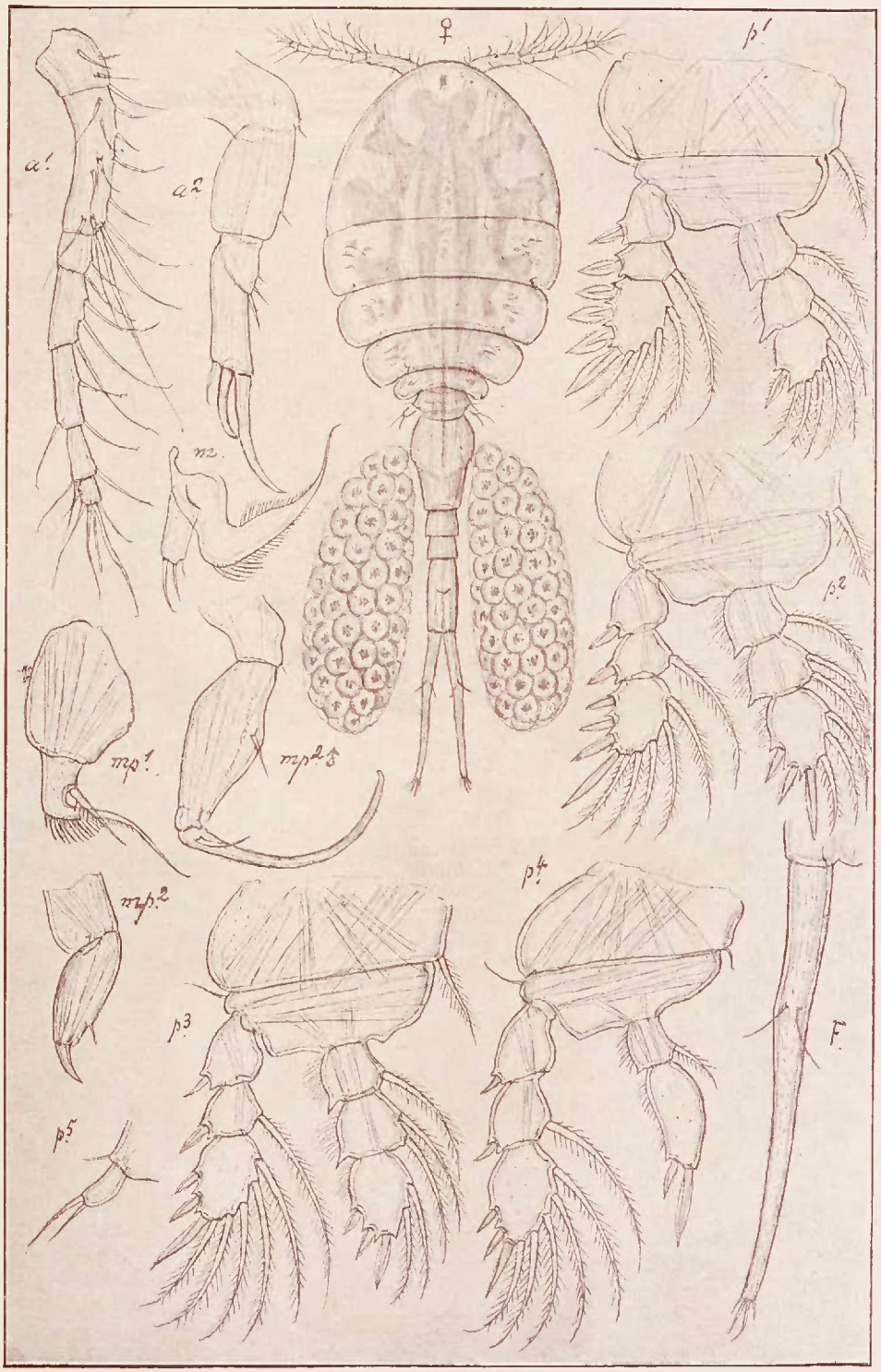
Copepoda.



G. O. Sars, del.

Lichomolgus albens, Thorell.

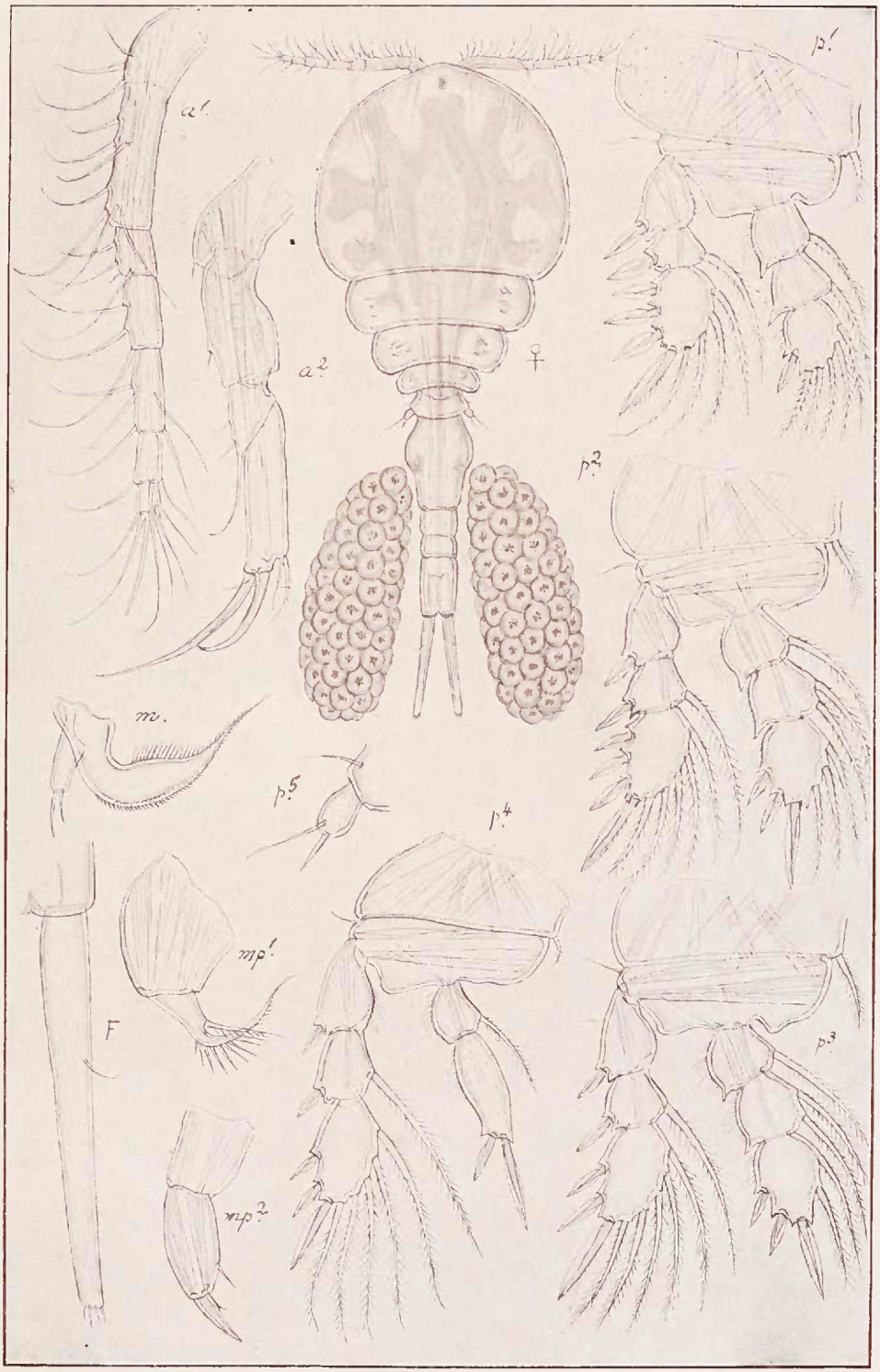
Copepoda.



G. O. Sars, del.

Lichomolgus forficula, Thorell.

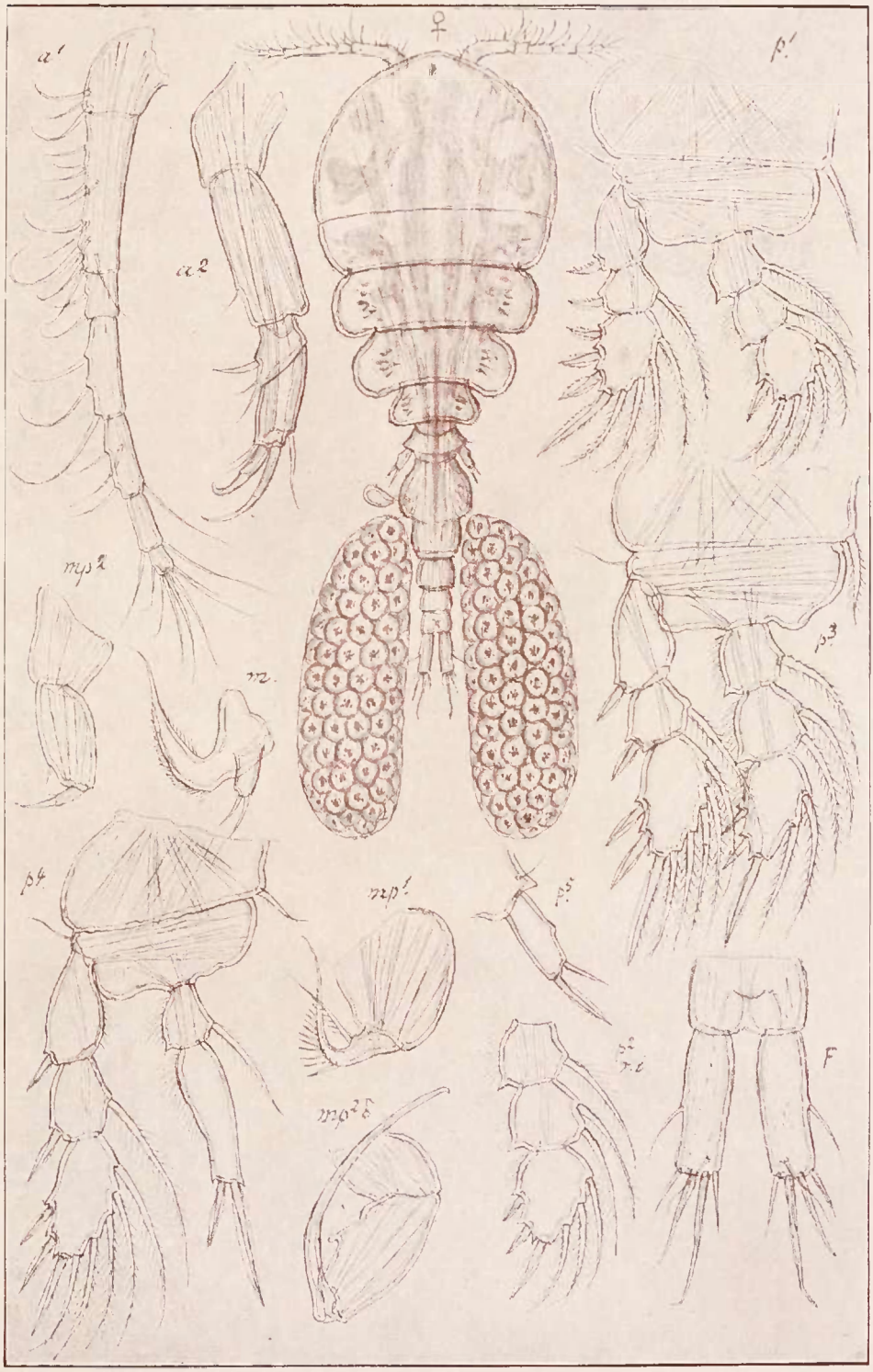
Copepoda.



G. O. Sars, del.

Lichomolgus marginatus, Thorell.

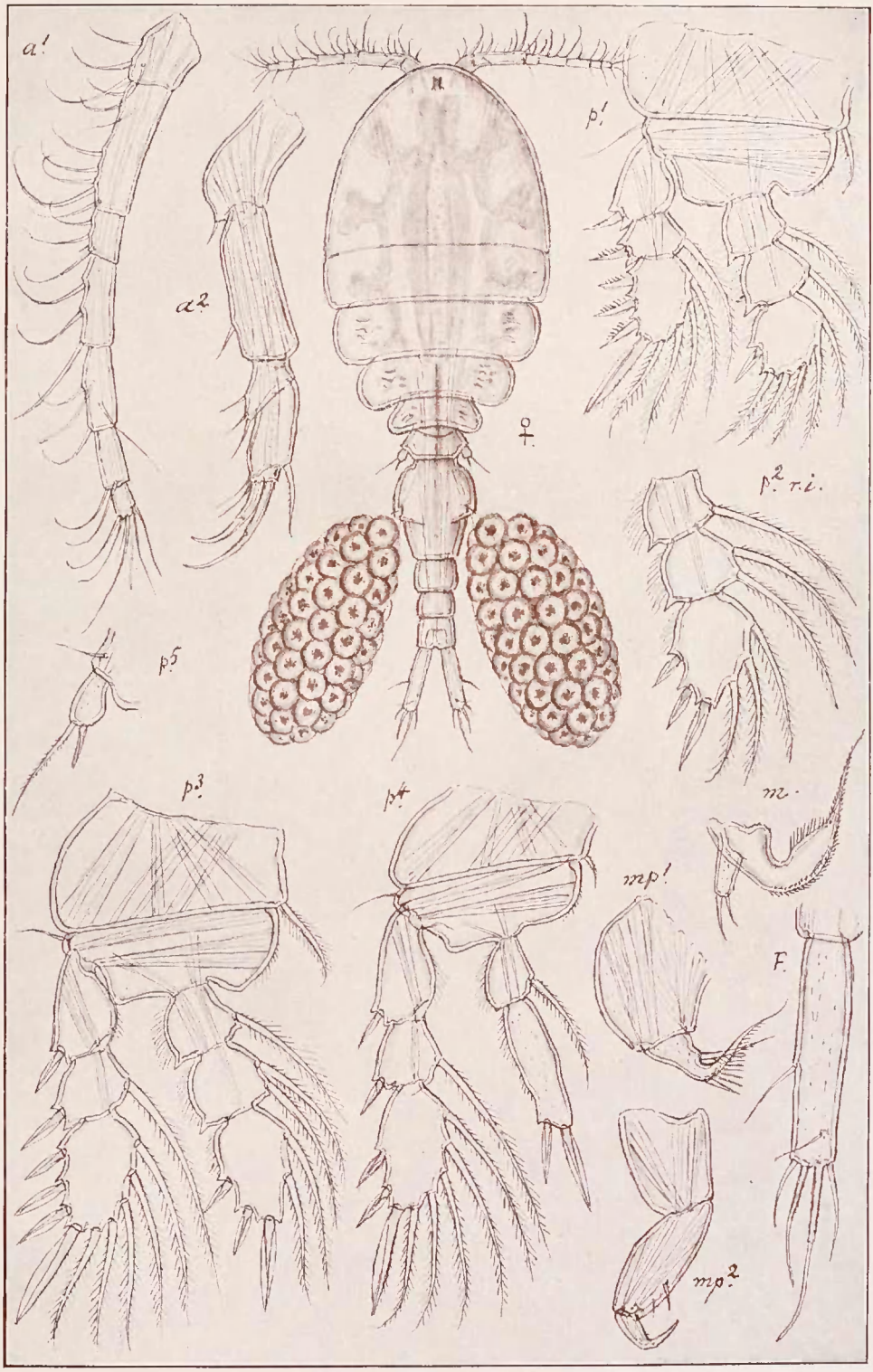
Copepoda.



G. O. Sars, del.

Lichomolgus furcillatus, Thorell.

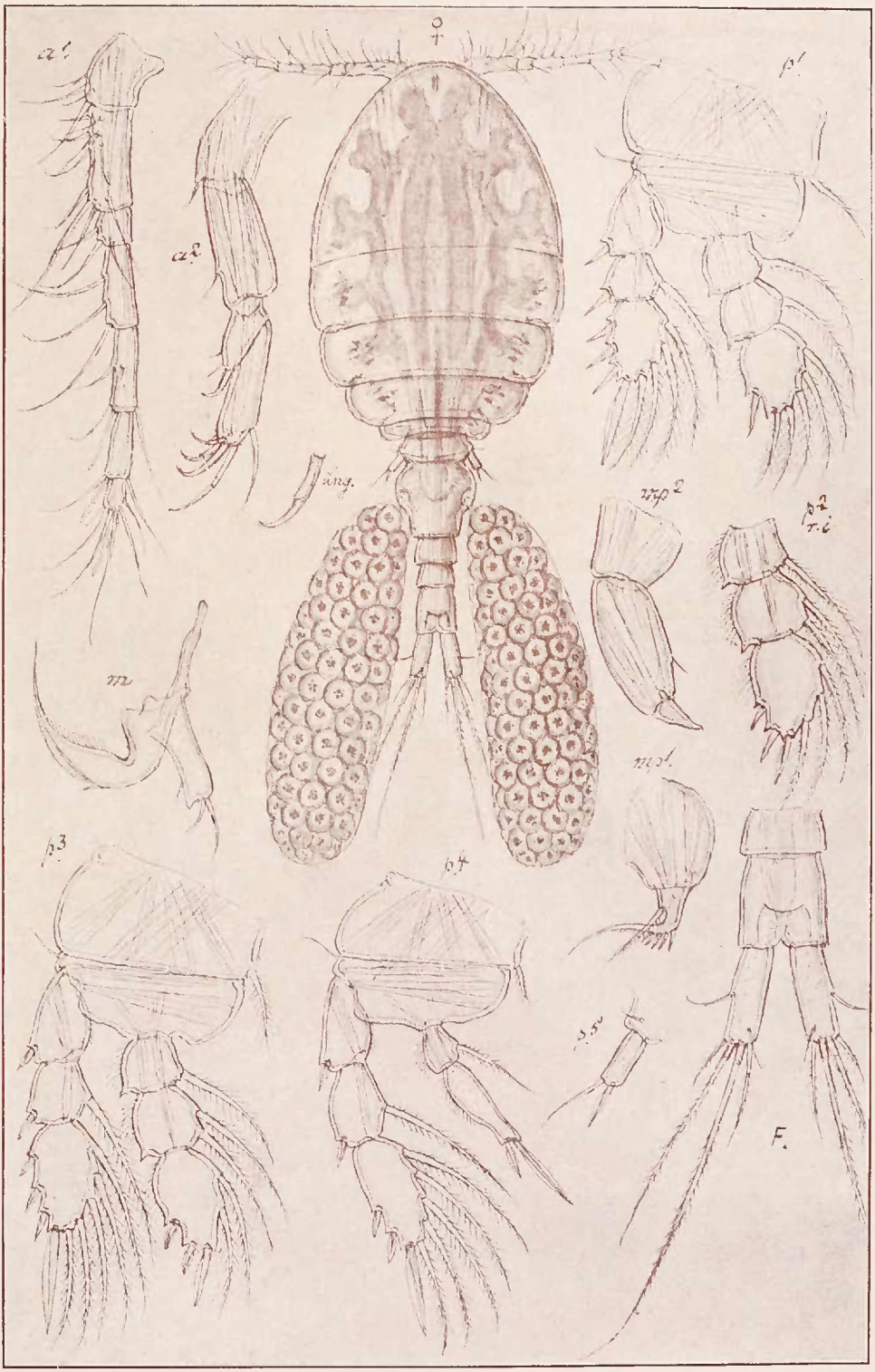
Copepoda.



G. O. Sars, del.

Lichomolgus Canui, G. O. Sars.

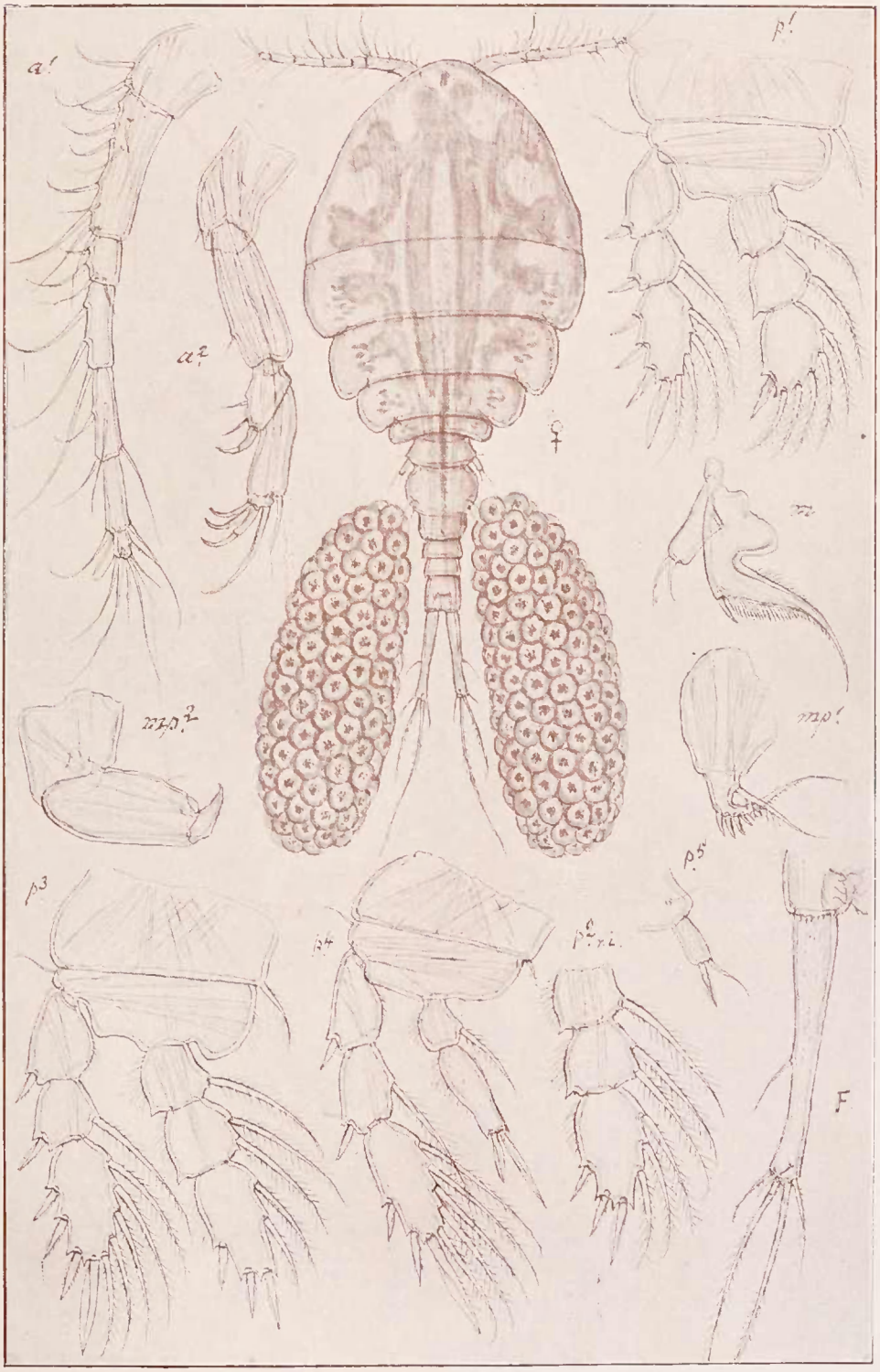
Copepoda.



G. O. Sars, del.

Lichomolgus Poucheti, Canu.

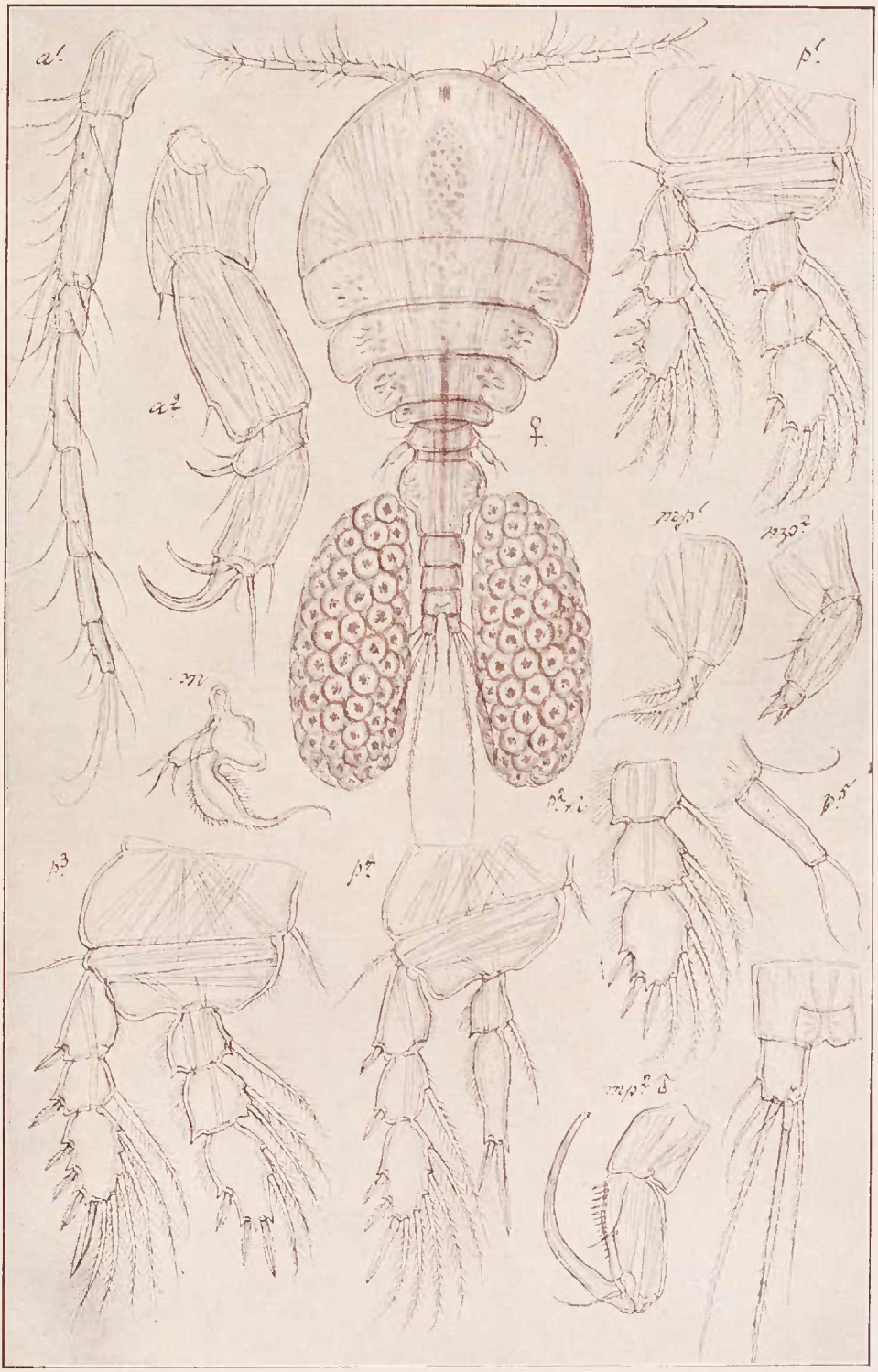
Copepoda.



G. O. Sars, del.

Lichomolgus tenuifurcatus, G. O. Sars.

