

AN ACCOUNT  
OF THE  
**CRUSTACEA**  
OF  
**NORWAY**

WITH SHORT DESCRIPTIONS AND FIGURES OF ALL THE SPECIES

BY  
G. O. SARS

VOL. IV  
**COPEPODA**  
**CALANOIDA**

PART IX & X  
TEMORIDÆ, METRIDIIDÆ, HETERORHABDIDÆ (part)

WITH 16 AUTOGRAPHIC PLATES



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*Remarks*.—The species belonging to this genus may be easily recognized by their unusually short and compact body, and the very slender anterior antennæ and caudal rami. The name *Halitemora* was proposed by Dr. Giesbrecht, to distinguish the marine species of the old genus *Temora* from those occurring in brackish and fresh water, to which the name *Eurytemora* was given, both these groups being at that time considered as only subdivisions (subgenera). As, however, their generic value is now generally accepted, the name *Halitemora* has been replaced by the original name *Temora*, whereas the 2nd name has been retained, to designate a distinct genus, which will be treated of farther on. We know at present of 4 or 5 species belonging to the present genus, all of which are true marine species. One of these belongs to the fauna of Norway, and will be described below.

#### 41. *Temora longicornis* (Müller).

(Pl. LXV & LXVI).

*Cyclops longicornis*, O. Fr. Müller. Entomostraca, p. 115.

Syn: *Temora finmarchica*, Baird.

„ *Diaptonus longicaulatus*, Lubbock.

„ *Halitemora longicornis*, Giesbrecht.

*Specific Characters*.—*Female*. Anterior division of body, seen dorsally, broadly oval in form, greatest width attaining fully half the length, and occurring quite in front, across the middle of the cephalosome, anterior extremity obtusely rounded, posterior gradually contracted; seen laterally, boldly vaulted above, greatest curvature about in the middle. Cephalosome fully as long as the metasome, front but very slightly produced below, dorsal gibbosity small, but distinct. Lateral parts of last segment of metasome rounded off. Urosome (comprising the caudal rami) somewhat exceeding half the length of the anterior division, genital and anal segments of about equal size, middle segment the smallest. Caudal rami perfectly symmetrical and very narrow, linear, more than twice as long as the anal segment, inner edge finely ciliated, outer edge exhibiting near the base a small ledge; apical setæ unusually short, the innermost but one much the largest and having its base conspicuously dilated, seta of the outer edge occurring at rather a long distance from the others and very delicate, being scarcely at all ciliated. Anterior antennæ, when reflexed, reaching about to the base of the caudal rami. Last pair of legs with the terminal joint about the length of the other 2 combined, and narrow oblong in form, projecting at the end into 4 about equal

denticles, 2 apical and 2 lateral, that of the outer edge distinctly defined at the base.

*Male* more slender than female, with the anterior division of the body less vaulted, and the urosome considerably longer and narrower. None of the caudal setæ dilated at the base. Right anterior antenna with the middle section moderately tumefied, and exhibiting at the end anteriorly a serrated lamella. Last pair of legs exhibiting the structure characteristic of the genus, left leg more than twice as large as the right, with the 2nd joint greatly dilated and having the thumb-like process long and slender, terminal joint shorter than the penultimate one and scarcely broader, being produced at the tip to an acute projection, outside which a ciliated seta is fixed, inner edge finely ciliated and carrying 2 small spines; right leg with the terminal joint abruptly curved near the base, and carrying outside a strong deflexed spine.

*Colour.* Body semipellucid, with a faint bluish tinge, and generally exhibiting on the anterior division some few, finely ramified pigmentary patches of a light brown or reddish colour.

Length of adult female 1.50 mm; of male about the same.

*Remarks.*—This Calanoid was described as early as in the year 1785 by O. Fr. Müller as *Cyclops longicornis*. It was, however, erroneously identified by Baird and subsequent authors with *Monoculus finmarchicus* of Gunnerus, which, as shown above, is a true *Calanus*. The *Diaptomus longicaulatus* of Lubbock seems to be the present species. Though easily recognizable from our other Calanoids, this form exhibits great resemblance to some exotic species, especially to *Calanus turbinatus* of Dana, and, indeed, Mr. Th. Scott