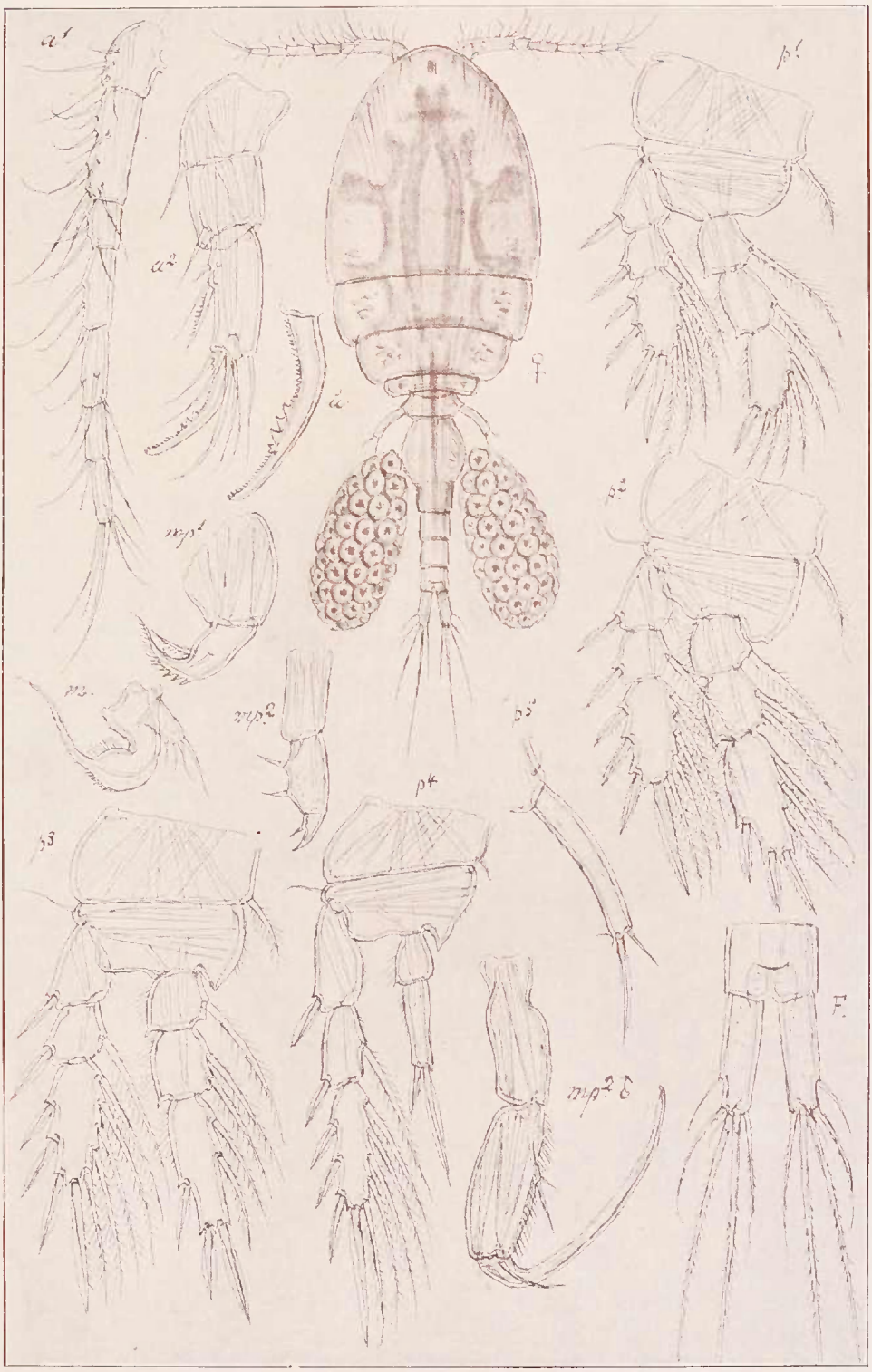
Copepoda.



G. O. Sars, del.

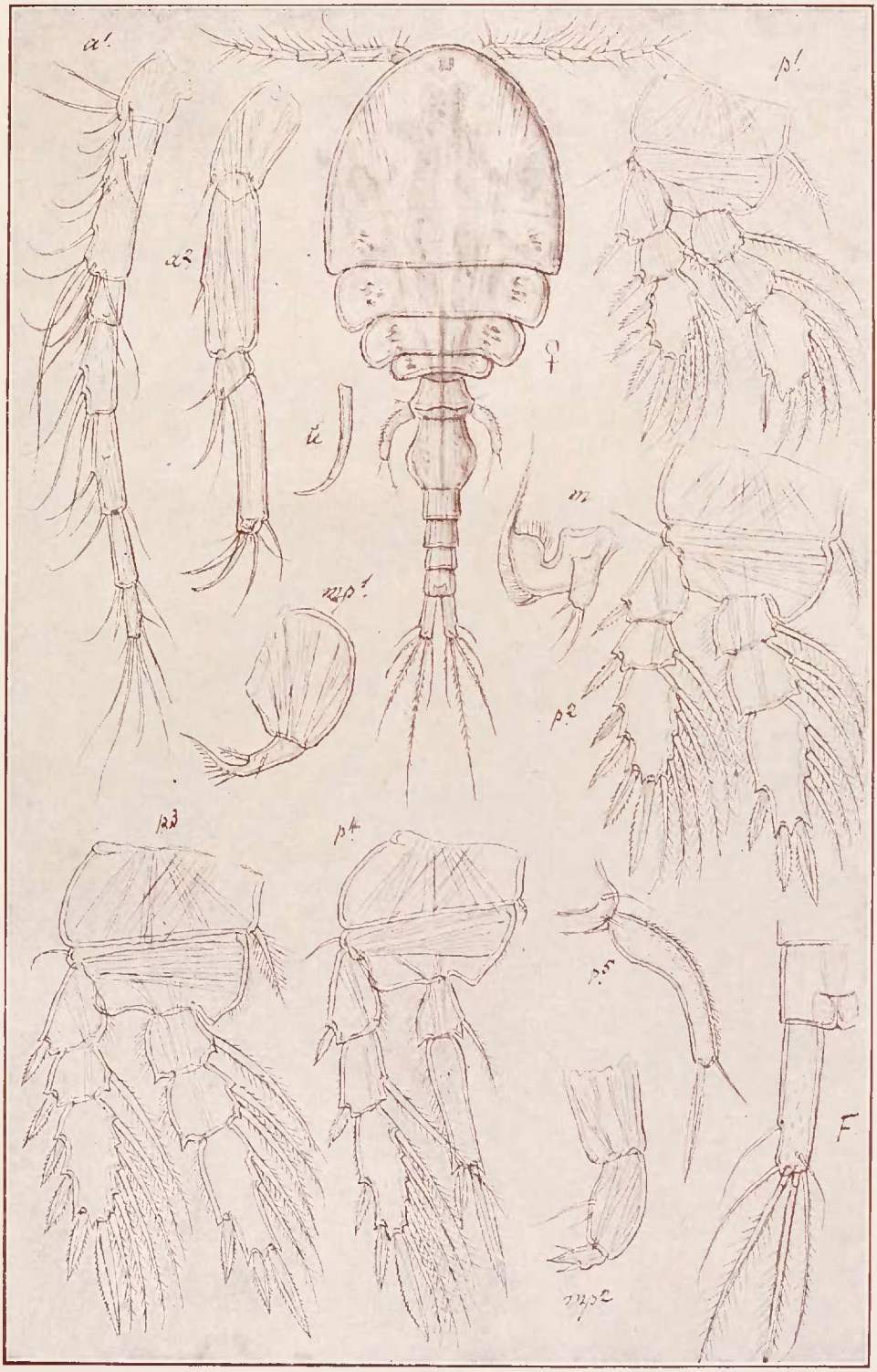
Lichomolgus agilis, Leydig.

Copepoda.



G. O. Sars, del.

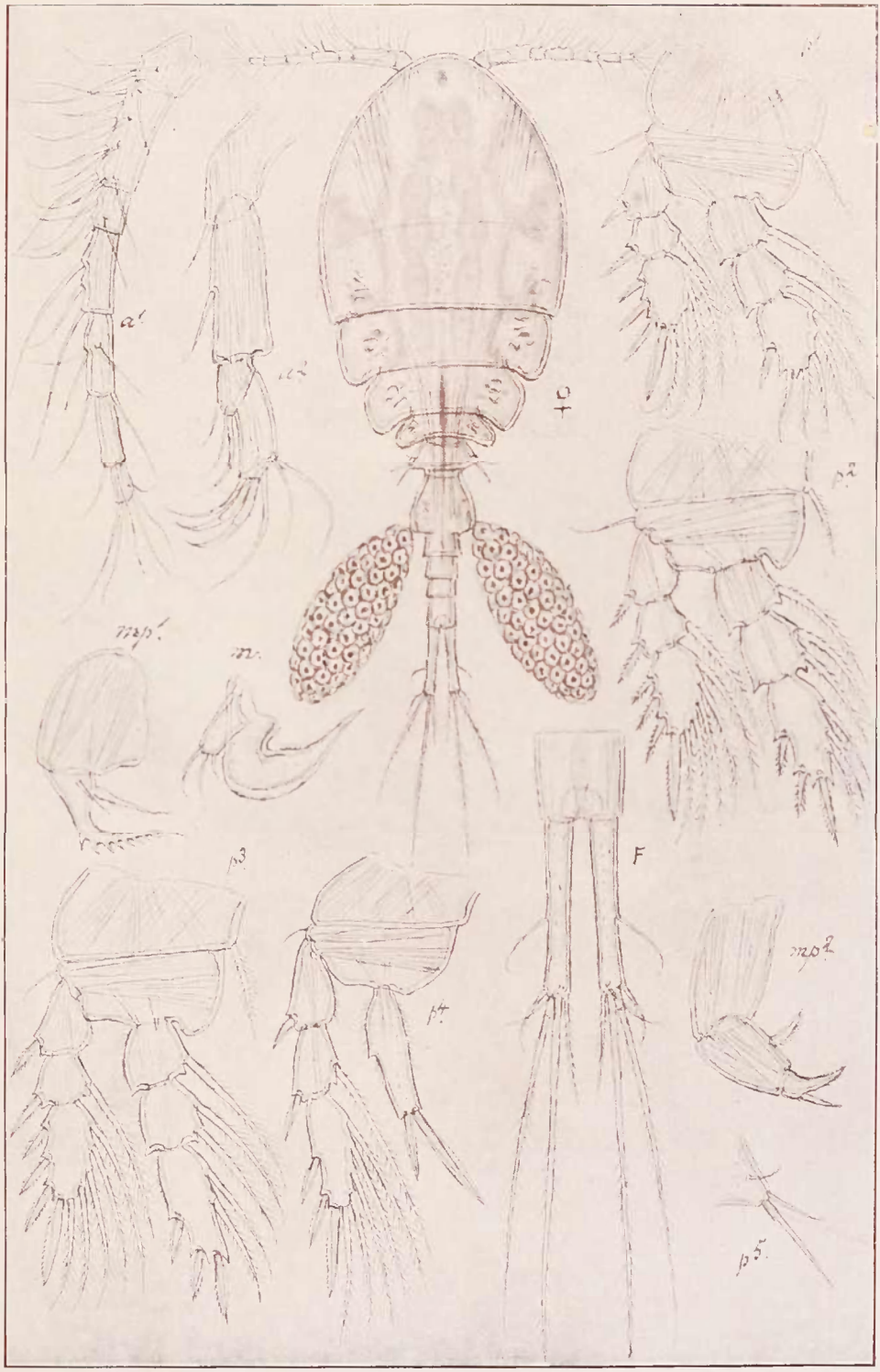
Macrocheiron fucicolum, Brady.



G. O. Sars, del.

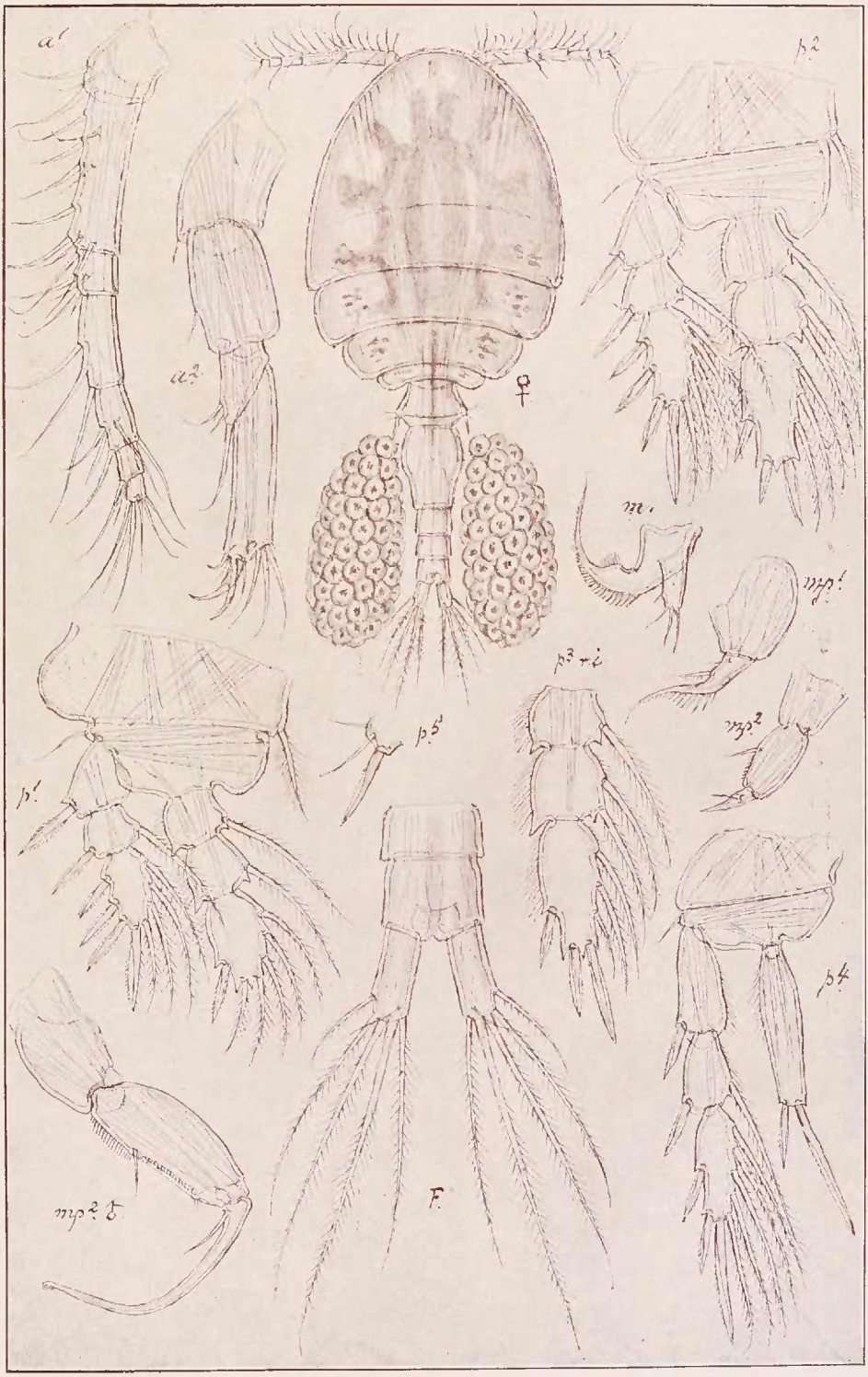
Macrocheiron hirsutipes (Scott).

Copepoda.



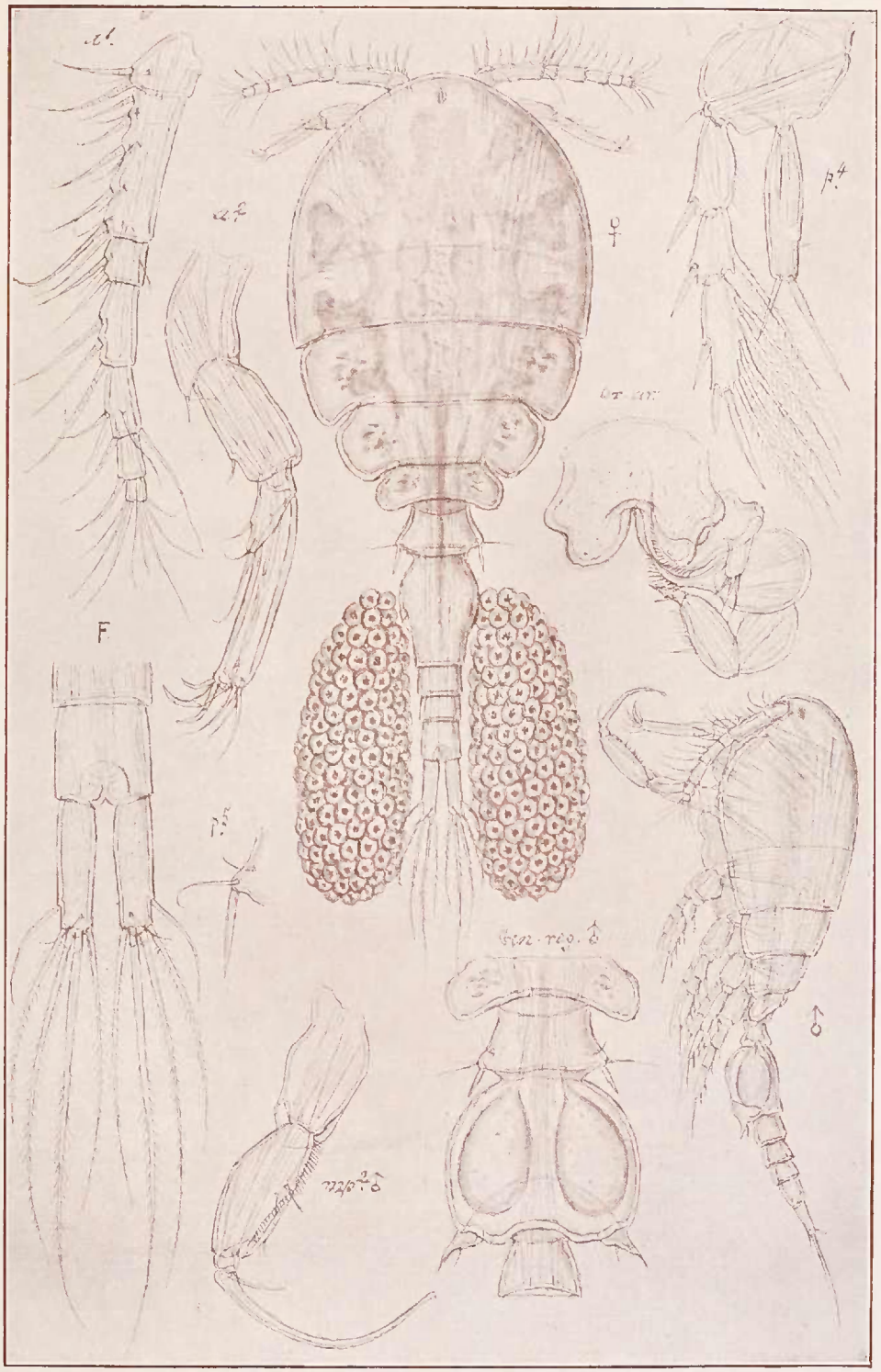
G. O. Sars, del.

Pseudanthessius gracilis, Claus.



G. O. Sars, del.

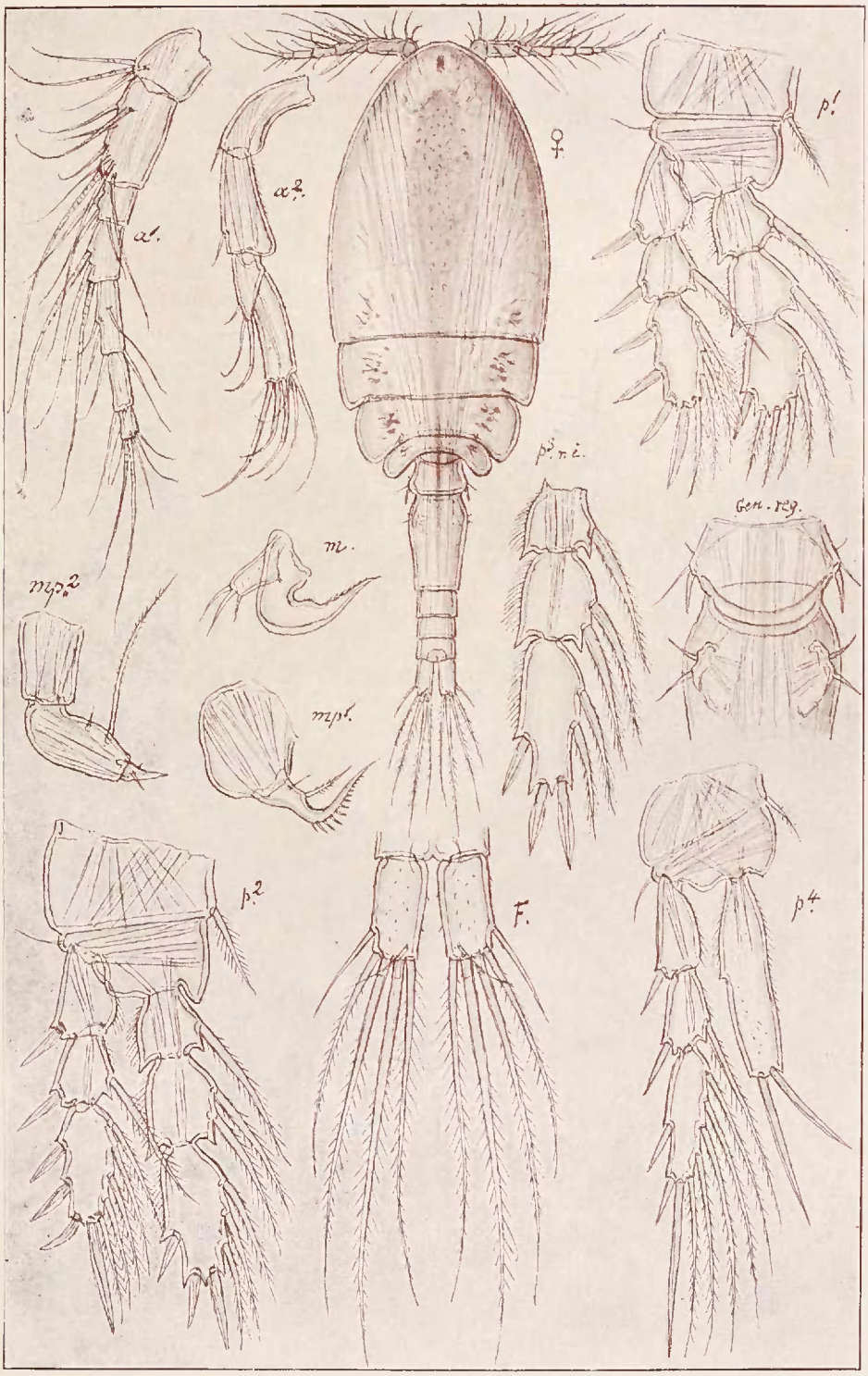
Pseudanthessius liber (Brady).



G. O. Sars, del.

Pseudanthessius assimilis, G. O. Sars.

Copepoda.



G. O. Sars, del.

Pseudanthessius Sauvagei, Canu.

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 XIII & XIV

LICHOMOLGIDÆ (concluded), ONCÆIDÆ, CORYCÆIDÆ, ERGASILIDÆ, CLAUSIIDÆ, EUNICICOLIDÆ, SUPPLEMENT

WITH 22 AUTOTYPIC PLATES



BERGEN
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1918

Gen. 41. **Modiolicola,** Aurivillius, 1883.

Generic Characters.—Anterior division of body moderately dilated and more or less depressed, with the 1st trunk-segment well defined from the cephalon. Tail slender and attenuated. Integuments thin and soft. Anterior antennæ 7-articulate and of a structure similar to that in the preceding genera. Posterior antennæ slender and almost naked, with the penultimate joint unusually prolonged; apical claws 3 in number. Maxillæ with the terminal lappet much produced, falciform; palp small, tri-setose. Anterior maxillipeds without the usual lateral spine on the distal joint. Posterior maxillipeds in female much reduced, in male well developed, prehensile. Natatory legs with both rami 3-articulate in all the pairs; inner ramus of 4th pair with no setæ inside the terminal joint. Last pair of legs uniarticulate, bisetose.

Remarks.—This genus was established in the year 1883 by Aurivillius, to include a peculiar Copepod found by him parasitic within the valves of the well-known mussel *Modiola vulgaris*. The genus is chiefly distinguished from those treated of in the preceding pages by the distinctly 3-articulate inner ramus of the 4th pair of natatory legs, and partly also by the structure of the posterior antennæ. Otherwise this genus is rather closely allied to *Lichomolgus*. In addition to the type species described below, Canu has recorded another species under the name of *M. inermis*. Only the type species has been observed by me.

93. Modiolicola insignis, Aurivillius.

(Pl. XCVII).

Modiolicola insignis, Aurivillius, Bidrag til Kännedomen om Krustaceer, som lefva hos Mollusker och Tunicater, p. 10 & 39, Pl. II, figs. 1—10, Pl. IV, figs. 1—8.

Specific Characters.—Female. Body moderately slender, with the anterior division rather expanded, rounded oval in outline, and pronouncedly flattened. Cephalic segment large and slightly produced in front, exhibiting behind a very distinct transverse suture limiting the cephalon from the 1st pedigerous segment. Epimeral plates of the 3 succeeding segments evenly rounded off. Tail equalling in length $^2/_3$ of the anterior division; genital segment about the length of the 3 succeeding segments combined, and somewhat tumid in its anterior part, which is rather sharply defined from the cylindrical posterior part; anal segment a little smaller than the preceding one.

Caudal rami scarcely longer than that segment, and not at all divergent; seta of outer edge attached about in the middle; apical setæ comparatively short. Anterior antennæ about the length of the cephalon and rather narrow, being clothed with comparatively short anteriorly-curving setæ. Posterior antennæ unusually slender and attenuated, almost nacked, except at the tip, which carries 3 strongly curved claws accompanied outside with 2 setæ. Posterior maxillipeds without any armature whatever, terminal joint small, tuberculiform. Natatory legs well developed, with the rami subequal in length; inner ramus of 4th pair fully as large as that of the preceeding pairs, but only provided with 2 setæ and 2 spines, the latter attached to the end of the terminal joint. Last pair of legs with the free joint rather small, sub-cylindrical in form, and carrying on the tip 2 very unequal setæ, the inner one much the larger and curved backwards. Ovisacs comparatively large, oblong in form, and only slightly divergent.

Male much smaller than female, and having the anterior division of the body less expanded. Genital segment greatly tumefied. Posterior maxillipeds powerfully developed, with the apical claw very long and slender.

Body of female semipellucid, with the ovarial tubes of a bright rosy colour; ova in the ovisacs reddish orange.

Length of adult female 1.40 mm., of male 1.00 mm.

Remarks.—This form was first described by Aurivillius, and has subsequently been recorded by several other authors. It is the type of the present genus.

Occurrence.—I have found this form not unfrequently within the pallial cavity of large specimens of *Modiola modiolus* taken in the outer part of the Christiania Fjord, at Hvalør. Aurivillius has also occasionally obtained it from *Mytilus edulis*.

Distribution.—Bohuslän (Aurivillius), British Isles (Scott), coast of France (Canu), Mediterranean (Raf. Monticelli).

Gen. 42. **Hermannella,** Canu, 1891.

Generic Characters.—Body of somewhat different form in the different species, and having the integuments well chitinised, cephalon more or less distinctly defined from the 1st pedigerous segment, and produced in front to a well-marked incurved rostrum. Tail attenuated, with the genital segment in

female scarcely subdivided. Anterior antennæ of the usual structure, 7-articulate. Posterior antennæ more or less strongly developed, in some cases pronouncedly prehensile, in other cases imperfectly prehensile. Oral parts on the whole of normal structure, the posterior maxillipeds in female having the dagtylar joint well developed, spiniform. Natatory legs with both rami distinctly 3-articulate; inner ramus of 4th pair however in most cases somewhat smaller than in the other pairs. Last pair of legs comparatively small, bisetose.

Remarks.—This genus, established by Canu, is nearly allied to *Modiolicola;* but differs in the more strongly chitinised integuments, the well defined rostrum, and the somewhat unlike structure of the posterior antennæ and the posterior maxillipeds. 5 species referable to this genus will be described in the sequel. All these have been found occasionally among dredged material; but is is very likely to believe, that they in reality, like the species of the preceding genus, lead a semiparasitic existence, probably within different bivalve Molluscs. This has indeed been stated to be the case with the type of this genus, *Hermannella rostrata* Canu, as also with *H. maxima* (Thomps.).

94. Hermannella valida, G. O. Sars, n. sp.

(Pl. XCVIII).

Specific Characters.—Female. Body rather stout and robust, with the anterior division considerably dilated in front, its greatest width equalling about half the length of the body. Cephalic segment very large and expanded, exhibiting behind a rather slight transverse suture defining the cephalon from the 1st pedigerous segment, lateral edges evenly curved throughout. Epimeral plates of the 2 succeeding segments obtusely rounded, those of penultimate segment acutely produced. Last segment of trunk very small. Tail comparatively short, scarcely longer than the 4 free trunkal segments combined; genital segment occupying about half the length of the tail, and somewhat dilated in the middle; anal segment considerably longer than the preceding one. Caudal rami much shorter than that segment, and only slightly longer than they are broad, each having close to the base outside a small bristle; caudal setæ not much different in length, that of the outer edge attached near the end. Anterior antennæ rather slender and of quite normal structure. Posterior antennæ very powerfully developed and pronouncedly prehensile, 1st joint much the largest and obliquely produced at the end; the 3 succeeding joints successively diminishing in size, the last one armed at the end with a single very strong claw accompanied by a number of unequal setæ. Maxillæ with the masticatory

lappet densely hairy and exserted to a slender setiform lash; palp provided at the end with 3 setæ, the innermost very small. Anterior maxillipeds with the terminal process only slightly curved and having 3 of the denticles stronger than the others. Posterior maxillipeds of moderate size, propodal joint scarcely as long as the basal one and provided inside, about in the middle, with a short seta; dactylar joint conical in form and having outside a slender spine. Inner ramus of the 3 anterior pairs of natatory legs somewhat longer than the outer; that of 4th pair however rather shorter, with the terminal joint narrow sublinear in form and only provided with 2 unequal spines, both issuing from the end. Last pair of legs with the free joint subfusiform in shape, inner apical seta short, spiniform, outer one 3 times as long.

Colour not yet ascertained.

Length of adult female 1.75 mm.

Male unknown.

Remarks.—This new species is readily recognised by the broadly expanded anterior division of the body, the comparatively short caudal rami, and the very powerful structure of the posterior antennæ. In size it is, next to *H. maxima* (Thompson), the largest of the northern species.

Occurrence.—Only a single female specimen of this form has hitherto come under my notice. It was taken, several years ago, in the inner part of the Stavanger Fjord, at Hjelmeland, from a depth of about 50 fathoms, among dredged material.

95. Hermannella parva, Scott.

(Pl. XCIX).

Hermannella parva, Norman & Scott, Crustacea of Devon and Cornwall, p. 199, Pl. XIII, fig. 15; Pl. XV, figs. 7—10; Pl. XVI, fig. 12; Pl. XIX, fig. 5.

Specific Characters,—Female. Body far less robust than in the preceding species, with the anterior division regularly oval in outline, greatest width not nearly attaining half the length of the body and occurring in the middle. Cephalic segment rather large and somewhat applanated, exhibiting behind a well-marked transverse suture, front narrowly rounded. Epimeral plates of the 3 succeeding segments obtusely rounded. Last trunkal segment very small. Tail not fully attaining half the length of the anterior division and attenuated behind; genital segment obpyriform in shape and scarcely longer than the 3 succeeding segments combined. Caudal rami rather narrow, sublinear in form, and scarcely at all divergent, exceeding in length the 2 preced-

ing segments combined; seta of outer edge attached near the middle; apical setæ rather unequal in length, the 2 middle ones being much longer than the other 2, which are rather small. Anterior antennæ shorter than the cephalon and of a similar structure to that in the preceding species. Posterior antennæ however rather unlike, being far less robust and imperfectly prehensile; basal joint not at all expanded; 2nd much the largest and angular at the end behind; 3rd joint very short and armed at the end anteriorly with an unguiform spine accompanied in front by 2 short setæ; last joint well developed and carrying at the tip 3 subequal, almost setiform claws, behind which 3 setæ are attached. Maxillæ with the masticatory lappet securiform in shape and almost nacked outside; palp with one lateral and 2 apical setæ. Anterior maxillipeds with the terminal process much curved and clothed outside with delicate spinules. Posterior maxillipeds well developed; propodal joint scarcely smaller than the basal one, and armed inside, about in the middle, with a ciliated anteriorly-curving spine; dactylar joint unguiform and having at the base a similar spine to that of the propodal joint accompanied by a short seta. Natatory legs comparatively more slender than in the preceding species; inner ramus of 4th pair somewhat shorter and much narrower than the outer, terminal joint with the inner edge quite smooth, outer edge exhibiting about in the middle a well-marked ledge, apex with 2 very unequal spines flanked on each side by a somewhat projecting corner. Last pair of legs with the free joint exceedingly small and slightly produced at the end outside; both apical setæ very short. Ovisacs of moderate size, oblong oval in form, and slightly divergent.

Colour pale yellow, with an orange tinge.

Length of adult female 0.73 mm.

Male unknown.

Remarks.—This form was described and figured by Scott in the above-quoted treatise from a solitary female specimen. As observed by that author, it somewhat resembles, in the general form of the body, *Pseudanthessius gracilis* Claus. It is however of far inferior size and, one closer examination, differs materially in the structure of the several appendages, agreeing in this respect with the other species of the present genus.

Occurrence.—I have met with this form occasionally both of the west and south coasts of Norway in moderate depths. All the specimens obtained were of the female sex.

Distribution.—British Isles (Scott).

96. Hermannella prehensilis, G. O. Sars, n. sp.

(Pl. C).

Specific Characters.—Female. Body rather slender, resembling somewhat in shape that of *H. parva*, though having the anterior division less expanded, with the greatest width in front of the middle. Last segment of trunk rather narrow and exhibiting on each side, inside the insertion of the free joint of last pair of legs, a small dentiform projection. Tail about half the length of the anterior division; genital segment somewhat fusiform in shape, being pronouncedly dilated in the middle, and shorter than the 3 succeeding segments combined; anal segment nearly twice as large as the preceding one. Caudal rami about the length of the last 2 segments combined and slightly divergent; seta of outer edge attached in the middle; apical setæ nearly as in *H. parva*. Anterior antennæ rather slender, equalling about the cephalon in length. Posterior antennæ much shorter, but very strongly built and pronouncedly prehensile; the first 2 joints rather thick and muscular; 3rd joint very movably articulated to the 2nd and armed at the end anteriorly with an exceedingly strong hooked claw; last joint small, without any claws, but clothed with a number of thin curved setæ. Maxillæ with the masticatory lappet securiform and very finely denticulated along the outer edge; palp with one lateral and 3 apical setæ. Anterior maxillipeds about as in *H. parva*. Posterior maxillipeds comparatively smaller, with the dactylar joint conical in form and provided with a single small spinule inside. Natatory legs resembling in structure those in *H. parva*, though having the inner ramus comparatively shorter and stouter; that of 4th pair somewhat smaller than the outer, with the terminal joint broader than in *H. parva*, and carrying 5 spines, one on the outer edge, 2 on the inner, and 2 on the tip. Last pair of legs with the free joint narrow cylindrical in form and having the 2 apical setæ well developed.

Colour not yet ascertained.

Length of adult female 1.40 mm.

Male unknown.

Remarks.—This new species is especially distinguished by the peculiar structure and pronouncedly prehensile character of the posterior antennæ. Otherwise it agrees pretty well with the other species of the present genus.

Occurrence.—Only a single female specimen of this form has hitherto come under my notice. It was taken, many years ago, at Skjerjehavn, outside the Sogn Fjord from a depth of about 20 fathoms.

97. Hermannella finmarchica, Scott.

(Pl. CI).

Hermannella (?) finmarchica, Scott, Ann. Mag. Nat. Hist. Ser. 7, Vol. XI, p. 28, Pl. IV, figs. 14—19.

Specific Characters.—Female. Body comparatively slender, with the anterior division oblong oval in outline, greatest width only sligtly exceeding half the length and occurring somewhat in front of the middle. Cephalic segment of moderate size and exhibiting behind a well-marked transverse suture defining the cephalon from the 1st pedigerous segment, frontal margin narrowly rounded. Last segment of trunk rather broad and, as in *H. prehensilis,* exhibiting on each side, just behind the insertion of the free joint of last pair of legs, a well-marked dentiform projection. Tail scarcely attaining half the length of the anterior division; genital segment comparatively large, exceeding in length the remaining 3 segments combined, and having the anterior part rather dilated and sharply defined from the short cylindrical posterior part. Caudal rami of moderate length, being about as long as the last 2 segments combined, and slightly divergent; seta of outer edge attached somewhat dorsally at about the hind third part of the ramus; the 2 middle apical setæ rather slender and elongated. Anterior antennæ scarcely as long as the cephalon, and having the first 2 joints comparatively broader than in the preceding species. Posterior antennæ resembling in structure those in *H. parva,* being rather feeble and imperfectly prehensile, with the apical claws slender, setiform. Maxillæ with the masticatory lappet securiform and finely crenulated outside; palp with 1 lateral and 2 apical setæ. Anterior maxillipeds of normal structure. Posterior maxillipeds comparatively short and stout, propodal joint conspicuously dilated in the middle and provided with 2 small spinules; dactylar joint short, conical in form. Natatory legs comparatively strongly built, with both rami well developed in all the pairs and about equal in size, all the spines pronouncedly dagger-shaped; inner ramus of 1st pair, as usual, with a single such spine, that of 2nd pair with 3, that of 3rd pair with 4, and that of 4th pair with 5 spines, all on the terminal joint. Last pair of legs with the free joint of moderate size, sub-cylindrical in shape, and slightly produced at the hind distal corner, apical setæ well developed, the inner one the longer. Ovisacs rather narrow and somewhat irregular in form.

Male, as usual, much smaller than female, and easily recognisable by the greatly tumefied genital segment. Posterior maxillipeds with the propodos somewhat contracted distally, dactylus long and slender, abruptly bent at the base.

Colour of female light yellow.

Length of adult female 1.30 mm., of male 0.90 mm.

Remarks.—Though the description and figures of this form given by Scott are rather imperfect owing to the bad condition of the specimens examined by him, I cannot doubt that the above-described form is the same. Scott had some doubt about its right position within the genus *Hermannella,* and indeed in some points it differs conspicuously from the typical species *H. rostrata* Canu, especially as regards the structure of the 4th pair of legs, the inner ramus of which is much fuller developed than in that species. But otherwise I find that it agrees fairly well with the other species here described.

Occurrence.—I have met with this form occasionally both off the west and south coasts of Norway in moderate depths. The specimens examined by Scott were collected by Canon Norman in Bugø Fjord, East Finmark. It thus appears that this form is destributed along the whole Norwegian coast. Out of Norway, however, it has not yet been recorded.

98. Hermannella tenuicaudis, G. O. Sars, n. sp.

(Pl. CII).

Specific Characters.—Female. Body rather slender, with the anterior division regularly oblong oval in outline, greatest width scarcely exceeding half the length, and occurring about in the middle. Cephalic segment about twice as long as the 3 succeeding segments combined, and exhibiting behind a well-marked transversal suture, frontal margin narrowly rounded. Last trunkal segment, as in the 2 preceding species, exhibiting on each side, behind the insertion of the free joint of last pair of legs, a dentiform projection. Tail very slender and attenuated, considerably exceeding half the length of the anterior division; genital segment about the length of the 3 succeeding segments combined and considerably dilated in the middle. Caudal rami long and narrow, fully equalling half the length of the remaining part of the tail, and slightly divergent; seta of outer edge placed about in the middle and somewhat dorsally; apical setæ comparatively less elongated than in *H. finmarchica.* Anterior antennæ more slender, equalling in length the cephalon. Posterior antennæ very like those in the said species, though having the apical claws still more slender. Maxillæ with the masticatory lappet rather large and finely serrate along the outer edge, the proximal serrations rather coarse; palp with 1 lateral and 3 apical setæ. Anterior maxillipeds with the terminal process less curved than in *H. finmarchica* and having the proximal spinule much

stronger than the others, lateral spine likewise with a coarse spinule near the base followed by 3 much smaller ones. Posterior maxillipeds resembling in shape those in the said species, though having the dactylar joint more produced. Natatory legs almost exactly as in *H. finmarchica*. Last pair of legs likewise rather similar, the free joint being cylindrical in form, with 2 very unequal apical setæ.

Body pellucid, of a whitish grey colour, with dark blue translucent intestine.

Length of adult female 1.20 mm.

Male unknown.

Remarks.—This form is closely allied to *H. finmarchica*, but at once distinguished by the much longer and narrower caudal rami, reminding in this respect on *Pseudanthessius Thorelli* Brady.

Occurrence.—Only a single female specimen of this form has hitherto come under my notice. It was taken, many years ago, off the west coast of Norway, the exact locality not having been noted, and a coloured drawing was at that time made from the specimen, when still alive.

Gen. 43. **Pseudomolgus,** G. O. Sars 1916.

Generic Characters.—General form of body resembling that in the preceding genus, the anterior division being more or less expanded, the posterior slender and attenuated. Cephalon well defined from the 1st pedigerous segment and produced in front below to an obtuse incurved rostrum. Anterior antennæ slender and generally composed of 7 articulations clothed with comparatively short setæ. Posterior antennæ unusually short and stout, with the outer joints imperfectly separated, apical claws exceedingly strong, hooked and distinctly biarticulate. Maxillæ with the masticatory part apparently bifid, an appendicular lappet being inserted inside the principal one and, like the latter, produced to a slender incurved lash; principal lappet coarsely denticulate along the outer edge; palp small, lamellar. Anterior maxillipeds with the terminal process short and armed with a limited number of subequal spinules. Posterior maxillipeds in female imperfectly developed, sub-lamellar, and apparently quite immobile; those in male, as usual, well developed, prehensile. Natatory legs with the rami rather broad and subequal

in size; inner ramus of 4th pair resembling that in the preceding pairs. Last pair of legs more fully developed than in the preceding genera, the free joint being rather produced, and armed with one lateral and 2 apical spines having between them a slender bristle.

Remarks.—The type of this genus, recently established by the present author, is *Lichomolgus arenicola* Brady, which, as shown by T. Scott, differs in several points very conspicuously from Thorell's genus. Scott referred this form provisionally to the genus *Hermannella* of Canu, apparently owing to the distinctly 3-articulate inner ramus of the 4th pair of legs. It cannot however in my opinion be referred to that genus, as it differs in some very important points, thus in the structure of the posterior antennæ, the maxillæ, the posterior maxillipeds in the female, and finally in the form and armature of the last pair of legs. The typical species has not yet been observed by me; but 2 nearly allied species will be described below.

99. Pseudomolgus leptostylis, G. O. Sars.

(Pl. CIII).

Pseudomolgus leptostylis. G. O. Sars, Bulletin de l'Institut océanographique de Monaco No. 323, 1916, p. 51, Pl. III.

Specific Characters.—Female. Body rather slender, but with the anterior division conspicuously more expanded than in the type species and broadly oval in outline, greatest width exceeding half the length and occurring in front of the middle. Last truncal segment rather narrow and without any lateral projections. Tail very slender and narrow, considerably exceeding half the length of the anterior division; genital segment not very large and only slightly dilated in the middle; anal segment nearly as long as the 2 preceding segments combined. Caudal rami much more produced than in the type species and very narrow, attaining almost half the length of the remaining part of the tail; seta of outer edge attached about in the middle; apical setæ not much elongated. Anterior antennæ moderately slender, not fully attaining the length of the cephalon, and composed of 7 well defined joints, the 2nd of which is the longest. Posterior antennæ much shorter than the anterior, but very strongly built and of nearly equal width throughout, last 2 joints completely fused together, apical claws 4 in number of about equal length, the hindmost one, however, conspicuously narrower than the others. Maxillæ with the principal masticatory lappet coarsely denticulated along the outer edge, the 2 proximal denticles being much stronger than the others; palp

forming a somewhat irregular short lamella carrying 2 small setæ, one outside and one at the tip, inner edge with an angular projection in the middle. Anterior maxillipeds with the termimal process divided into 5 slender subequal spinules. Posterior maxillipeds without any armature whatever, each forming a simple somewhat lamellar stem terminating in a minute point. Natatory legs with the 1st joint of the outer ramus distinctly denticulated outside; terminal joint of inner ramus in 1st pair with one, in 2nd pair with 3, and in the last 2 pairs with 4 spines; all the spines distinctly dagger-shaped. Last pair of legs with the free joint narrow oblong in form, edges partly ciliated, marginal spines rather slender, that of the outer edge attached at about the posterior 4th part of the joint.

Male, as usual, of smaller size than female, and having the genital segment considerably dilated. Posterior maxillipeds powerfully developed, with the propodos coarsely denticulated along the whole inner edge, dactylus long and curved.

Colour not yet ascertained.

Length of the female here described about 2 mm.; that of male 1.50 mm.

Remarks.—This species has recently been briefly mentioned and figured by the present author in the above-quoted journal from a female specimen procured during the Monaco Expedition. It is closely allied to the type species, *P. arenicola* (Brady), but easily distinguished by the comparatively broader and more expanded anterior division of the body, and more particularly by the much more produced caudal rami. The structure of the several appendages seems to agree very closely with that in the type species, except that the anterior antennæ are distinctly 7-articulate, whereas these antennæ in *P. arenicola,* both according to Brady and Scott, are only composed of 6 joints.

Occurrence.—A solitary adult female specimen of this form (that here figured) was taken, several years ago, in the inner part of the Trondhjem Fjord, at Vennæs, from the considerable depth of 100—150 fathoms, and recently some few young female specimens and an adult male were picked up from the bottom-residue of a large collecting bottle containing various animals collected by Mr. Kjær in the Christiania Fjord, near Drøbak.

Distribution.—Off the Amsterdam island, Spitsbergen (Monaco expedition).

100. Pseudomolgus dilatatus, G. O. Sars, n. sp.
(Pl. CIV).

Specific Characters.—Female. Body far less slender than in the preceding species, with the anterior division considerably expanded and rounded oval in outline, greatest width equalling half the length of the body (without the caudal rami). Cephalic segment much broader than it is long, and having the edges quite evenly arcuate throughout. Last trunkal segment comparatively broader than in the preceding species. Tail only slightly exceeding half the length of the anterior division; genital segment of moderate size and slightly dilated in front; anal segment but little longer than the preceding one. Caudal rami rather narrow and produced, though not nearly attaining half the length of the remaining part of the tail; seta of outer edge attached about in the middle and somewhat dorsally; apical setæ about as in the preceding species. Anterior antennæ rather slender, exceeding somewhat the length of the cephalon and, as in the preceding species, composed of 7 well defined joints. Posterior antennæ of a still more compact structure than in the preceding species, being scarceiy more than half as long as the anterior ones, but very thick; apical claws 3 in number, the hindmost one rather thin, almost setiform, the other 2 very large with the distal part strongly hooked. Oral parts nearly agreeing in structure with those in the preceding species. Legs also very similar; those of last pair however comparatively smaller, with the marginal spines less slender.

Colour not yet ascertained.

Length of the specimen examined 1.40 mm.

Male unknown.

Remarks.—The above-described species is evidently congeneric with the preceding one, though easily distinguishable by the much more robust form of the body, as also by the structure of the posterior antennæ. It is moreover rather inferior in size.

Occurrence.—A single female specimen of this form was taken, many years ago, in the Romsdal Fjord, near Molde, from a depth of about 100 fathoms.

Gen. 44. **Rhinomolgus,** G. O. Sars, n.

Generic Characters.—Body cyclopoid in shape, with the anterior division moderately expanded. Cephalon only faintly separated from the 1st trunkal segment, and provided beneath the front with a peculiar mobile rostral lamella.

Tail with the genital segment in female scarcely subdivided. Caudal rami sub-lamellar, with 2 successive setæ on the outer edge and 3 on the tip. Anterior antennæ composed in female of 7 joints, the first 2 of which are much larger than the others and clothed with numerous strong setæ; outer joints in male coalesced. Posterior antennæ much elongated and distinctly prehensile, being armed at the tip with a short uncinate claw. Anterior lip deeply incised in the middle. Maxillæ with a slender appendicular masticatory lappet inside the principal one; the latter securiform in shape and rather expanded at the base, its outer edge coarsely serrated and divided proximally into 2 unequal lobules, one of which is distinctly denticulaled; palp unusually large and incurved, resembling in structure that in the *Clausidiidæ*. Anterior maxillipeds with the basal part very large and massive, terminal part produced into a straight digitiform process denticulated at the tip, and having inside a densely spinulose seta. Posterior maxillipeds, as usual, very different in the 2 sexes, in female conically tapered, with the dactylar joint small and tipped by a short uncinate claw, in male very large and distinctly prehensile, dactylus long and slender. Natatory legs strongly built, with both rami 3-articulate in all the pairs. Last pair of legs biarticulate, proximal joint small and less perfectly separated from the segment, distal joint comparatively large, foliaceous, and extending laterally, being armed in a similar manner to that in the preceding genus.

Remarks.—This is a very distinct genus, exhibiting several aberrant characters, some of which seem to point to the *Clausidiidæ*. According to the prehensile nature of the posterior antennæ and the structure of the masticatory part of the maxillæ, it ought however unquestionably to be included in the present family. One of the most perplexing peculiarities is perhaps the remarkable mobile rostral lamella, from which indeed the generic name here proposed has been derived. The genus comprises as yet only a single species, to be described below.

101. Rhinomolgus anomalus, G. O. Sars, n. sp.
(Pl. CV & CVI).

Specific Characters.—Female. Body not particularly slender, with the anterior division oval fusiform in outline, greatest width about equalling $^2/_3$ of the length and occurring a little in front of the middle. Cephalic segment large, and exhibiting behind a rather slight transverse suture defining the cephalon from the 1st pedigerous segment; front narrowly rounded. Rostral

lamella pronouncedly spatulate in form, being contracted at the base and gradually widening towards the extremity, which is broadly truncated. Lateral lobes of the 3 succeeding segments rounded of the end. Last truncal segment rather narrow. Tail exceeding half the length of the anterior division; genital segment about as long as the 3 succeeding segments combined, and somewhat dilated in the middle; anal segment scarcely larger than the preceding one. Caudal rami somewhat lamellar and oblong oval in form, exceeding in length the anal segment, inner edge finely ciliated, outer edge with 2 successive setæ, the distal one apparently answering to the outer apical seta in other forms, the somewhat narrowed extremity carrying 3 unequal setæ and a small dorsal bristle extending outwards. Eye wholly absent. Anterior antennæ shorter than the cephalon, and somewhat abruptly bent near the middle, being composed of 7 well defined joints, the 2nd of which is much the largest and densely clothed with unusually long and coarse, finely annulated setæ, the 5 outer joints much narrower than the first 2. Posterior antennæ exceeding in length the anterior and nearly nacked, being composed of 5 well defined joints, the first of which is very short, the 2nd much the largest, the 3rd about half as long and equal to the combined length of the outer 2 joints; terminal joint armed on the tip with a comparatively short uncinate claw accompanied by a small bristle, and having moreover 2 unequal setæ attached to a distinct ledge at some distance from the tip behind. Natatory legs with the inner ramus a little longer than the outer, its terminal joint comparatively large, fully as long as the other 2 combined, and exhibiting a somewhat different armature in the several pairs, that of 1st pair having one spine outside the tip, that of 2nd pair 3, that of 3rd pair 4, and that of 4th pair 5 spines. Last pair of legs with the proximal joint rather small and carrying outside the usual slender bristle; distal joint oblong oval in form and finely ciliated on the proximal part of the inner edge, being moreover provided with 3 slender marginal spines, one somewhat beyond the middle of the outer edge, the other 2 on the obtusely rounded extremity; between the latter a small bristle is attached. Ovisacs not very large, oval in form, and closely appressed to the sides of the tail.

Male somewhat smaller than female, and having the anterior division of the body less broad. Genital segment considerably tumefied and terminating on each side in a triangular lappet clothed with 2 setæ and a small denticle. Anterior antennæ with 2 well-defined recurved æstethasks, the one attached to the 2nd, the other to the 4th joint; the 3 outer joints wholly coalesced. Posterior maxillipeds very powerfully developed, propodos with the outer edge

sub-angular in the middle, inner edge straight and clothed with a row of slender spinules; dactylus very long and provided at the base inside with a slender spine.

Colour of female whitish grey, with translucent pale yellow ovarial tubes.

Length of adult female 2.45 mm.; of male 2.20 mm.

Remarks.—The above-described form is easily distinguished from any of the other *Lichomolgidæ,* both as to the general form of the body and to the structure of the several appendages. The remarkable rostral lamella attached beneath the frontal part of the head, between the insertions of the anterior antennæ, is more generally extended downwards, and accordingly is most conspicuous in the lateral or ventral aspects of the animal. As it however is very mobile, it may in some cases be protracted, so as to be visible also in the dorsal view of the animal, projecting in front with its broadly truncated extremity, as shown by the figures here given.

Occurrence.—A considerable number of specimens of this peculiar Copepod were picked up from the dredged material obtained by a single catch made in the outer part of the Trondhjem Fjord, about midway between Bejan and the opposite border of the Fjord, the depth ranging from 100 to 150 fathoms. The material contained various deep-water animals, of which a species of Antedon, A. Sarsi, was by far the most abundant. Though I am much disposed to believe that the present Copepod is a parasit of the said Crinoid, I am unable to state this with full certainty, as none of the specimens were found in immediate connexion with their supposed hosts.

Gen. 45. **Sabelliphilus,** M. Sars, 1862.

Generic Characters.—Form of body rather different from that in the other genera of the present family, being very narrow, with the anterior division only slightly dilated. Cephalon faintly defined from the 1st trunkal segment, and provided below the front with a strongly chitinised, immobile rostral plate extending backwards and deeply bifurcate at the end. Tail composed of the usual number of segments. Anterior antennæ 7-articulate, with the first 2 joints much larger than the others and lamellarly expanded. Posterior antennæ exceedingly powerful and armed at the end with very strong uncinated claws,

as also with a row of coarse spines inside the 2nd joint. Oral parts on the whole of normal structure. Natatory legs comparatively slender, with both rami 3-articulate; inner ramus of 4th pair with the number of setæ reduced. Last pair of legs very small, bisetose.

Remarks.—This genus was established by my late father as early as the year 1862, to include a peculiar Copepod found by him parasitic on the gills of a species of *Sabella*. It ought undoubtedly to be included in the family *Lichomolgidæ*, as here defined, in spite of the aberrant form of the body and the likewise somewhat aberrant structure of the 2 pairs of antennæ. The genus comprises as yet only a single species, to be described below.

102. Sabelliphilus elongatus, M. Sars.

(Pl. CVII).

Sabelliphilus elongatus, M. Sars, Beskrivelse af 4 nye parasitiske Copepoder. Forh. Christiania Vid. Selskab f. 1861, p. 139.

Syn: *Sabelliphilus Sarsii*, Claparede.
„ — *Leuckartii*, Kossman.
„ *Lichomolgus sabellæ*, Thompson.

Specific Characters. Female. Body very slender and elongated, with the anterior division narrow oblong in outline, greatest width only slightly exceeding $^1/_3$ of the length. Cephalic segment nearly twice as long as the 3 succeeding segments combined and obtusely truncated in front, exhibiting behind a rather faintly marked transverse suture defining the cephalon from the 1st pedigerous segment; rostral plate of moderate size and closely appressed to the ventral face, projecting at the end into 2 strong spiniform processes. Lateral lobes of the 3 succeeding segments obtusely rounded. Last trunkal segment very small. Tail scarcely attaining half the length of the anterior division; genital segment of moderate size and considerably tumefied in its anterior part; anal segment longer than the preceding one. Caudal rami rather narrow, exceeding somewhat the anal segment in length, and scarcely divergent; seta of outer edge attached near the middle; apical setæ slender, the inner median one attaining the length of the tail. Anterior antennæ about half the length of the cephalon and clothed with comparatively short setæ; the first 2 joints much larger than the others and pronouncedly lamellar; 3rd joint very small; the remaining 4 joints gradually diminishing in size. Posterior antennæ unusually strongly built, 4-articulate, the first 2 joints very massive and forming with each other a geniculate bend; 2nd joint exhibiting inside a longitudinal crest divided into 5 very strong teeth; 3rd joint armed at the end

anteriorly with a strongly uncinate claw; terminal joint with 3 similar claws accompanied by a number of curved setæ. Maxillæ with the masticatory lappet simple, securiform, and exserted to a slender point, outer edge coarsely serrate; palp comparatively narrow, with one lateral and 3 short apical setæ. Anterior maxillipeds with the basal part rather broad and provided outside with a densely serrated crest, terminal part exserted to a narrow incurved lash armed outside with 4 strong spinules and having inside at the base the usual appendicular spine. Posterior maxillipeds of moderate size, with the propodal joint about equal in size to the basal one; dactylar joint forming a strongly uncinate claw, with a small appendicular spine inside. Natatory legs of comparatively feeble structure, with the rami rather narrow and nearly equal-sized in the 3 anterior pairs; inner ramus of 4th pair somewhat smaller, with the terminal joint narrow oblong in form and only provided with 2 spines at the end. Last pair of legs with the free joint short cylindrical in form, apical setæ rather small, the outer one the longer. Ovisacs very narrow and elongated, cylindrical in form.

Body in female of a whitish grey colour, with dark fuscous translucent ovarial tubes. Eye well marked, of bright red colour.

Length of adult female 1.65 mm.

Remarks.—The present form, as above mentioned, was briefly described by my late father under the above name, and has subsequently been observed by several other authors, though the specific identity was not recognised by them. I regard it as beyond doubt that the form recorded by Claparede as *S. Sarsii* is the very same species, and this seems also to be the case with *S. Leukartii* of Kossman and with *Lichomolgus sabellæ* of Thompson.

Occurrence.—My late father found this form attached to the gills of *Sabella Sarsi* captured off the west coast of Norway. I have myself met with this Copepod in 2 widely distant localities, viz., at Kvalö, on the Nordland coast, and at Risör, south coast of Norway. In both localities only a single female specimen was obtained among dredged material and detached from its host.

Distribution.—British Isles (Thompson), coast of France (Canu), Mediterranean (Claparède, Della Valle).

Fam. 12. Oncæidæ.

General Characters.—Body of rather different shape in the different genera, but with the anterior and posterior divisions always well defined, the latter generally rather slender and attenuated. Eye imperfectly developed or quite absent. Anterior antennæ not much elongated, with the number of joints more or less reduced. Posterior antennæ imperfectly prehensile. Maxillæ and anterior maxillipeds comparatively small. Posterior maxillipeds, as a rule, powerfully developed in both sexes, terminating in a clawed hand. Natatory legs with both rami 3-articulate, the inner one generally more slender than the outer. Last pair of legs small, uniarticulate.

Remarks.—This family was originally established by Giesbrecht to comprise 5 different genera, viz., *Oncæa, Conæa, Lubbockia, Pachysoma* and *Ratania.* The last named genus was however subsequently removed by that author and referred to the siphonostomous Cyclopoida (Asterocheridæ). A new genus referable to the present family, *Pseudolubbockia,* has more recently been added by the present author, so that the family still comprises 5 genera. The most aberrant of these genera is unquestionably the genus *Pachysoma* of Claus, the systematic position of which seems to me to be rather questionable. All the forms comprised within the present family lead a true pelagic existence; but it is very probable that, like the *Lichomolgidæ,* they are in reality semiparasitic in habits, though it has not yet been stated which pelagic animals are at time infested by them. Of the above-named genera only one is as yet represented in the Fauna of Norway.

Gen. 46. **Oncæa,** Philippi, 1843.

Syn: *Antaria,* Dana.

Generic Characters.—Body cyclopoid in shape, with the anterior division more or less dilated and strongly vaulted above. Cephalon distinctly defined from the 1st trunkal segment, and having below the front an obtuse incurved rostral prominence. The 3 succeeding segments gradually diminishing in size, and having the epimeral parts rounded and but little prominent. Last trunkal segment very small, though distinctly defined. Tail attenuated and composed in female of 4, in male of 5 segments, the 1st of which (the genital segment)

is much the largest. Caudal rami comparatively small, with the normal number of setæ. Eye wholly absent. Anterior antennæ of moderate length, 6-articulate, 3rd joint much the largest, the outer 3 joints forming together a well defined terminal part very movably articulated to the preceding joint and clothed at the end with long diverging setæ. Posterior antennæ smaller than the anterior and more or less strongly curved, being composed of only 3 joints, the last of which is provided at the end with long rigid setæ curving anteriorly. Maxillæ armed at the incurved extremity with 2 short movable claw-like spines; palp sub-clavate in form, with a limited number of small marginal setæ. Anterior maxillipeds biarticulate, distal joint carrying on the end 2 digitiform appendages coarsely spinulose on the inner edge. Posterior maxillipeds powerfully developed in both sexes and distinctly prehensile, propodos more or less dilated, dactylus slender and very mobile, especially in male. Natatory legs with the outer ramus more strongly built than the inner and armed outside and at the tip with coarse dagger-like spines, inner ramus with the terminal joint much produced, especially in the posterior pairs, assuming in the latter a narrow linear form. Last pair of legs small, bisetose. Two ovisacs present in female, attached somewhat dorsally, so as partly to cover the tail.

Remarks.—This genus was established as early as the year 1843 by Philippi, to include a mediterranean species (O. venusta). The genus *Antaria* of Dana is identical with Philippi's genus. No less than 10 different species are recorded by Giesbrecht in his great work. They all are very nearly related, and in some cases not easy to distinguish without a very close examination. The chief distinguishing characters refer to the relative size of the genital segment in the female, the length of the caudal rami, and partly also the mutual length of the outermost and innermost apical seta of the tail. Two Norwegian species of this genus will be described below.

103. Oncæa borealis, G. O. Sars, n. sp.

(Pl. CVIII).

Syn: *Oncæa conifera,* G. O. Sars (not Giesbrecht).

Specific Characters.—Female. Body comparatively slender, with the anterior division oblong fusiform in outline, greatest width scarcely attaining half the length, and occurring about in the middle, 2nd trunkal segment, as in *O. conifera,* raised dorsally in the form of an hump-like prominence. Tail about half the length of the anterior division; genital segment scarcely longer than the remaining part of the tail, and gradually somewhat narrowed behind;

anal segment shorter than the 2 preceding segments combined. Caudal rami very small, being much shorter than the anal segment, and scarcely more than twice as long as they are broad; seta of outer edge attached a little in front of the middle; innermost apical seta slightly exceeding the outermost in length. Antennæ and oral parts on the whole resembling in structure those in *O. conifera.* Posterior maxillipeds, however, somewhat less strongly developed, with the propodos oblong oval in form; dactylus somewhat shorter than the propodos and finely denticulated along the inner edge. Natatory legs with the rami comparatively more slender than in *O. conifera,* and the spines of the outer ramus less strong. Last pair of legs with the free joint much smaller than in that species, not cylindrical, but rounded oval in form. Ovisacs of moderate size, extending about to the end of the anal segment, and oval in form.

Male much smaller than female, with the anterior division of the body narrower and wanting the dorsal hump. Tail comparatively shorter, with the genital segment very large and tumid. Anterior antennæ with the joints of the terminal part imperfectly separated. Posterior maxillipeds resembling in structure those in female, but of somewhat larger size, with the dactylus longer and quite smooth.

Body in both sexes, pellucid, with a fainte yellow or orange tinge.

Length of adult female scarcely exceeding 0.70 mm.; that of male 0.40 mm.

Remarks.—The above described species has been previously identified by the present author with *O. conifera* Giesbrecht, which it ressembles in the presence on the 2nd trunkal segment in the female of a hump-like dorsal prominence. Having however now had an opportunity of examining Giesbrecht's species, I find it to differ in some points so markedly that I am led to the conclusion, that it is specifically distinct from the form here treated of. I have recently examined another form from the Malayan Archipelago, the female of which has a quite similar dorsal hump, and which on this cause has been identified by Clewe with *O. conifera;* but which, on a closer examination, has turned out to be a very distinct species, different both from that species and the one here described. The above-mentioned dorsal hump cannot therefore be regarded as a character exclusive of *O. conifera.* The latter is a much larger and more robust species than the one here treated of, and moreover differs conspicuously in the relative size of the genital segment in the female, as also in the much fuller development of the last pair of legs.

Occurrence.—I have met with this form occasionally in plankton both of the west and south coasts of Norway, as also in the upper part of the Christiania Fjord. Mr. Nordgaard has taken it in Oster Fjord, near Bergen.

Distribution.—Polar Sea, north of Siberia (Nansen's Expedition), British Isles (Farran).

104. Oncæa similis, G. O. Sars, n. sp.

(Pl. CIX, fig. 1).

Specific Characters.—Female. General form of body very similar to that in the preceding species, though perhaps a little more slender. Anterior division narrow fusiform in outline, with the dorsal face quite evenly vaulted, no trace being found of the dorsal hump present in the preceding species. Tail about half the length of the anterior division, and having the genital segment rather large, nearly twice as long as the remaining part of the tail; the 2 succeeding segments very short, and combined scarcely longer than the anal segment. Caudal rami about the length of that segment and agreeing in form and armature with those in the preceding species. Antennæ and oral parts also very similar, except that the maxillary palp is of somewhat simpler structure, being only provided with 5 marginal setæ. Natatory legs on the whole agreeing in structure with those in the said species, though having the spines of the outer ramus comparatively stronger and more coarsely denticulated. Last pair of legs with the free joint still smaller than in *O. borealis*; apical setæ, however well developed.

Colour not yet ascertained.

Length of adult female 0.78 mm.

Male unknown.

Remarks.—The present form is closely allied to *O. borealis*, and may indeed at the first sight be easily confounded with it. On a closer inspection it is however at once distinguished by the absolute absence of the characteristic dorsal hump, as also by the rather different mutual relation of the caudal segments.

Occurrence.—A few female specimens of this form were found together with *O. borealis* in a plankton-sample taken by Mr. Nordgaard in the Oster Fjord, near Bergen, and kindly sent to me for examination.

Fam. 13. Corycæidæ.

General Characters.—Body not at all depressed, but more or less pronouncedly club-shaped, with the anterior division well defined from the posterior and obtusely truncated anteriorly. Front without any true rostral prominence, but provided with 2 very large juxtaposed corneal lenses (conspicilla). 1st trunkal segment confluent with the cephalon, or only very slightly defined from it. The 3 succeeding segments in some cases imperfectly separated dorsally; lateral lobes af 3rd segment generally produced to acute lappets. Last trunkal segment imperfectly developed. Tail with the segments reduced in number, in some cases wholly confluent. Caudal rami more or less produced, styliform, with the apical setæ partly spiniform and reduced in number. Anterior antennæ comparatively small; posterior ones very strong and pronouncedly prehensile, terminating in a clawed hand, which is larger in male than in female. Oral area placed far behind and somewhat prominent. Maxillæ and anterior maxillipeds very small and clawed at the extremity. Posterior maxillipeds well developed in both sexes and distinctly prehensile. Natatory legs with the inner ramus much smaller than the outer; that of 4th pair much reduced or quite wanting. Last pair of legs absent in both sexes.

Remarks.—This family is here taken in a more restricted sense than done by Giesbrecht, who comprised within it also the genus *Sapphirina* and allied genera. These, I believe, should more properly be removed to a separate family, the *Sapphirinidæ*, as they differ very conspicuously both in the general form of the body and in some of the structural details. In the restriction here adopted the family as yet only comprises 2 nearly-allied genera, viz., *Corycæus* Dana and *Corycella* Farran. Only the first-named genus is represented in the Fauna of Norway.

Gen. 47. **Corycæus,** Dana, 1845.

Syn: *Agetus,* Kröyer.

Generic Characters.—Body more or less elongated, subclavate in form, with the anterior division only slightly dilated. Cephalic segment very large, and in most cases exhibiting behind, across the back, a fainte suture, indicating the limit between the cephalon and the 1st trunkal segment; corneal lenses

distinctly separated in the middle; pigmented ocular rodes far remote from the corneal lenses and converging to a point placed about in the middle of the anterior division, near the ventral face; each provided at the distal end with a highly refractive body.[1]) 3rd trunkal segment produced on each side to an acute posteriorly-pointing lappet; 4th segment much smaller than the preceding one, and in some cases confluent with it dorsally. Tail composed in both sexes of only 2 segments, which in some cases are imperfectly separated. Caudal rami narrowly produced, with 2 unequal spiniform apical setæ accompanied by a slender sub-dorsal bristle. Anterior antennæ short, 6-articulate. Posterior antennæ powerfully developed, especially in male, 3-articulate; middle joint rather dilated; terminal joint very mobile and tipped with a slender claw. Maxillæ armed at the extremity with a bifid movable claw, inside which a likewise movable spiniform appendage coarsely pectinate on the outer edge is attached; palp comparatively small, scale-like. Anterior maxillipeds short, with the terminal part imperfectly defined from the basal one and exserted to a curved claw, having moreover at the base inside 2 or 3 unequal pectinated setæ. Posterior maxillipeds distinctly 3-articulate, the last 2 joints forming together a clawed hand more strongly developed in male than in female. The 3 anterior pairs of natatory legs with both rami 3-articulate, the outer one much the larger and rather produced, being armed outside and at the tip with strong denticulated spines. 4th pair of legs much feebler in structure, with the inner ramus reduced to a single small joint. Ovisacs in female attached dorsally and in some cases confluent.

Remarks.—This genus was established by Dana as early as the year 1845, and is the type of the present family. The genus *Agetus* of Kröyer is identical with Dana's genus. It comprises a great number of species chiefly occurring in southern latitudes. No less than 20 different species have been enumerated by Giesbrecht in his great work; but some of these are more properly referable to the nearly-related genus *Corycella* Farran. Off the Norwegian coast only a single species has as yet been observed, to be described below.

[1]) I am however by no means convinced that the above-mentioned parts, as generally opined, are in reality visual in significance, but should be much more inclined to suppose, that they constitute a peculiarly modified photogenous apparatus for projecting condensed light forwards, like the light-projectors of our automobiles. To settle this question, observations on living specimens would be needed.

105. Corycæus anglicus, Lubbock.

(Pl. CIX, fig. 2, Pl. CX).

Corycæus anglicus, Lubbock, Ann. & Mag. Nat. Hist. 2nd series, Vol. XX, p. 408, Pl. XI, figs. 14—17.

Syn: *Corycæus germanus*, Leuckart.

Specific Characters.— Female. Body moderately slender, with the anterior division narrow oblong in outline, greatest width not nearly attaining half the length and occurring somewhat in front of the middle. Cephalic segment very large, occupying about half the length of the body, and exhibiting across the back behind a rather slight suture limiting the cephalon from the 1st trunkal segment; lower edges strongly bulging in front of the middle. Lateral lappets of 3rd segment rather large, wing-like, and acuminate at the end, extending about as far as the middle of the genital segment; 4th segment well defined, and somewhat angular laterally. Tail slightly exceeding half the length of the anterior division and having its 2 segments well defined, the proximal one (genital segment) rather tumid and carinated below, the carina forming in front of the middle a projecting angle; distal caudal segment about half as long as the proximal one and evenly narrowed behind. Caudal rami rather slender, being fully twice as long as the anal segment, and conspicuously divergent; seta of outer edge very small and attached at a short distance from the end, the outer corner of which is produced to a small dentiform projection; inner apical seta about the length of the corresponding ramus and more than twice as long as the outer. Anterior antennæ with the joints not much different in size and clothed with slender diverging setæ. Posterior antennæ with a long spiniform seta issuing from the end of the basal joint anteriorly; middle joint large, oblong oval in form, and carrying inside the base a similar, but much shorter seta, its anterior edge forming a thin lamella divided at the end into 2 unequal dentiform projections, terminal joint armed at the base with 2 claw-like spines and carrying at the end a similar spine and a much stronger curved claw. Posterior maxillipeds with the propodos not much dilated and provided near the end with a short spine; dactylus about the length of the propodos. Outer ramus of the 3 anterior pairs of legs rather strongly built, with the terminal joint much the largest and armed with 4 spines, one on the tip and 3 on the outer edge; inner ramus scarcely more than half as long and much narrower, its terminal joint being provided in the 1st pair with 5, in the 2nd pair with 4, and in the 3rd pair with only 2 setæ. 4th pair of legs conspicuously smaller than the 3 preceding ones, outer ramus with no

spines on the middle joint and with only a single one on the terminal joint; inner ramus represented by a small joint carrying 2 slender setæ. Ovisacs confluent to a single almost globular bag attached to the dorsal face of the genital segment.

Male of about same size as female, and having the body more pronouncedly club-shaped. Lateral lappets of 3rd trunkal segment comparatively smaller. Tail with the genital segment considerably tumefied; anal segment smaller than in female. Caudal rami scarcely at all divergent. Posterior antennæ still more strongly developed than in female, with the apical claw much more produced. Posterior maxillipeds likewise more powerful, with the propodos larger and the dactylus very long.

Body in both sexes highly pellucid, and in some places tinged with a light reddish orange pigment.

Length of adult female about 1 mm.

Remarks.—This form was first described by Lubbock from specimens captured at the west coast of England (Plymouth), and has subsequently also been observed by several other authors, though its identity has not always been recognised. Thus the *C. germanus* of Leuckart is unquestionably the very same species. It is nearly allied to *C. obtusus* of Dana, but apparently specifically distinct.

Occurrence.—I have met with this form occasionally off the west coast of Norway, as also in the Christiania Fjord, at Dröbak, among plankton taken near the surface of the sea. It is, like the other species of this genus, a pronouncedly pelagic animal, which has its true home in the open sea and only quite accidentally is thrown by the currents nearer to the shores and into the Fjords.

Distribution.—North Atlantic Ocean, off the British Isles (Lubbock & Brady), Helgoland (Leuckart); coast of Bohuslän (Trybom).

Fam. 14. Ergasilidæ.

General Characters.—Body in the juvenile state of the animal quite cyclopoid in shape, becoming however in the adult female, after its affixion, more or less deformed. Eye simple, of normal appearance. Anterior antennæ comparatively short, resembling in structure those in the *Coryçæidæ*. Posterior

antennæ pronouncedly prehensile, terminating in a very movable claw, and more strongly developed in female than in male. Oral parts, as in the *Corycæidæ*, densely crowded on a protuberance of the ventral face, placed far behind the insertion of the antennæ. Maxillæ and anterior maxillipeds very small and clawed at the extremity. Posterior maxillipeds wanting in female, normally developed in male. Natatory legs comparatively feeble in structure, with the rami more or less incurved. Last pair of legs small, but well defined, uniarticulate. Ovisacs in female of very large size.

Remarks.—This family also is here taken in a more restricted sense than done by most other authors. Thus I find it necessary to remove the genus *Bomolochus* of Nordman, which is generally included in the present family, but which seems to me to differ in many points so materially from the other genera, that it scarcely can be associated with them. In the restriction here adopted the family as yet only comprises 3 genera, viz., *Ergasilus* Nordman, *Ergasiloides* G. O. Sars and *Thersetina* Norman *(Thersites* Pagenstecher). Only the first-named genus is as yet stated to be represented in the fauna of Norway.

Gen. 48. **Ergasilus,** Nordman, 1832.

Generic Characters.—Body of adult female more or less pyriform in shape, with the anterior part greatly tumefied and the segments not very sharply marked off from each other; that of young female (before affixion) and of male pronouncedly depressed and tapered behind, with all the segments sharply defined. Tail comparatively short, and composed in female of 4, in male of 5 segments. Anterior antennæ 6-articulate and densely setiferous. Posterior antennæ in female exceedingly powerful, 3-articulate, terminal joint together with its apical claw forming a very strong and movable dactylus admitting of being bent against the preceding joint; those in male much smaller, but of a similar structure. Maxillæ armed at the extremity with a movable claw-like spine accompanied by a short seta, and having moreover a somewhat similar spine outside at some distance from the tip; palp small, lamelliform. Anterior maxillipeds terminating in a single claw-like spine densely hairy on the edges. Posterior maxillipeds wholly absent in female, but well developed in male and terminating in a slender clawed hand. Natatory legs with the rami comparatively short and 3-articulate, except the outer ramus of

4th pair, which is only composed of 2 joints. Last pair of legs with the free joint well defined, bisetose.

Remarks.—This genus, the type of the present family, was established by Nordman as early as the year 1832, to include a peculiar parasite *(E. Sieboldi)* found by him on the gills of various fresh-water fishes. Another species apparently referable to this genus was subsequently recorded by Van Beneden under the name of *E. nanus*. Only the type species is as yet represented in the fauna of Norway.

106. Ergasilus Sieboldi, Nordman.

(Pl. CXI).

Ergasilus Sieboldi, Nordman, Mikrographische Beiträge zur Naturgeschichte wirbelloser Thiere, Heft 2.

Specific Characters.—Young female (before affixion). Body moderately slender and gradually tapered behind, with the anterior division oblong in outline, greatest width not nearly attaining half the length and occurring in front of the middle. Cephalon well defined from the trunk and almost pentagonal in form, the frontal part being somewhat produced and narrowly rounded. Trunkal segments defined from each other by deep lateral incisions and gradually diminishing in size, epimeral plates obtusely rounded; last segment very small, but well defined. Tail comparatively short, scarcely exceeding in length $^1/_4$ of the anterior division; genital segment somewhat dilated and equal in length to the remaining 3 segments combined. Caudal rami narrow, sub-linear in form, and scarcely at all divergent, equalling about in length the last 2 segments combined; outer edge quite smooth, apex carrying 3 very unequal setæ the inner one much the largest, exceeding in length the tail. Eye very conspicuous with dark pigment. Anterior antennæ scarcely exceeding half the length of the cephalon, and composed of 6 well defined joints clothed with slender diverging setæ; last joint the smallest, the others not very different in size. Posterior antennæ exceedingly large and powerful, and almost quite nacked; basal joint thick and massive, forming with the middle joint a geniculate bend; the latter joint much elongated and sligtly narrowed distally, dactylar joint cylindrical in form and terminating in a very strong curved claw. Natatory legs with the basal part rather broad, rami comparatively short and nearly equal-sized; spines of the outer ramus very small and quite wanting on the middle joint in 2nd and 3rd pairs; terminal joint of both rami short, lamelliform, with densely crowded marginal setæ. Last pair of legs with the free joint oblong oval in form; apical setæ comparatively short.

Adult male more slender in form than female, with the cephalon less broad in front. Genital segment widening distally, and generally containing 2 well-marked spermatophores. Anterior antennæ of exactly same structure as in female. Posterior antennæ however much smaller than in female, though built in a similar manner. Posterior maxillipeds rather slender, with the dactylus very long and nearly straight, terminating in an obtuse point.

Body in both sexes rather pellucid, with very dark translucent intestine, and moreover exhibiting a bright blue pigment chiefly accumulated in the anterior part.

Length of young female, immediately before affixion, 1.30 mm.; that of adult male 1.10 mm.

Remarks.—The adult ovigerous female of this form was first described by Nordman in the above-quoted treatise, and has subsequently been more closely examined by several other authors. The male and the still free-living female are far less fully known, and I hope therefore that the description and figures here given will be of some interest.

Occurrence.—In the adult state, as above mentioned, the female of this form is found firmly attached by the strongly clawed posterior antennæ to the gills of various fresh-water fishes, and when once attached in this manner, it scarcely at all leaves its hold. In the juvenile state, however, it is a vagabond animal, swimming about, like the always free-living male, near the surface of the water in company with other free-living Copepods, from which it may at once be recognized by the bright blue pigment accumulated within the anterior part of the body. In this free-living state I have taken the present Copepod occasionally among plankton collected from some of our larger lakes. It is very likely to believe, that the female is fecundated by the male before its affixion.

Distribution.—Lakes of Sweden, Russia and central Europa.

Fam. 15. Clausiidæ.

General Characters.—Body more or less elongated and narrow, with no sharp demarkation between the anterior and posterior divisions; the latter composed (in female) of the normal number of segments. Anterior antennæ small, attenuated. Posterior antennæ comparatively short, but distinctly pre-

hensile. Oral parts more or less imperfectly developed; the posterior maxillipeds being in female rudimentary or quite absent. Natatory legs in some cases normally developed, in other cases much reduced. Last pair of legs present and extended laterally, being generally uniarticulate. 2 ovisacs present in female, attached laterally.

Remarks.—The type of this family is the genus *Clausia* of Claparède, the systematic position of which has remained rather questionable, though it evidently ought to be included within the great section of poecilostomous Cyclopoida. Another genus apparently referable to the same family will be treated of in the sequel.

Gen. 49. **Conchocheres,** G. O. Sars, n.

Generic Characters.—Body elongated, tapered behind, with the integuments very thin and soft. Anterior division divided into the normal number of segments, and not very sharply marked off from the posterior. Cephalon more or less distinctly defined, and in female conspicuously protuberant laterally, front without any rostral prominence. Tail in both sexes composed of 4 segments only. Caudal rami slender, with the apical setæ much reduced in size. Anterior antennæ composed of 6 joints clothed with comparatively short setæ, and in male moreover provided with a number of largely developed æstethasks. Posterior antennæ in both sexes short and stout, carrying on the tip a strong uncinate claw. Oral area not far remote from the insertions of the antennæ, and but little protuberant. Anterior lip bell-shaped, with a small incision in the middle. Maxillæ very small, with the masticatory part narrowly exserted and armed at the tip with 3 hook-like spinules; palp small, lamelliform. Anterior maxillipeds with the basal part oblong in form, tapering distally, terminal part imperfectly defined and provided with a single small curved spine. Posterior maxillipeds wholly absent in female, but distinctly developed in male and, as usual, prehensile. Natatory legs present in the normal number and all having the rami distinctly 3-articulate. Last pair of legs represented on each side by a small 3-setose joint.

Remarks.—The present genus agrees with the typical one in the comparatively slender form of the body, and partly also in the structure of the antennæ and the oral parts. The natatory legs, however, are rather different, and much more fully developed. On the other hand are the last pair of legs

of rather inferior size. It is probable, that the genus *Myicola* of Whright is nearly allied to the present genus; but I have had no opportunity of comparing them closer, as the paper of that author is not accessible to me. Only a single species of the present genus is as yet known to me.

107. Conchocheres malleolatus, G. O. Sars, n. sp.
(Pl. CXII).

Specific Characters.—Female. Body rather slender, with the anterior division dilated in front, but narrowed behind. Cephalon only faintly defined from the trunk, and produced on each side to a very conspicuous hammer-shaped protuberance, frontal part broadly rounded. Epimeral parts of the trunkal segments not at all prominent laterally. Last trunkal segment very small. Tail about equalling in length the trunk, and perfectly cylindrical in form; genital segment not at all dilated, and scarcely longer than the 2 succeeding segments combined; anal segment considerably larger than the preceding one. Caudal rami comparatively slender and narrow, tapered distally and slightly divergent; seta of outer edge small, and attached a little in front of the middle; apical setæ much reduced in size, the outermost one somewhat remote from the other 3. Eye wholly absent. Anterior antennæ scarcely exceeding half the length of the cephalon, some of the joints less sharply defined, the first 2 much the largest, the others rapidly diminishing in size. Posterior antennæ with the basal joint very large and massive, the other 2 abruptly much narrower and somewhat unequal in size, the last one being the larger; apical claw with a small denticle at the base. Natatory legs of a rather uniform structure and extended somewhat laterally, rami comparatively slender and nearly equal-sized, spines of the outer one small, 3 of them belonging to the terminal joint. Last pair of legs with the free joint very small, oblong oval in form, and carrying one lateral and 2 apical setæ. Ovisacs large, subcylindrical in form and distinctly curved inwards.

Male rather unlike the female and of much smaller size, with the cephalon more distinctly defined from the trunk and of quite normal appearance, no trace of the peculiar lateral protuberances present in the female being detected. Trunkal segments with the epimeral plates well defined and rounded at the end. Genital segment gradually widening behind and, as a rule, containing 2 well-marked spermatophores. Anterior antennæ comparatively larger than in female, with all the joints well defined, and carrying 5 large recurved

æstethasks. Posterior maxillipeds distinctly developed; propodos rather narrow and quite nacked; dactylus long and slender, evenly curved in its outer part.

Colour in both sexes an uniform opaque white.

Length of adult female attaining 3.30 mm.; that of male only 1.60 mm.

Remarks.—The most conspicuous peculiarity distinguishing the above —described Copepod is perhaps the strongly marked lateral protuberances of the cephalon in the female, giving the body, as it were, a somewhat hammer-shaped form; hence the specific name here proposed. Moreover the peculiar curvature of the ovisacs distinguishes this form from most other Copepoda.

Occurrence.—I have found this remarkable Copepod occasionally within the pallial cavity of a species of *Neœra (N. obesa)* taken off the west coast of Norway. As the parasite is of rather large size in proportion to its host, it could be easily detected even to the nacked eye as an opaque white mass shining through the pellucid valves of the shell. No doubt the parasite is very noxious to the Mollusk, and in all probability quite destroys its reproductory faculty.

Fam. 16. Eunicicolidæ.

General Characters.—Anterior division of body large, shield-like, with the segments more or less completely fused together dorsally, those of posterior division well defined. Anterior antennæ attenuated; posterior ones sub-prehensile. Oral parts rather peculiar in structure, though present in the normal number. Legs imperfectly developed, the 2 posterior pairs being wholly absent. 2 ovisacs present in female attached laterally.

Remarks.—This new family is established, to include the remarkable genus *Eunicicola* of Kurz (= *Eurynotus* Scott), the very aberrant characters of which prevent its reception within any of the other families here recorded. The description given by earlier authors (Kurz and Scott) could even leave some doubt about the right position of this genus within the section of the poecilostomous Cyclopoida, as here defined. On a careful examination of the oral parts, however, I have found that, in spite of their rather aberrant structure, they in reality are built on the type characteristic of that group of Copepoda.

Gen. 50. **Eunicicola,** Kurz, 1877.

Syn: *Eurynotus,* Scott.

Generic Characters.—Body short and stout, with the integuments well chitinised, and the 2 chief divisions sharply marked off from each other, the anterior one clypeiform, and without any distinct segmentation dorsally. Tail composed in female of 4, in male of 5 segments. Anterior antennæ slender and attenuated. Posterior antennæ stout, 3-articulate, last joint armed at the end with 2 claw-like appendages, each terminating in a peculiar cup-shaped dilatation. A large circular sucking disk present in female, just in front of the oral aperture; but wholly wanting in male. Maxillæ with the masticatory part greatly produced, and not, as usual, incurved, but abruptly bent backwards and terminating in a slender, freely projecting knife-shaped extremity; palp of rather compact structure, and provided at the outer projecting corner with 2 strong and densely ciliated recurved setæ. Anterior maxillipeds rather small, with the terminal part conical in form and tipped with 2 setæ. Posterior maxillipeds in female forming 2 transversely oval gibbous prominences, coarsely scabrous from numerous scale-like spikes clothing their surface, each prominence exserted inside to a small setiferous lobe; those in male transformed to very strong, clawed prehensile organs. Only 3 pairs of legs present, the 2 anterior ones biramous, the 3rd pair with only a single (outer) ramus.

Remarks.—This genus was established by Kurz as early as the year 1877, to include a peculiar Copepod found by him parasitic on the skin of a species of Eunice. The genus *Eurynotus* of Scott it unquestionably identical with Kurz's genus, being indeed founded upon the very same form as that observed by the latter author. Of course only a single species of the present genus is as yet known.

108. Eunicicola Clausi, Kurz.

(Pl. CXIII).

Eunicicola Clausii, Kurz, Sitzb. d. K. Akad. der Wissensch. Berlin, I Jahrg. 1877, p. 1, Pl. I & II.

Syn: *Eurynotus insolens,* Scott.

Specific Characters.—Female. Anterior division of body rounded oval or almost square in outline, being only slightly longer than broad; dorsal face evenly vaulted, and exhibiting, somewhat in front of the middle, a slight transverse furrow apparently indicating the limit between cephalon and trunk; ventral face flattened; front a little bulging, but without any true rostrum. Trunkal part

of body obtusely rounded behind, and without the slightest trace of a segmentation dorsally, whereas ventrally well-marked chitinous stripes are seen, running transversally between the insertions of the legs. Tail scarcely exceeding half the length of the anterior division and partly overlapped in front by the trunk; genital segment rather dilated in its anterior part, being almost twice as broad as it is long; the succeeding segments gradually attenuated; anal segment comparatively small and deeply incised behind in the middle. Caudal rami scarcely longer than the anal segment and somewhat divergent; seta of outer edge attached near the end; apical setæ rather unequal, the inner mediate one being the longest and somewhat exceeding half the length of the tail; innermost seta very small. Eye quite absent. Anterior antennæ about the length of the cephalic part of the body, and composed of 7 well-defined joints clothed anteriorly with comparatively short setæ; 1st joint rather broad; 2nd joint much the largest, carrying behind at the base a group of 4 short bristles and at the end a long densely ciliated seta; the remaining joints rapidly diminishing in size. Posterior antennæ rather strongly built, last joint of a somewhat irregular form, and provided at the end, in addition to the 2 peculiar cup-shaped claws, with 4 rather strong and partly ciliated setæ. Sucking disk very large and conspicuous, with densely crowded radiating fibres, and finely ciliated at the edge. The 2 anterior pairs of legs with the outer ramus 3-articulate and longer than the inner, which only consists of 2 joints. 3rd pair of legs considerably smaller and without any inner ramus, outer ramus biarticulate. Ovisacs slender, cylindrical in form, each containing a rather limited number of ova arranged in a single series.

Male of rather smaller size than female, and having the trunkal part of the body somewhat less broad behind. Tail comparatively more slender, with the genital segment widening behind and terminating on each side in an obtuse projection. Both pairs of antennæ exactly as in the female. Sucking disk however quite wanting. Posterior maxillipeds very powerfully developed; basal joint short with a strongly denticulated process inside; propodos much dilated, with the palmar edge bulging at the base and densely clothed with small spikes; dactylus strong and curved.

Colour not yet ascertained.

Length of adult female 0.90 mm., of male 0.65 mm.

Remarks.—This form was first recorded by Kurz in the above-quoted Journal, and was several years afterwards described by Scott under another name, viz., *Eurynotus insolens,* the paper of Kurz being at that time unknown

to him. The structure of the oral parts have not been satisfactorily made out either by Kurz or by Scott, and the signification of the peculiar sucking disk occurring in the female was quite misapprehended by Kurz, who believed it to enclose the oral aperture, a pair of chitinous rods joining this disk on each side and serving for its support being erroneously described as mandibles.

Occurrence.—Two female specimens of this peculiar Copepod were found last summer at Risør, south coast of Norway, among dredged material taken up from a depth of abouth 50 fathoms, and some other specimens, among them an adult male, were recently picked up from the bottom-residue of a large collecting bottle containing various marine animals obtained by Mr. Kjær in the Christiania Fjord, near Drøbak. Kurz, as above mentioned, found this form parasitic on a species of *Eunice (E. Claparèdi),* and no doubt this form also off our coasts may be stated to infest some nearly-allied worms.

Distribution.—British Isles (Scott), Mediterranean at Triest (Kurz).

CORRECTIONS AND ADDITIONS.

Page 8. For Oithona helgolandica, Claus read:

Oithona similis, Claus.

Oithona similis, Claus, Die Copepoden Fauna von Nizza, p. 11.

Remarks.—On a closer consideration, I am now led to the conclusion, that the 2 forms recorded by Claus under the names *O. helgolandica* and *O. similis* are in reality very distinct species, the former being in all probability identical with the form subsequently described by Giesbrecht as *O. nana*. This species, which accordingly must bear the older name *helgolandica*, has not yet been observed off the Norwegian coast. For the northern species described page 8 as *O. helgolandica* the specific name *similis* given to it by Claus ought of course to be retained.

Page 9. Add the following genus and species:

Gen. **Paroithona**, Farran, 1908.

Generic Characters.—General form of body resembling that in *Oithona*, the 2 chief divisions being sharply marked off from each other. Cephalon distinctly defined from the first trunkal segment, and having the front rounded off below, without any rostral projection. Tail slender, with long diverging apical setæ. Antennæ and oral parts on the whole built on the same type as in *Oithona*, except that the mandibular palp is somewhat simpler in structure. Natatory legs with the inner ramus in all pairs only composed of 2 joints. Last pair of legs very small.

Remarks.—This genus, recently established by Farran, is closely allied to *Oithona*, from which it is chiefly distinguished by the inner ramus of all the natatory legs being only biarticulate. Mr. Farran has recorded 2 species

referable to this genus, the one, *P. parvula*, from the west coast of Ireland, the other, *P. pulla*, from the Indian Ocean. The first-named species also occurs off the Norvegian coast, and will be described below.

Paroithona parvula, Farran.

(Pl. CXIV).

Paroithona parvula, Farran, Second Report on the Copepoda of the Irish Atlantic Slope. Fisheries Ireland. Scient. Investig. 1906, II, p. 89, Pl. X, figs. 1—13.

Specific Characters.—Female. Body moderately slender, with the anterior division regularly oval fusiform in outline, greatest width equalling about half the length and occurring a little in front of the middle; frontal part obtusely blunted and evenly rounded below, without the slightest trace of any rostrum. Tail exceeding somewhat half the lenght of the anterior division, and very narrow, cylindrical in form; genital segment only slightly dilated in its anterior part and longer than the 2 succeeding segments combined; anal segment fully as long as the preceding one and slightly widening distally. Caudal rami quite short, not nearly attaining the length of the anal segment, and slightly divergent; seta of outer edge attached near the base; apical setæ very unequal, 2 of them excessively prolonged and crossing each other at the base. All integuments very thin and fragile. Anterior antennæ not attaining the length of the anterior division, and composed of 9 joints clothed with partly very long and diverging setæ; some of the joints being however less perfectly defined. Posterior antennæ biarticulate, proximal joint nearly twice as long as the distal one. Mandibular palp armed at the inner projecting corner with a single strong claw-like spine clothed on both edges with a limited number of slender spikes; inner ramus very small, outer well developed, imperfectly 3-articulate, and provided with 5 long densely plumous setæ. Maxillæ and maxillipeds of a structure very similar to that in *Oithona*. Natatory legs rather slender and partly extending laterally; inner ramus in 1st pair about the size of the outer, in the other 3 pairs much smaller; outer ramus in all the pairs distinctly 3-articulate, its terminal joint having outside in the 2 anterior pairs 2 spines, in the 2 posterior pairs a single spine; apical spine of this ramus in the 3 posterior pairs exceedingly long and slender. Last pair of legs apparently represented on each side by a single short seta arising from a knob-like prominence.

Colour not yet ascertained.

Length of adult female 0.52 mm.

Male unknown.

Remarks.—This form was described and figured by Mr. Farran in the above-quoted Report as the type of his genus *Paroithona.* It may easily be recognised from the 2 Norwegian species of *Oithona* described in the present work by its small size and the somewhat less slender form of the body, in which respect it however resembles some exotic species of that genus. From the Indian species, *P. pulla* Farran, it differs among other things in the distinctly 3-articulate outer ramus of the 1st pair of legs, this ramus being in the said species, like the inner, only composed of 2 joints.

Occurrence.—The occurrence of the present form off the Norwegian coast has first been stated by Mr. Farran, who found it not unfrequently in a plankton-sample taken from deep water in the Hundfjord, west coast of Norway (Nordfjord), some of the specimens having kindly been sent to me for examination. I am moreover enabled to state its occurrence in another locality of the Norwegian coast, 2 or 3 female specimens having recently been picked up from a sample of pelagic Copepoda taken by Mr. Nordgaard in the Herløfjord, near Bergen.

Distribution.—West coast of Ireland (Farran).

Page 14. For Cyclopina brevifurca, G. O. Sars, read:

Cyclopina Schneideri, Scott.

Cyclopina Schneideri, Scott, Notes on some Copepoda from Arctic seas, collected by Canon A. M. Norman. Ann. Mag. Nat. Hist. Ser. 7. Vol. XI, p. 6, Pl. 1, figs. 1—6.

Remarks.—I am now disposed to regard the form described by me on p. 14 as *C. brevifurca* to be more properly identical with the species recorded by Scott from east Finmark under the above name. True there are some apparent differences, chiefly as regards the size[1]) and the structure of the last pair of legs (according to the figure given); but in all other respects the agreement between these 2 forms are so complete, that I find it unreasonable to keep them apart as distinct species.

Page 16. Add the 2 following species:

Cyclopina euacantha, G. O. Sars, n. sp.

(Pl. CXV, fig. 1).

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

[1]) Scott gives the length of his specimen to rather more than 1 mm.

occurring somewhat behind the middle. Cephalic segment longer than the 4 succeeding segments combined and slightly narrowed in front. Tail somewhat exceeding half the length of the anterior division; genital segment only slightly dilated in its anterior part, and about the length of the 3 succeeding segments combined. Caudal rami moderately produced and rather narrow, being scarcely at all divergent; seta of outer edge attached about in the middle; apical setæ normally developed. Anterior antennæ slender and elongated, exceeding in length the cephalic segment, and composed of 19 well-defined joints, 1st, 2nd, 4th, and 7th the largest, the other joints very small. Posterior antennæ with the terminal joint much shorter than the antepenultimate one. Natatory legs comparatively short and stout, with the spines of the outer ramus unusually strong, dagger-like. Last pair of legs biarticulate, proximal joint rather broad, being angularly produced outside, distal joint considerably longer, but much narrower, oblong in form, and armed with 3 very strong dagger-like spines, 1 apical and 2 lateral ones.

Colour not yet ascertained.

Length of adult female 0.80 mm.

Male unknown.

Remarks.—This form, which has briefly been mentioned on page 11, was observed many years ago by the present author, and was at that time subjected to a careful anatomical examination; but both the specimens and the dissections have unfortunately been lost, so that I have had no opportunity of renewing my investigation. The figures given on the accompanying plate, which are copied from my earlier drawings, will however at once show it to be a very distinct species.

Occurrence.—The specimens of this form observed were taken off the Lofoten islands, at Skraaven, from a depth of about 12 fathoms, sandy bottom. Only a few female specimens were obtained, none of them carrying ovisacs.

Cyclopina pygmæa, G. O. Sars, n. sp.

(Pl. CXV, fig. 2).

Specific Characters.—Female. Body resembling in shape that in *C. gracilis,* though comparatively more slender, with the anterior division oblong oval in outline, greatest width only slightly exceeding half the length and occurring about in the middle. Tail rather narrow, with the genital segment scarcely longer than the 2 succeeding segments combined. Caudal rami considerably produced, exceeding in lenght the last 2 segments combined, and

slightly divergent, being somewhat contracted in the middle, but a little widening towards the end; the outer corner of which is produced to a small dentiform projection; seta of outer edge attached considerably in front of the middle; apical setæ rather slender, the 2 middle ones coarsely spinulose at the edges for some part of their length; seta of inner corner much longer than that of the outer. Anterior antennæ comparatively short, not nearly attaining the length of the cephalic segment and, as in *C. gracilis*, composed of only 10 joints, the 6th being much the largest and about equalling in length the outer 4 joints combined. Posterior antennæ, oral parts and natatory legs resembling in structure those parts in *C. gracilis*. Last pair of legs also rather similar, though comparatively of somewhat smaller size. Ovisacs rather small and closely appressed to the sides of the tail.

Colour whitish grey.

Length of adult female not exceeding 0.42 mm.

Remarks.—The above-described form is closely allied to *C. gracilis* Claus, and indeed at first I was inclined to regard it as merely a small variety of that species. Having however subsequently met with this form in many different localities and always found its characters pretty constant, I am now of opinion that it should be kept apart as a distinct species.

Occurrence.—I first observed this form at Skutesnæs SW coast of Norway, where it occurred not unfrequently together with *C. gracilis*, from which it at once distinguished itself by its much smaller size. The same form has subsequently occurred to me in the following localities of the southern coast: Farsund, Lillesand, Grimstad and Risør.

Page 32. For Cyclop strenuus, Fisher, read:

Cyclops pictus, Koch.

Deutschlands Crustaceen, Myriapoden und Arachniden. Heft. 21, Pl. 1.

Remarks.—As it appears to me beyond doubt, that Koch's species is the same as that subsequently described by Fischer as *C. strenuus*, I think that, according to the rules of priority, the name proposed by the first named author must be retained for the present species.

Page 109. Add the following genus and species:

Gen. **Scottomyzon,** Giesbrecht, 1897.

Generic Characters.—Body short and stout, with the anterior division very sharply marked off from the posterior and greatly dilated, especially in female. Rostral prominence obtuse, incurved. Tail very small and consisting in female of only 3, in male of 4 segments; genital segment in both sexes greatly tumefied. Caudal rami short, with the usual number of setæ. Anterior antennæ not much produced, but, as in most other Ascomyzontidæ, divided into numerous short articulations; those in male distinctly hinged near the end, but without any supplementary æstethasks. Posterior antennæ with the appendicular (outer) ramus more fully developed than in the other Ascomyzontidæ. Siphonal tube quite short, with large opening. Mandibles with the masticatory part not much produced, palp small, unisetose. Maxillæ with both lobes well developed and nearly equalsized. Anterior maxillipeds much more strongly built than the posterior. Natatory legs with the rami comparatively slender, terminal joint of the outer one with only 2 spines outside. Last pair of legs small, biarticulate.

Remarks.—This genus was established by Giesbrecht to include a species first described by T. Scott and referred by him to the genus *Dermatomyzon* of Claus. It is chiefly characterised by the short and stout form of the body, the unusual size of the outer ramus of the posterior antennæ and the very strong development of the anterior maxillipeds; finally by the peculiar structure of the siphonal tube. Only a single species is as yet known.

Scottomyzon gibberum (Scott).

(Pl. CXVI).

Dermatomyzon gibberum, Scott. On some new and rare Crustacea from Scotland. Ann. Mag. Nat. Hist. Ser. 6, Vol. XIII, p. 144, Pl. IX, figs. 10—14.

Specific Characters.—Female. Form of body very short and compact, more so than in any of the other known Ascomyzontidæ. Anterior division of somewhat varying shape according to age, being in young specimens subclavate or pear-shaped, in fully adult specimens nearly circular in outline, with the greatest width about equal to the length. Cephalic segment exceedingly large, with the lateral edges quite evenly arcuate throughout. The succeeding segments rapidly diminishing in size, and having the epimeral plates rounded off. Tail very short, being scarcely $^1/_5$ as long as the anterior division; genital

segment much dilated, nearly twice as broad as it is long, the 2 succeeding segments small. Caudal rami likewise of inconsiderable size, scarcely longer than they are broad, and somewhat divergent; apical setæ not much produced and somewhat spreading. Anterior antennæ scarcely more than half as long as the cephalic segment, and composed of 18 joints, the 1st and 3rd of which are the largest. Posterior antennæ with the terminal joint comparatively small and of conical form, being provided with a short lateral seta and a rather feeble apical spine accompanied by 2 unequal bristles; appendicular ramus almost as long as the penultimate joint and carrying on the tip 3 short bristles. Siphonal tube nearly oval in form. Mandibles with the extremity quite simple, without any denticles. Maxillæ with the inner lobe a little shorter and stouter than the outer, and carrying on the end 3 rather strong subequal and densely ciliated setæ; outer lobe sublinear in form and provided with 4 more slender apical setæ. Anterior maxllipeds very powerful, with the terminal claw exceedingly strong and abruptly curved at the tip in a hook-like manner. Posterior maxillipeds of quite normal structure. Natatory legs with the inner ramus in the 2 anterior pairs about equal in size to the outer, in the 2 posterior pairs rather smaller; spines of outer ramus in all the pairs rather small. Last pair of legs with the distal joint narrow oblong in form and provided at the tip with 2 comparatively short setæ and inside with a very minute bristle. Ovisacs globular in form, each containing a very limited number of ova.

Male much smaller than female, and having the anterior division of the body far less tumefied. Tail comparatively more fully developed, with the genital segment somewhat larger and, as a rule, containing 2 globular spermatophores, genital lappets each tipped by a long seta pointing obliquely outwards. Anterior antennæ more strongly built than in female and composed of only 16 joints, the last 2 of which form together a very movable terminal part admitting of being bent against the preceding part.

Body in female of a more or less vivid brick-red colour, that in male much paler.

Length of adult female amounting to 0.56 mm.; that of male 0.45 mm.

Remarks.—This form, as above mentioned, was first described by T. Scott as a species of the genus *Dermatomyzon* of Claus, but was subsequently justly removed from this genus by Giesbrecht, to form the type of his new genus *Scottomyzon*. It is an easily recognisable form, which cannot be confounded with any of the other Ascomyzontidæ.

Occurrence.—I have recently found this form parasitic on our common starfish, *Asterias rubens* taken at Risør, south coast of Norway, as also in the

upper part of the Christiania Fjord. Owing to its small size, it is not easy to detect the parasite when still attached to its host, and it was indeed only after immersion of the starfishes in a feeble solution of alcohol that, by an examination of the bottom-residue of the bottle. I succeeded in getting sight of the detached parasites. The greater number of the specimens thus secured were of the male sex, and only very few female specimens were obtained, among them a fully adult ovigerous one, that here figured. Mr. A. Scott has procured this form by the same proceeding from starfishes collected of the British coast.

Distribution.—British Isles (Scott),

Page 172. Add the following species:

Pseudanthessius dubius, G. O. Sars, n. sp.

(Pl. CXVII).

Specific Characters.— Female. Body moderately slender, with the anterior division comparatively broad and regularly oval in outline, greatest width equalling about $^2/_3$ of the length and occurring in the middle. Cephalic segment very large, and scarcely exhibiting any transversal suture behind, front narrowly rounded. Last trunkal segment very small. Tail slender, equalling in length about $^2/_3$ of the anterior division, and only composed of 3 segments, the 1st of which (the genital segment) is, as usual, much the largest and subfusiform in shape, being divided in the middle by a transversal suture into 2 parts, the anterior one somewhat bellshaped, the posterior rapidly tapered; the 2 succeeding segments sharply marked off from each other, both of narrow cylindrical form, fully twice as long as they are broad. Caudal rami very slender and narrow, being nearly as long as the last 2 segments combined, and slightly divergent; seta of outer edge attached somewhat beyond the middle; apical setæ rather unequal, the 2 middle ones being, as usual, much longer than the other 2, which are very small, especially that attached to the outer corner. Anterior antennæ slender and narrow, being composed of the usual number of joints clothed with moderately long setæ; 2nd joint the largest, last joint very small. Posterior antennæ likewise rather slender, though a little shorter than the anterior ones; 2nd joint about as long as the last 2 combined; terminal joint armed at the tip with a single well-developed claw accompanied by 5 strong curved setæ. Maxillæ not examined. Anterior maxillipeds with the terminal process only slightly curved. Posterior maxillipeds with the propodal joint fully as large as the basal one, and provided inside

in the middle with a very small spine accompanied by a likewise small bristle; dactylar joint conical in form, with a minute spinule at the base. Natatory legs resembling in structure those in the type species *(P. gracilis)*; inner ramus of 4th pair however of larger size and densely ciliated on both edges, the outer one exhibiting in the middle a well-marked dentiform projection. Last pair of legs, as in the other species of this genus, quite rudimentary, being represented on each side by a short spine and 2 setæ, all attached immediately to the corresponding segment.

Body, in the living state of the animal, very pellucid, of whitish colour, with orange-colured intestine and light fuscous ovarial tubes.

Length of adult female slightly exceeding 1 mm.

Male unknown.

Remarks.—The most prominent peculiarity of the present species is the composition of the tail of only 3 segments, in which respect it differs not only from the other species of this genus, but from all the known Lichomolgidæ. The structure of the several appendages, however, is in full accordance with that found in the genus *Pseudanthessius,* to which it accordingly must be referred. In the very narrow and produced caudal rami it resembles the form recorded by Brady as *Lichomolgus Thorelli*, and indeed at first I was inclined to regard it as identical with that species. The structure of the caudal segments, however, as also that of the last pair of legs, is, according to the figures given by Brady of these parts, so totally different that an identification of these 2 forms is inadmissible.

Occurrence.—Only a single female specimen of this form has hitherto come under my notice. It was taken many years ago off the west coast of Norway, the exact locality not being noted, and, after a coloured drawing was made from the still living animal, it was submitted to a careful anatomical examination. The figures here given are copied from the drawings made at that time.

Page 189. Add the following genus and species:

Gen. **Lichomolgella,** G. O. Sars, n.

Generic Character.—General form of body somewhat resembling that in the genus *Machrocheiron.* Tail however comparatively shorter and stouter, with the genital segment (in female) rather massive and exhibiting behind 2 peculiar ventral lappets confluent in the middle. Anterior antennæ unusually

short, though composed of the normal number of joints. Posterior antennæ likewise short and stout, distinctly prehensile. Maxillæ not examined. Anterior maxillipeds of quite normal structure. Posterior maxillipeds, however, rather unlike those in other female *Lichomolgidæ*, the propodal joint being considerably dilated and the dactylar joint claw-like. Natatory legs with the rami comparatively short and stout, and having all the spines very strongly developed; inner ramus of 4th pair very short, uniarticulate, with 2 apical spines. Last pair of legs represented on each side by a small, but well defined bisetose joint.

Remarks.—This new genus is established, to include a small Lichomolgid, which I have found it impossible to range within any of the other genera, though it exhibites some affinity both to the genus *Macrocheiron* and to *Pseudantessius*. With the latter genus it agrees in the structure of the 4th pair of legs, the inner ramus of which is uniarticulate; but the last pair of legs are rather different, having a well defined bisetose joint, as in most other Lichomolgidæ. In the structure of the genital segment and of the posterior maxillipeds it differs conspicuously from any of the other genera.

Lichomolgella pusilla, G. O. Sars, n. sp.

(Pl. CXVIII, fig. 1).

Specific Characters.—Female. Body moderately slender, with the anterior division oval in outline, greatest width equalling about $^2/_3$ of the length and occurring in the middle. Cephalic segment very large, occupying almost half the length of the body, and exhibiting near the middle a fainte arcuate transverse suture. The 3 succeeding segments rapidly diminishing in size, and having the lateral parts evenly rounded off. Last trunkal segment very small. Tail rather short, not nearly attaining half the length of the anterior division; genital segment comparatively large, exceeding in length the remaining part of the tail, and exhibiting on each side, at some distance from the end, an angular corner; ventral lappets each tipped by a slender seta pointing obliquely outwards; the 3 succeeding segments subequal in size, and fully twice as broad as they are long. Caudal rami very short, being scarcely longer than the anal segment; seta of outer edge attached about in the middle; apical setæ partly brocken in the specimen examined. Anterior antennæ unusualy short and stout, but composed of 7 well-defined joints clothed with slender setæ. Posterior antennæ about the length of the anterior ones, and rather strongly built; 2nd joint considerably longer than the outer 2 combined, and projecting at the end behind in a rounded corner; penultimate joint very short and armed at

the end anteriorly with a slender biarticulate claw and 3 small bristles; terminal joint carrying on the end 5 curved setæ and a slender claw of same appearance as that on the penultimate joint. Posterior maxillipeds with the propodal joint considerably dilated and oval in form, carrying somewhat beyond the middle a short spine and in front of it a slender seta; dactylar joint exserted in the form of an almost straight claw with a slender spinule at the base. Natatory legs with the rami in the 3 anterior pairs nearly equal-sized; inner ramus of 4th pair, however, much reduced in size, forming a single oval joint with 2 somewhat unequal spines on the tip. Last pair of legs with the free joint rather small and oblong in form; apical setæ not much produced and subequal in size.

Colour not yet ascertained.

Length of the specimen examined 0.45 mm.

Male unknown.

Remarks.—The above-described form may be easily distinguished from any of the other Lichomolgidæ by its small size, the unusually short anterior antennæ and the structure of the tail.

Occurrence.—Only a single specimen of this form, an apparently full-grown female, has hitherto come under my notice. It was picked up from a sample taken several years ago at Skutesnæs, SW coast of Norway, from a depth of about 20 fathoms.

Page 193. Add the following species:

Oncæa minuta, Giesbrecht.

(Pl. CXVIII, fig. 2).

Oncæa minuta, Giesbrecht, Fauna & Flora des Golfes von Neapel, Pelagische Copepoden, p. 591, Pl. 47, figs. 3, 6, 26, 46, 59.

Specific Characters.—Female. Body moderately slender, with the anterior division oval fusiform in outline, greatest width about half the length and occurring in the middle, dorsal face evenly vaulted throughout. Last trunkal segment extremely small. Tail not attaining half the length of the anterior division; genital segment evenly dilated in the middle and slightly longer than the remaining part of the tail; anal segment larger than either of the 2 preceding segments. Caudal rami comparatively short, scarcely attaining the length of the anal segment; seta of outer edge attached about in the middle; apical setæ not much produced, that of the inner corner very small, shorter than that of the outer. Structure of the several appendages very similar

to that in the 2 other Norwegian species. Inner ramus of 4th pair of legs, however, wanting the plug-shaped process between the 2 apical setæ[1]). Last pair of legs extremely small, with the free joint nodiform.

Colour not yet ascertained.

Length of adult female scarcely 0.46 mm.

Remarks.—I cannot doubt that the above-described form is that recorded by Giesbrecht as *O. minuta.* Beside by its small size, it differs from the 2 other Norwegian species by the form and relative size of the genital segment, and by the very small innermost caudal seta.

Occurrence.—Two female specimens of this form were recently found among some pelagic Copepoda kindly sent to me from Mr. Nordgaard, who obtained them in the Herløfjord near Bergen.

Distribution.—North Atlantic Ocean, Mediterranean, Pacific, Indian Ocean.

[1]) True, Giesbrecht, asserts that such a process is present; but I suspect that the leg he figures is in reality not the 4th, but the 3rd, in which this process is well marked.

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(With corrections).

The following are the chief signs on the figures, with their signification:

♀ female; ♂ male; *C.* cephalon; *R.* rostrum; *T.* tail; *gen. reg.* genital region; *F.* furca or caudal rami; a^1 anterior antenna; a^2 posterior antenna; *or. area* oral area; *S.* siphonal tube; *M.* mandible; *Mp.* mandibular palp; *m.* maxilla; $mp.^1$ anterior maxilliped; $mp.^2$ posterior maxilliped; p^1–p^5. legs of 1st to 5th pairs.

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AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

WITH SHORT DESCRIPTIONS AND FIGURES OF ALL THE SPECIES

BY

G. O. SARS

PROFESSOR OF ZOOLOGY AT THE UNIVERSITY OF CHRISTIANIA

VOL. VI

COPEPODA

CYCLOPOIDA

WITH 118 AUTOTYPIC PLATES

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PREFACE.

In concluding this Volume, I wish to observe that I am far from claiming it to give any exhaustive account of the group treated off. Especially as regards the semiparasitic forms belonging to the sections *Siphonostoma* and *Poecilostoma,* there is certainly still much to do, and I have no doubt that, on a closer and more methodical investigation of these interesting forms, many new species will be added to those here described, the greater number of which have been met with only quite accidentally in isolated specimens detached from their hosts. Yet I hope that this Volume will be useful as comprehending what is as yet known about this part of our Fauna.

As to the plates accompanying the present Volume, they are, as will be seen, reproduced in quite a different manner from those in the preceding Volumes, where the autographic method has been applied throughout. This latter method may indeed give very good results, as seen from some of the earlier Volumes of the present work. But the method involves some danger for the clearness of the drawings, if not the outmost care is taken in their transfer on the stone. I have been very sorry to see that several of the plates accompanying the last (5th) Volume, for want of an habile and experienced printer, have been less satisfactorily reproduced, and I therefore have thought it right to abandon this method altogether and to chose another method, the phototypic one, which, though somewhat more costy, will better ensure the perfect reproduction of my drawings.

By the elaboration of the present Volume I have been assisted by the same gentleman who did it in the case of the preceding Volume, and my hearty thanks are here again paid to them for their kindness. I also is much indebted to Prof. Wirén of the Upsala University and to Mr. G. P. Farran, Dublin, for kindly sending me specimens for examination. My best thanks are moreover due to Mr. A. Kjær for kindly having given me an opportunity of

examining the bottom-residue of some large collecting bottles for search of semiparasitic forms. Several interesting species of both siphonostomous and poecilostomous Cyclopoida have thereby been secured and submitted to a closer investigation. Finally I beg to thank the direction of the Bergen Museum for the readiness with which it has admitted the increased expenses by the altered reproduction of the plates, and for the interest it has shown in the continued publication of my work.

G. O. Sars.

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SYSTEMATIC LIST

OF THE SPECIES DESCRIBED IN THE PRESENT VOLUME.

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similis, Claus.
Paroithona, Faran.
parvula, Farran.

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longicornis, Boeck.
Schneideri, Scott.
elegans, Scott.
euacantha, G. O. Sars.
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tumidula, G. O. Sars.
Cyclopetta, G. O. Sars.
difficilis, G. O. Sars.
Pterinopsyllus, Brady.
insignis, Brady.

Cyclopidæ.

Cyclops, Müller.
pictus, Koch.
abyssorum, G. O. Sars.
lacustris, G. O. Sars.
scutifer, G. O. Sars.
vicinus, Uljanin.
insignis, Claus.
vulgaris, Koch.
gigas, Claus.
capillatus, G. O. Sars.
lucidulus, Koch.
robustus, G. O. Sars.
pulchellus, Koch.
bisetosus, Rehberg.
crassicaudis, G. O. Sars.
langvidus, G. O. Sars.
diaphanus, Fischer.
abyssicola, Lilljeborg.
varicans, G. O. Sars.
bicolor, G. O. Sars.
Mesocyclops, G. O. Sars.
obsoletus, Koch.
oithonoides, G. O. Sars.
crassus, Fischer.
Dybowskyi, Lande.
gracilis, Lilljeborg.
Pachycyclops, G. O. Sars.
signatus, Koch.
bistriatus, Koch.
annulicornis, Koch.
Leptocyclops, G. O. Sars.
agilis, Koch.
speratus, Lilljeborg.

Lilljeborgi, G. O. Sars.
macruroides, Lilljeborg.
macrurus, G. O. Sars.
Platycyclops, G. O. Sars.
phaleratus, Koch.
affinis, G. O. Sars.
fimbriatus, Fischer.

Siphonostoma.

Ascomyzontidæ.

Ascomyzon, Thorell.
asterocheres, Boeck.
Lilljeborgi, Thorell.
Boecki, Brady.
simulans, Scott.
latum, Brady.
parvum, Giesbrecht.
Echinocheres, Claus.
violaceus, Claus.
Dermatomyzon, Claus.
nigripes, Brady.
Rhynchomyzon, Giesbr.
purpurocinctum, Scott.
rubrovittatum, G. O. Sars.
Collocheres, Canu.
gracilicauda, Brady.
Mesocheres, Norm. & Scott.
anglicus, Norm. & Scott.
Leptomyzon, G. O. Sars.
elegans, A. Scott.
Scottocheres, Giesbrecht.
elongatus, Scott.
Scottomyzon, Giesbr.
gibberum, Scott.

Acontiophoridæ.

Acontiophorus, Brady.
scutatus, Brady.

Myzopontiidæ.

Myzopontius, Giesbr.
pungens, Giesbr.
Neopontius, Scott.
angularis, Scott.

Dyspontiidæ.

Dyspontius, Thorell.
striatus, Thorell.
Cryptopontius, Giesbr.
brevifurcatus, Giesbr.
Arctopontius, G. O. Sars.
expansus, G. O. Sars.
Bradypontius, Giesbr.
magniceps, Brady.
papillatus, Scott.
major, G. O. Sars.
caudatus, G. O. Sars.
Cribropontius, Giesbrecht.
Normani, Brady.

Artotrogidæ.

Artotrogus, Boeck.
orbicularis, Boeck.

Cancerillidæ.

Parartotrogus, Scott.
arcticus, Scott.
Cancerilla, Dalyell.
tubulata, Dalyell.

Poecilostoma.

Clausidiidæ.

Hemicyclops, Boeck.
purpureus, Boeck.
Hippomolgus, G. O. Sars.
furcifer, G. O. Sars.

Lichomolgidæ.

Lichomolgus, Thorell.
albens, Thorell.
marginatus, Thorell.
forficula, Thorell.
furcillata, Thorell.
Canui, G. O. Sars.
Poucheti, Canu.
tenuifurcatus, G. O. Sars.
agilis, Leydig.
Macrocheiron, Brady.
fucicolum, Brady.
hirsutipes, Scott.
Pseudanthessius, Claus.
gracilis, Claus.
liber, Brady.
assimilis, G. O. Sars.
Sauvagei, Canu.
dubius, G. O. Sars.
Lichomolgella, G. O. Sars.
pusilla, G. O. Sars.
Modiolicola, Auriv.
insignis, Auriv.
Hermannella, Canu.
valida, G. O. Sars.
parva, Norm. & Scott.
prehensilis, G. O. Sars.
finmarchica, Scott.
tenuicaudis, G. O. Sars.
Pseudomolgus, G. O. Sars.
leptostylis, G. O. Sars.
dilatatus, G. O. Sars.
Rhinomolgus, G. O. Sars.
anomalus, G. O. Sars.
Sabelliphilus, M. Sars.
elongatus, M. Sars.

Oncæidæ.

Oncæa, Philippi.
borealis, G. O. Sars.
similis, G. O. Sars.
minuta, Giesbr.

Corycæidæ.

Corycæus, Dana.
anglicus, Lubb.

Ergasilidæ.

Ergasilus, Nordman.
Sieboldi, Nordm.

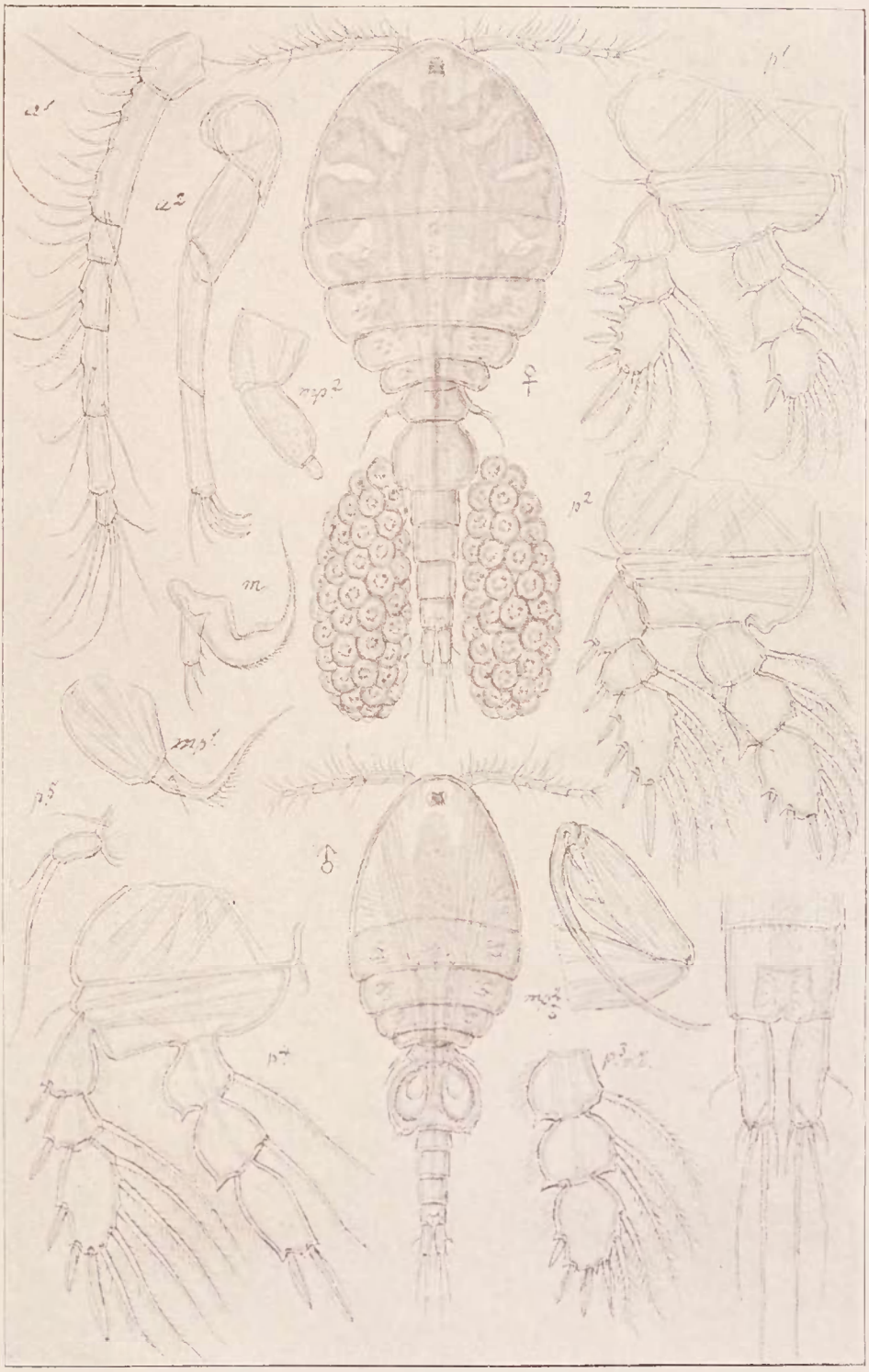
Clausiidæ.

Conchocheres, G. O. Sars.
malleolatus, G. O. Sars.

Eunicicolidæ.

Eunicicola, Kurz.
Çlausi, Kurz.

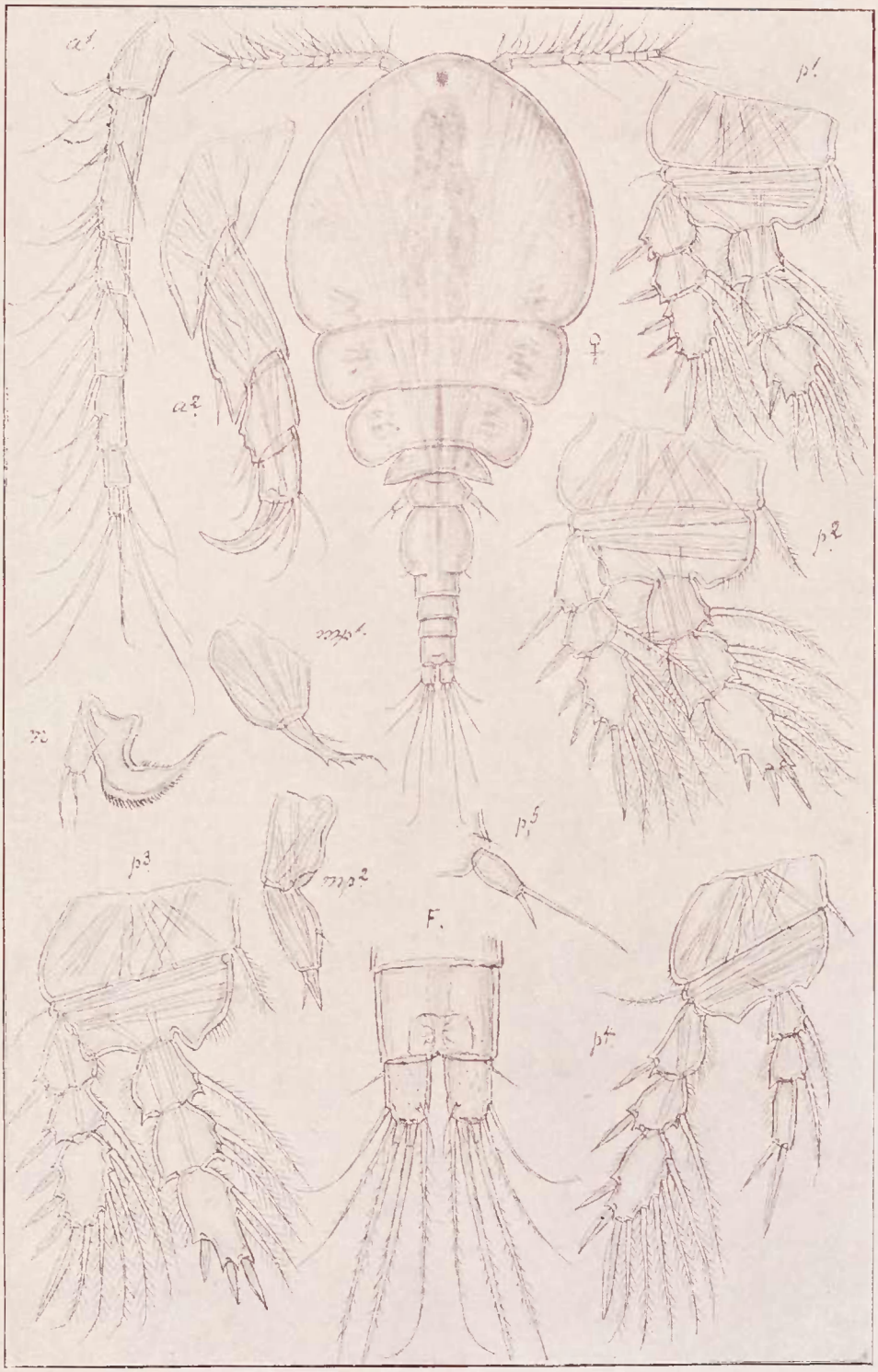
Copepoda



G. O. Sars, del.

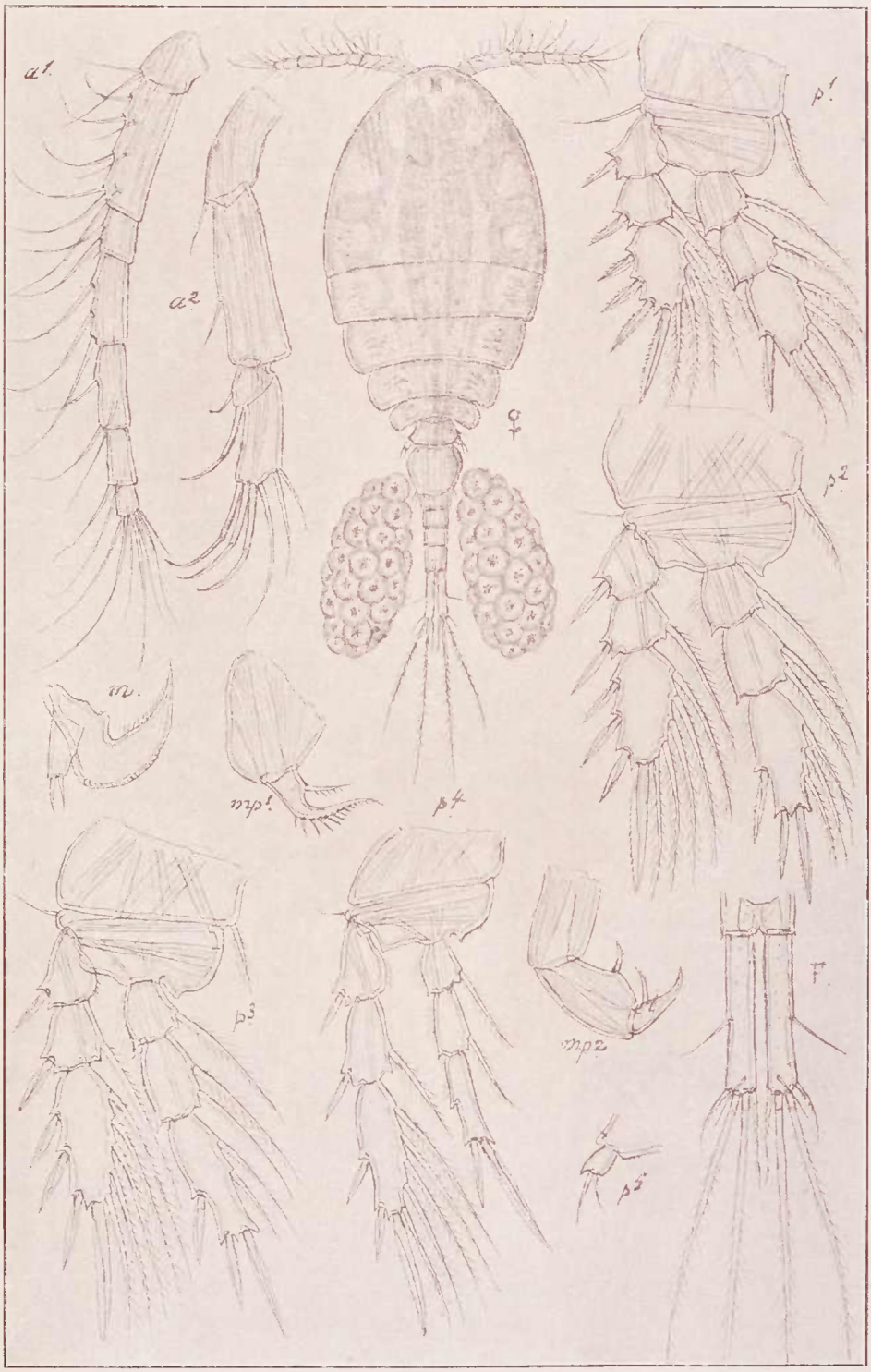
Modiolicola insignis, Aurivillius

Copepoda



G. O. Sars, del.

Hermannella valida, G. O. Sars

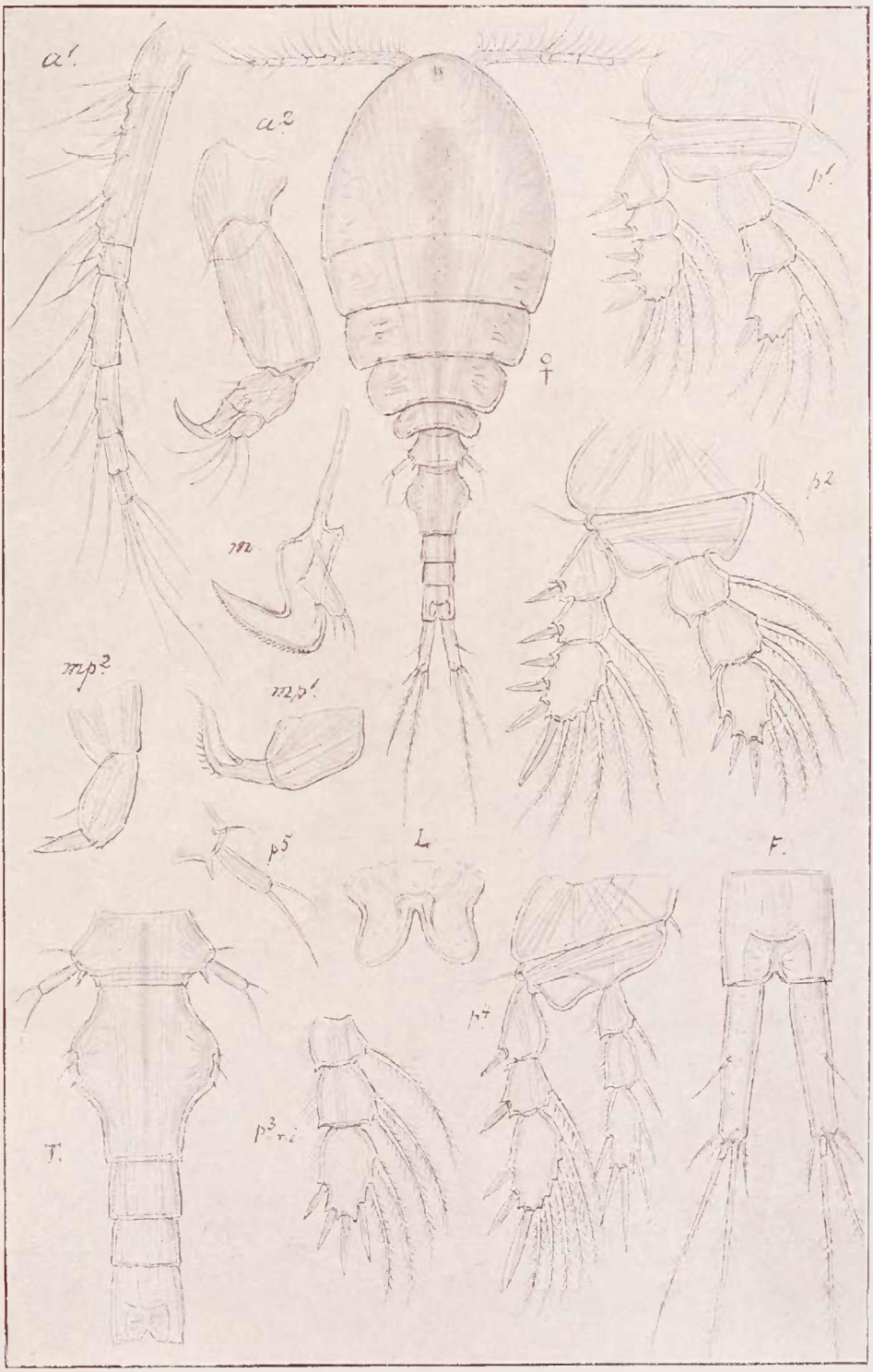


G. O. Sars, del.

Hermannella parva, Norm. & Scott

Copepoda

Cyclopoida

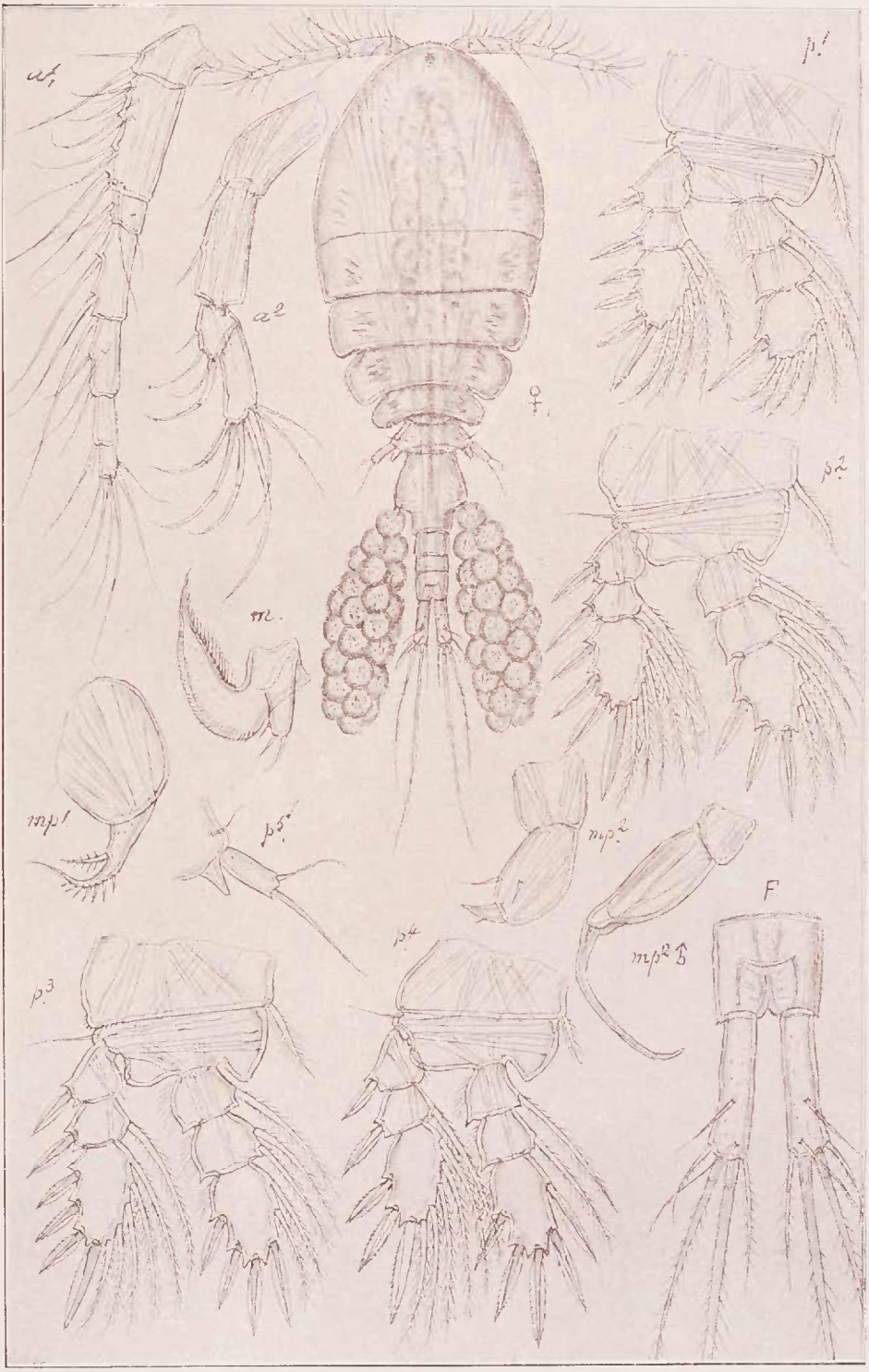


G. O. Sars, del.

Hermannella prehensilis. G. O. Sars

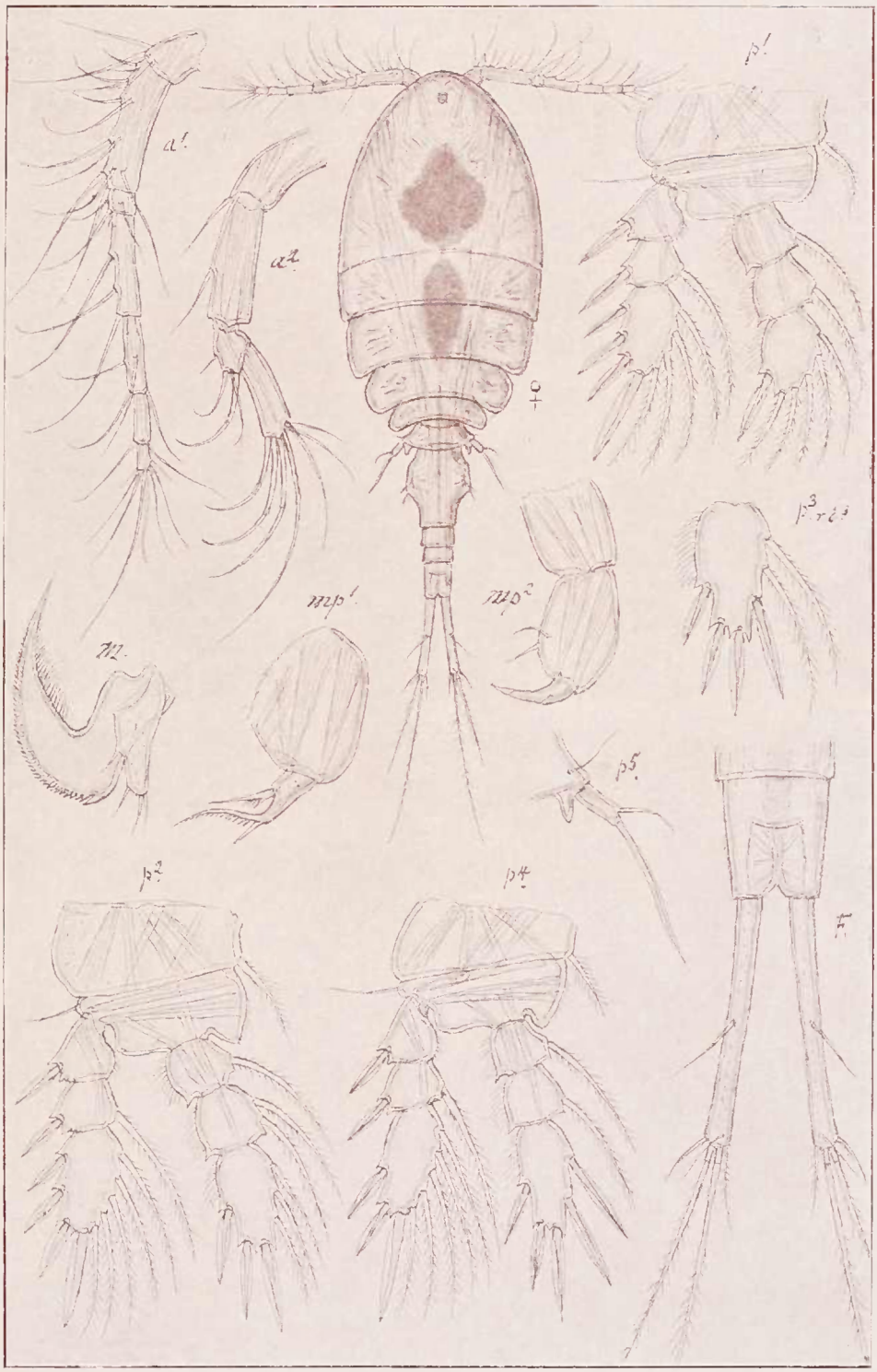
Copepoda

Cyclopoida



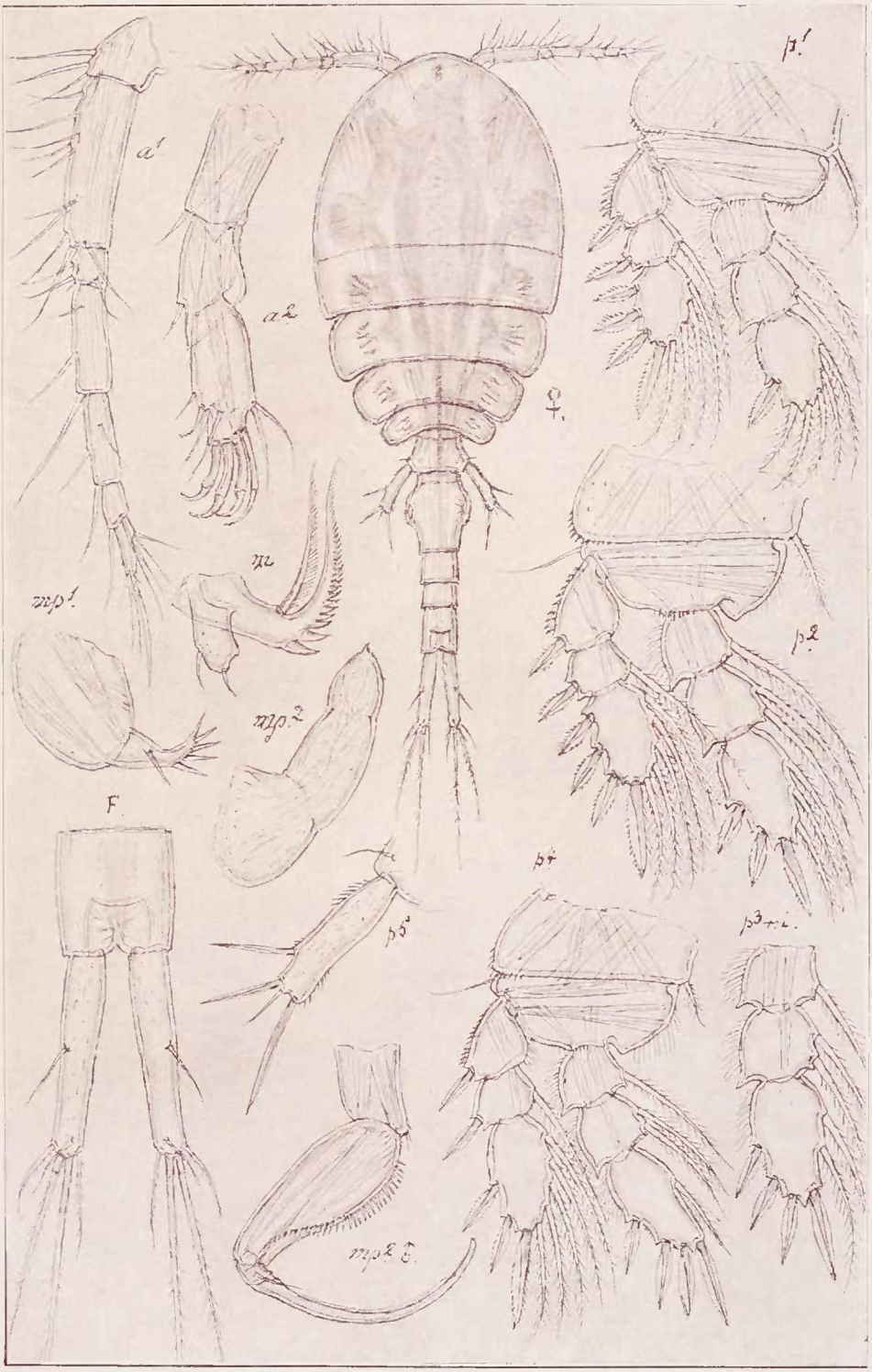
G. O. Sars, del.

Hermannella finmarchica, Scott



G. O. Sars, del.

Hermanella tenuicaudis, G. O. Sars

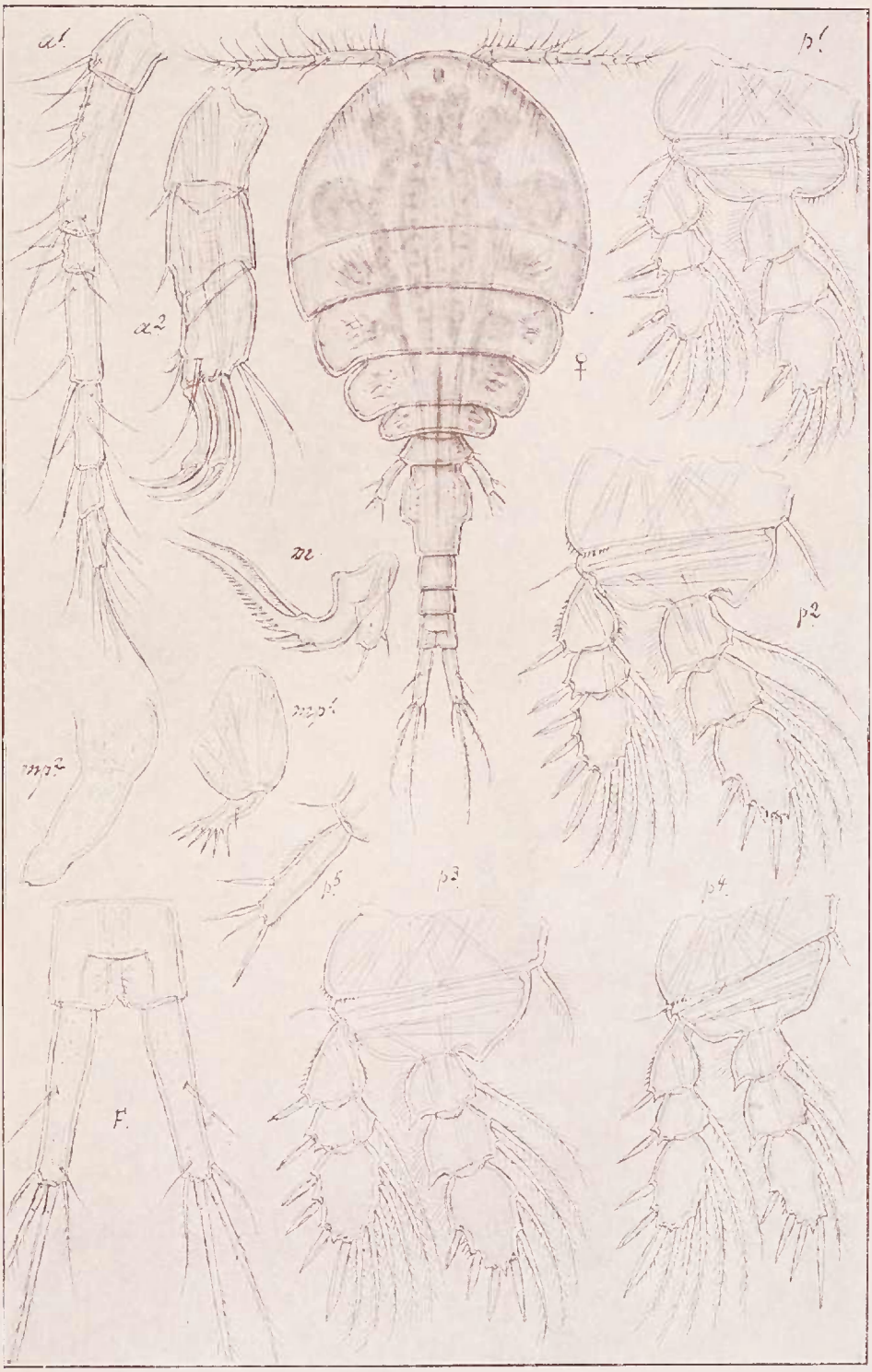


G. O. Sars, del.

Pseudomolgus leptostylis, G. O. Sars

Copepoda

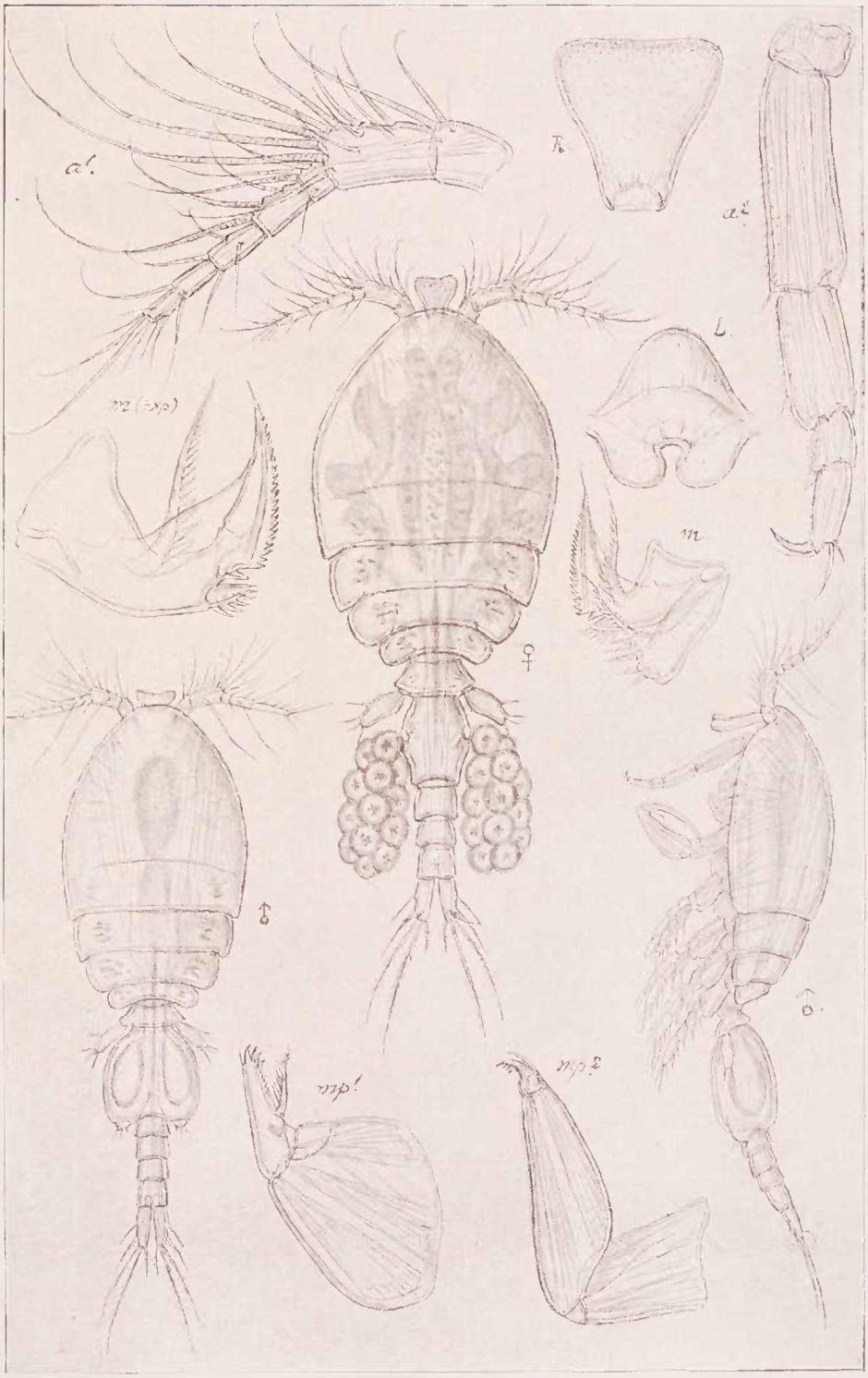
Cyclopoida



G. O. Sars, del.

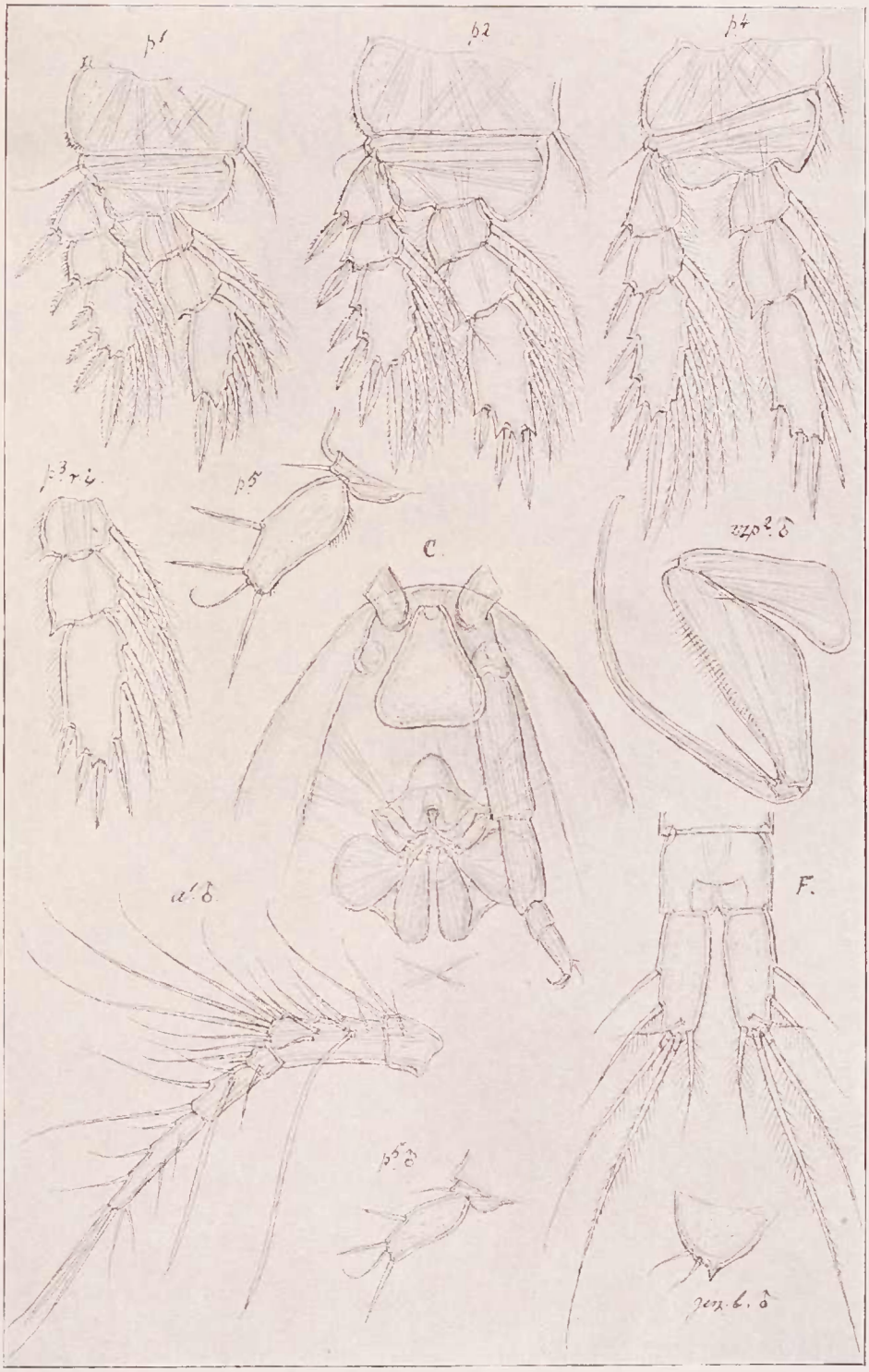
Pseudomolgus dilatatus, G. O. Sars

Copepoda



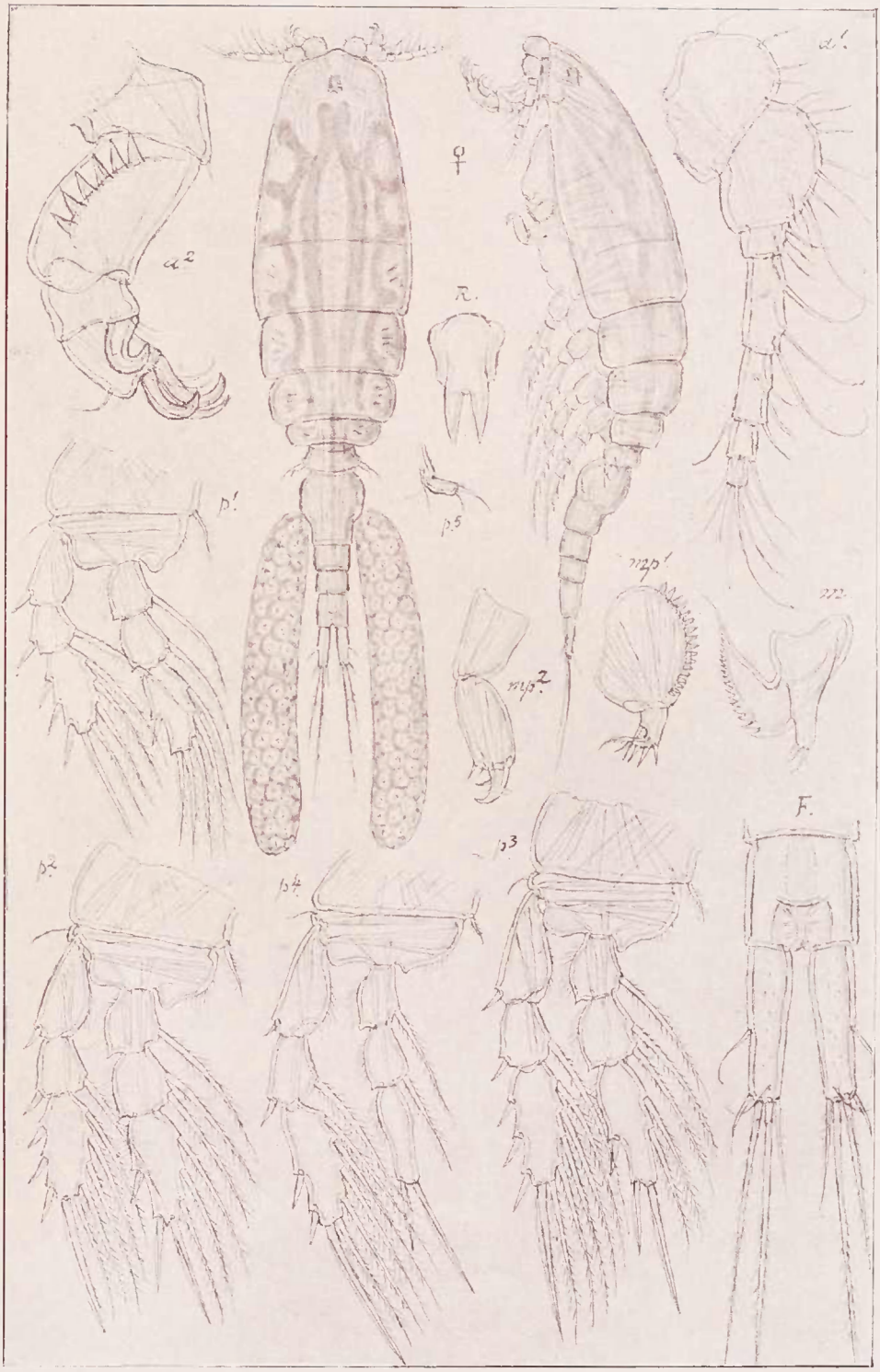
G. O. Sars del.

Rhinomolgus anomalus, G. O. Sars



G. O. Sars, del.

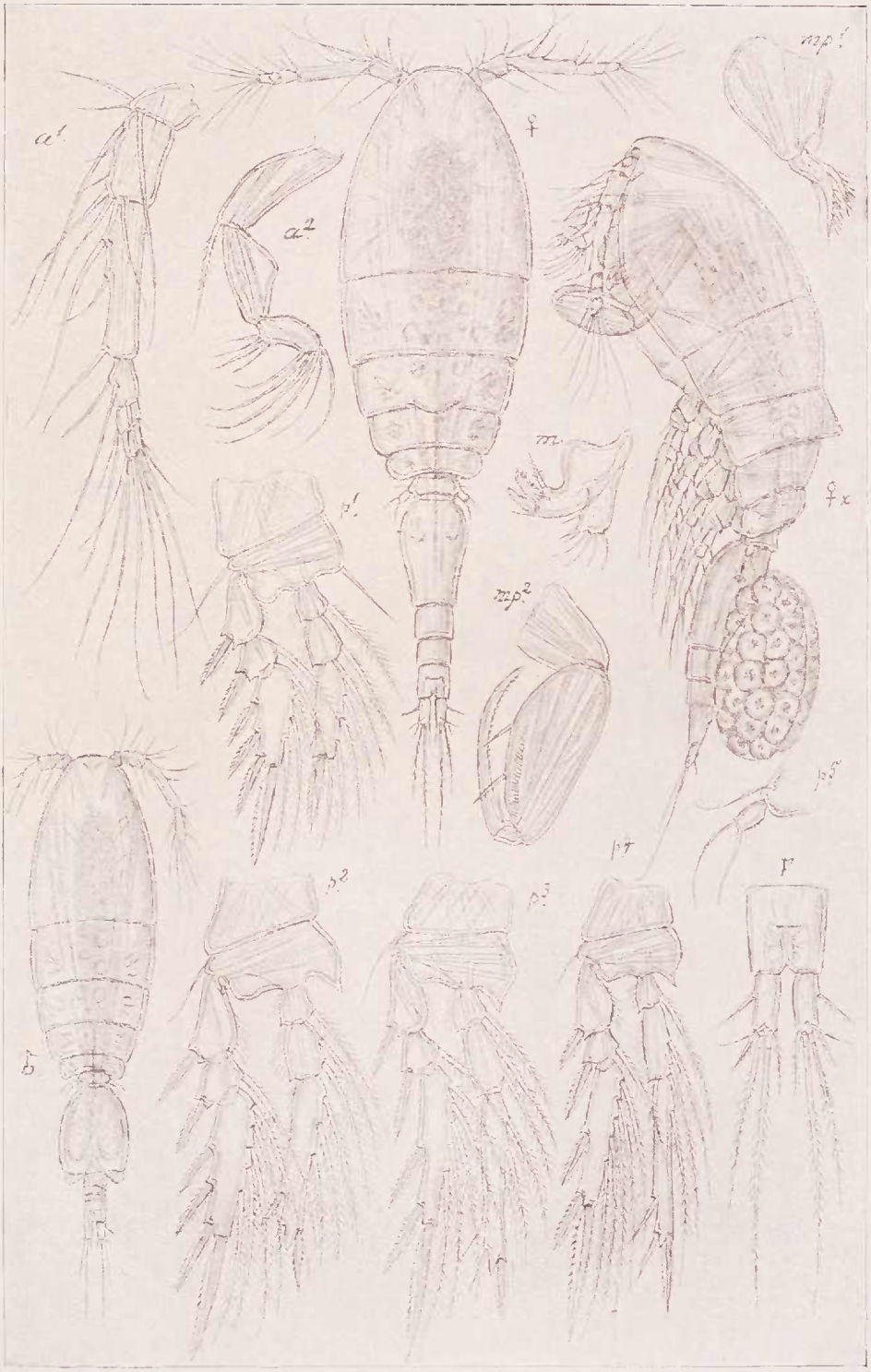
Rhinomolgus anomalus, G. O. Sars
(continued)



G. O. Sars, del.

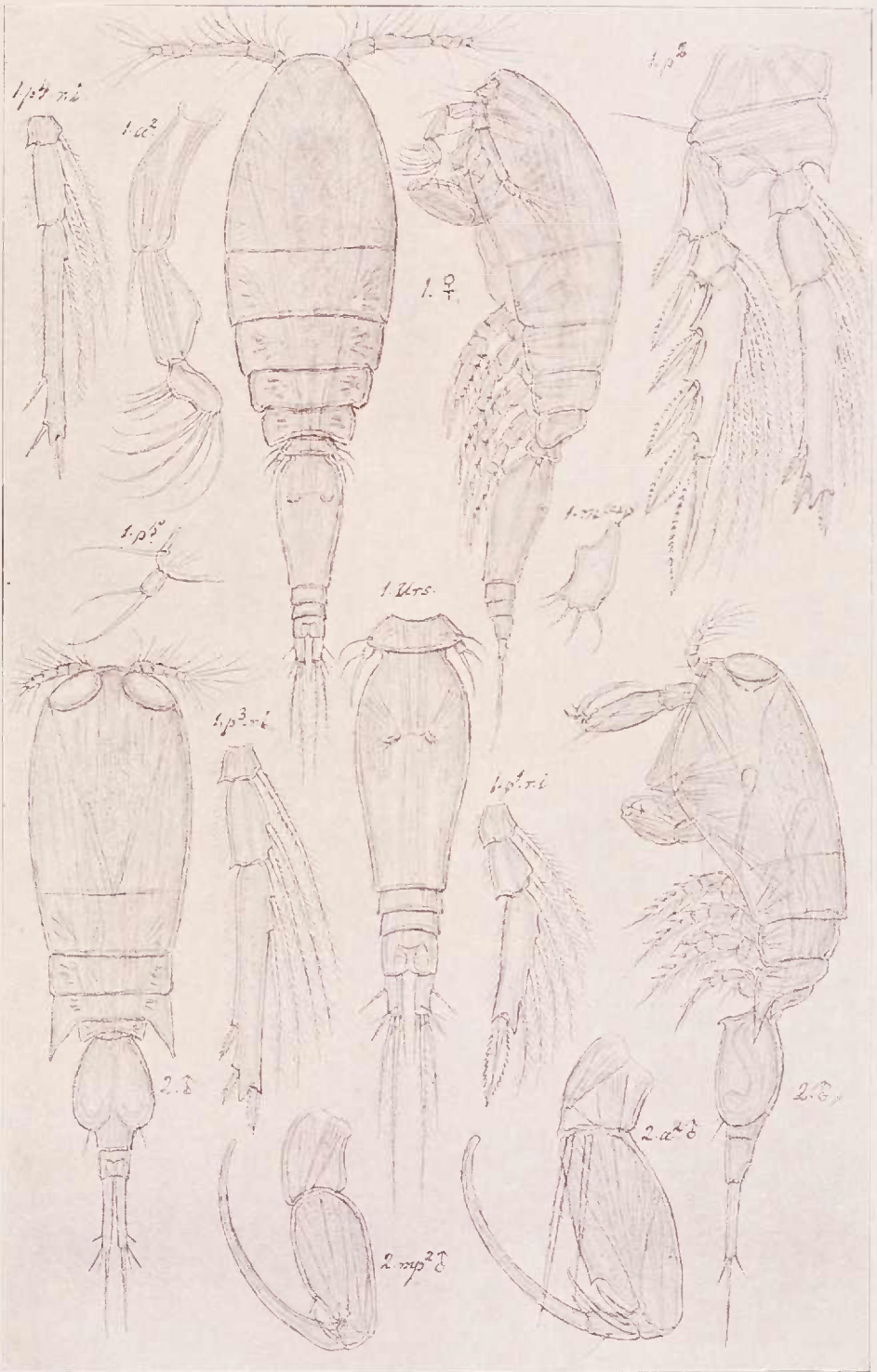
Sabelliphilus elongatus, M. Sars

Copepoda



G. O. Sars, del.

Oncæa borealis. G. O. Sars



G. O. Sars, del.

1. Oncæa similis, G. O. Sars
2. Corycæus anglicus, Lubbock ♂

Copepoda

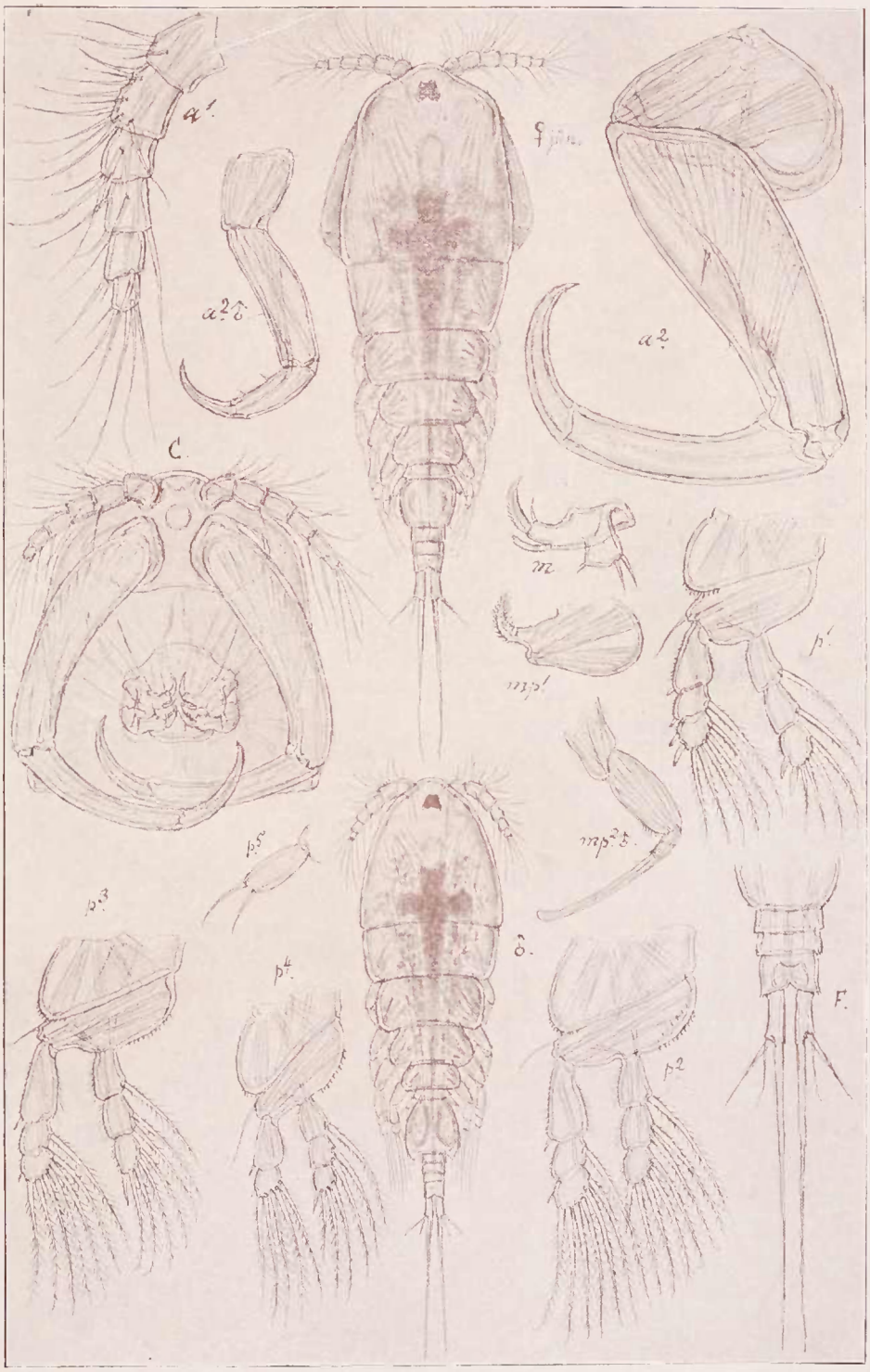
Cyclopoida



G. O. Sars, del.

Corycæus anglicus, Lubbock ♀

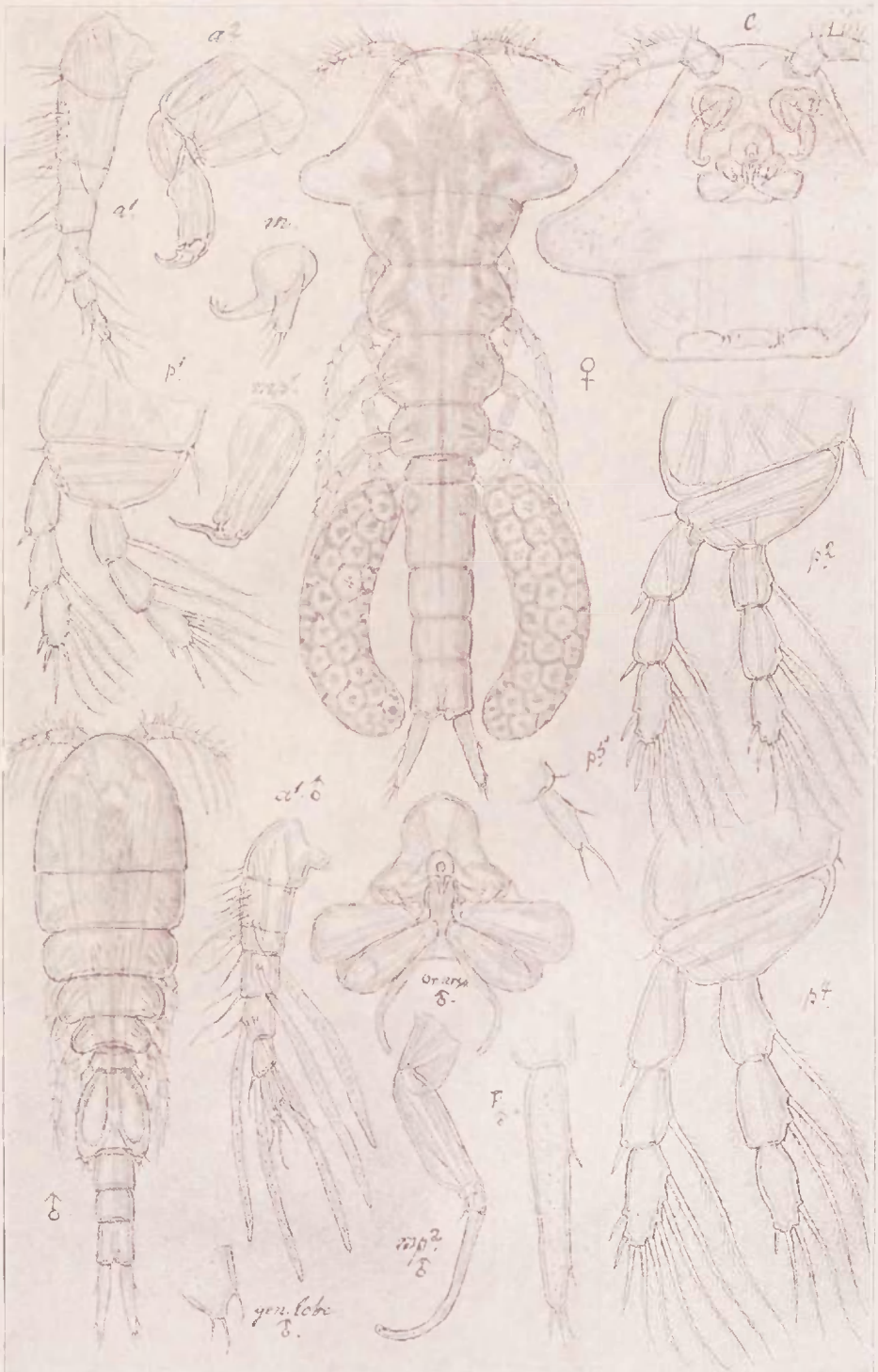
Copepoda



G. O. Sars, del.

Ergasilus Sieboldi, Nordm.

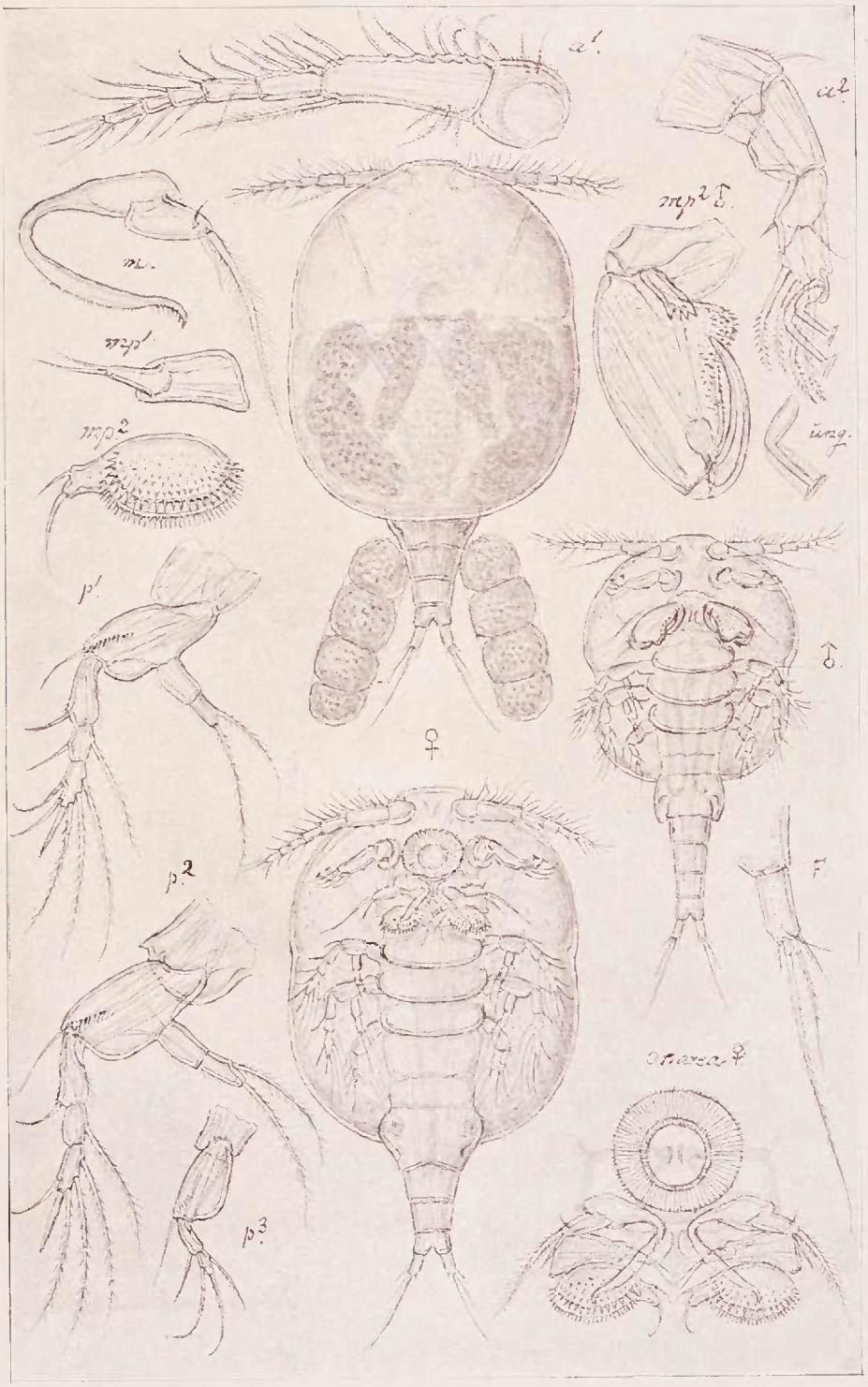
Copepoda



G. O. Sars, del.

Conchocheres malleolatus, G. O. Sars

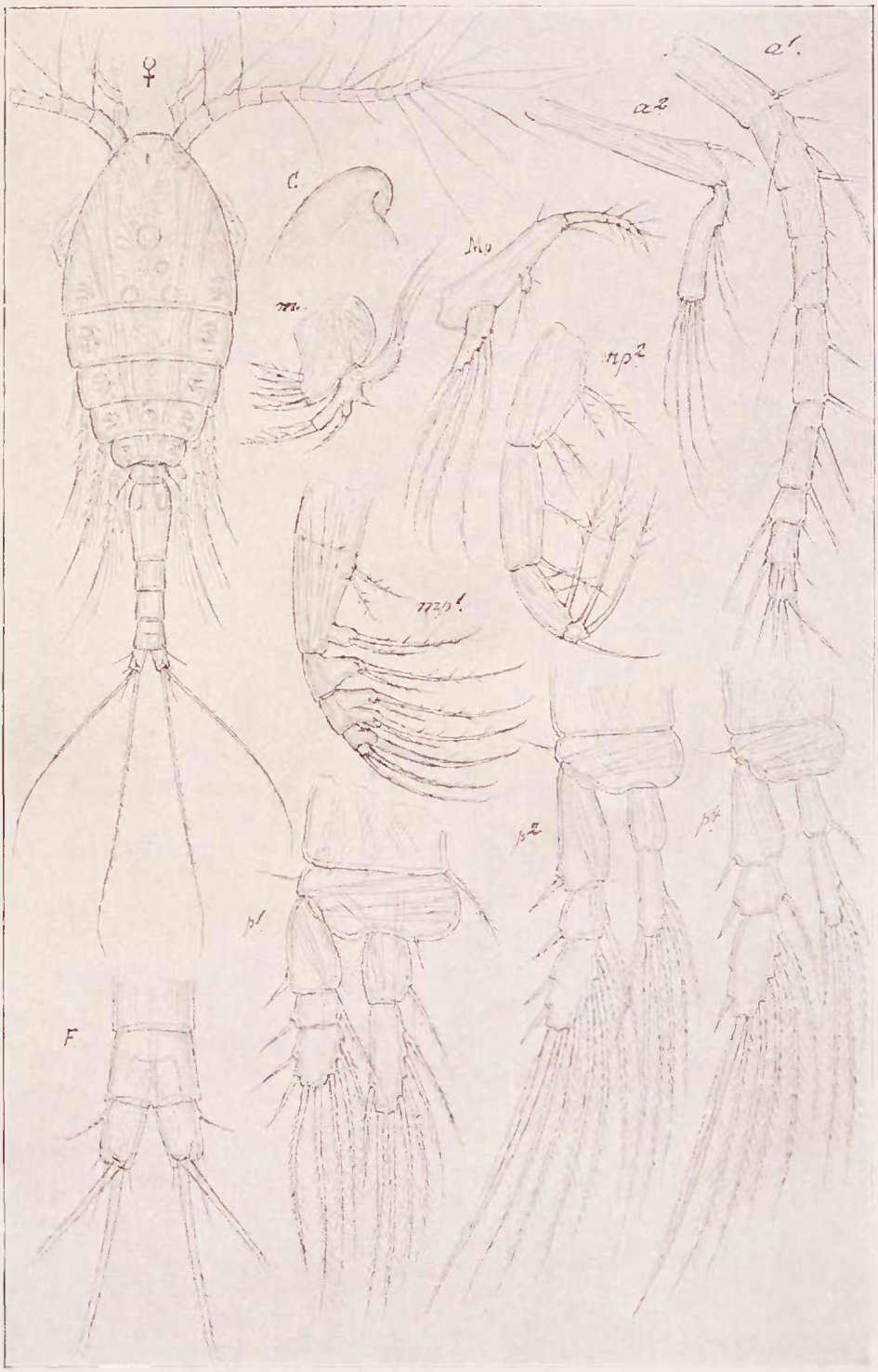
Copepoda



G. O. Sars, del.

Eunicicola Clausi, Kurz

Copepoda

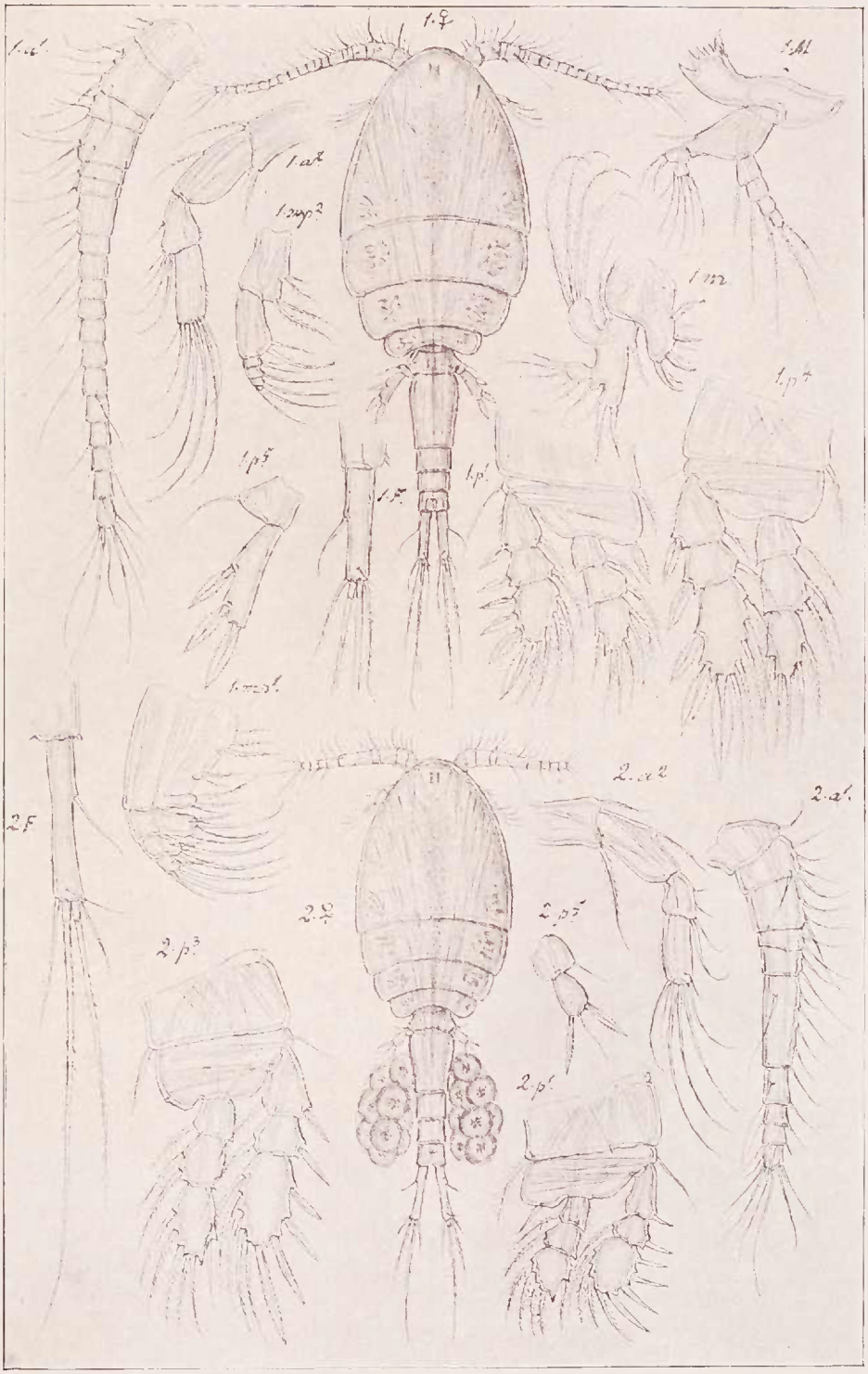


G. O. Sars, del.

Paroithona parvula, Farran

Copepoda

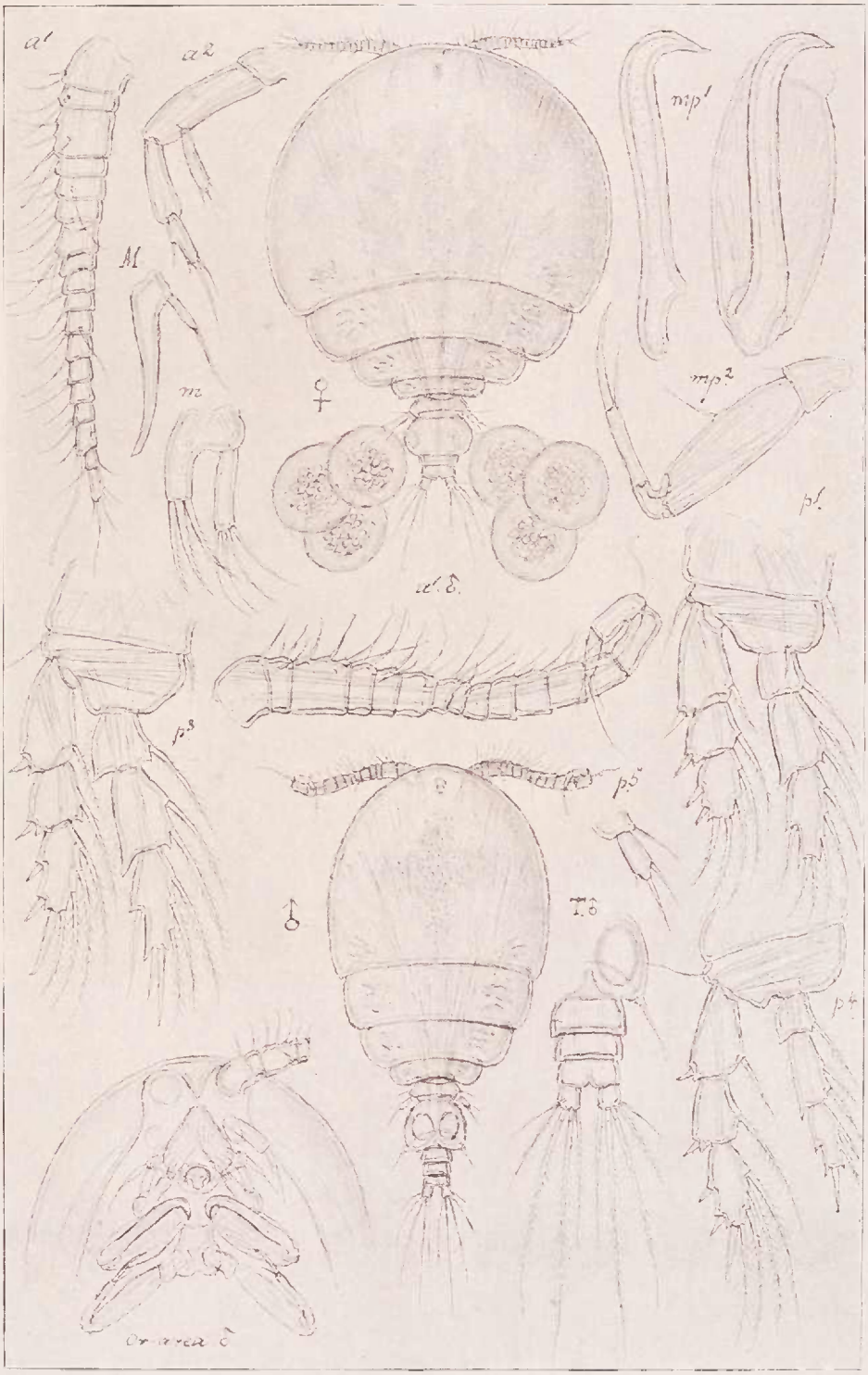
Cyclopoida



G. O. Sars, del.

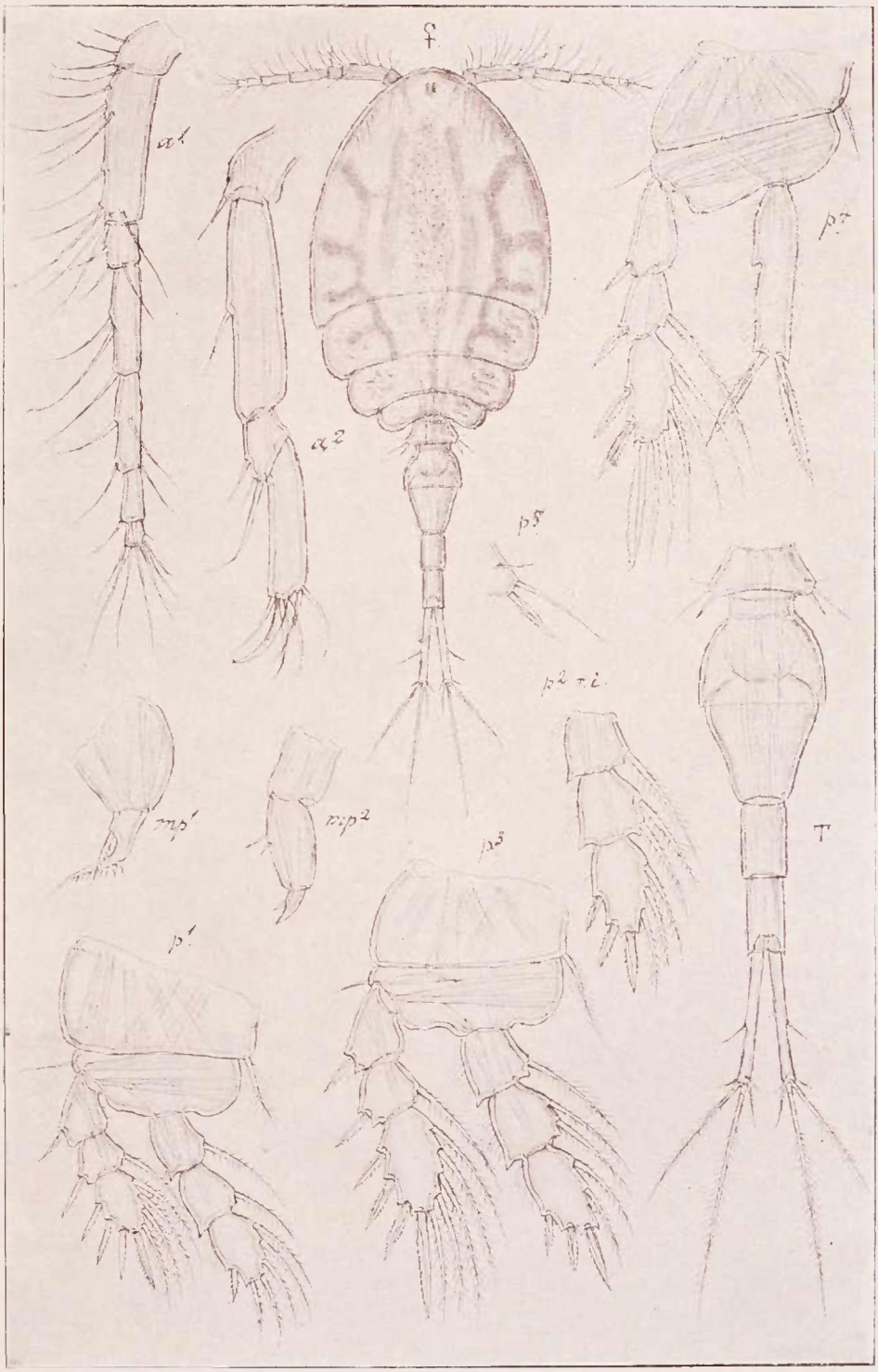
1. Cyclopina euacantha, G. O. Sars
2. „ pygmæa, G. O. Sars

Copepoda



G. O. Sars, del.

Scottomyzon gibberum, (Scott)

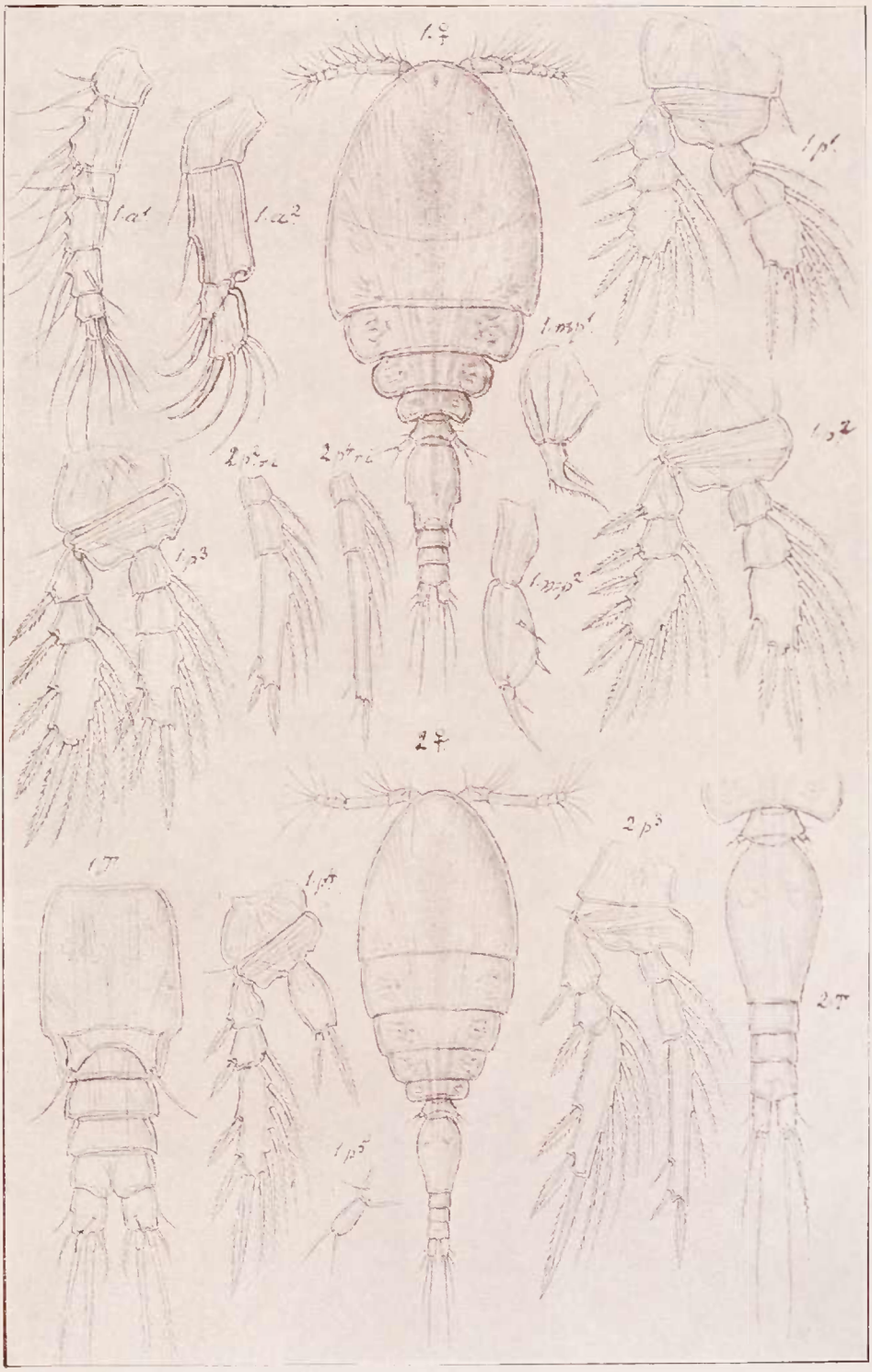


G. O. Sars, del.

Pseudanthessius dubius, G. O. Sars

Copepoda

Cyclopoida



G. O. Sars, del.

1. Lichomolgella pusilla, G. O. Sars
2. Oncæa minuta, Giesbr.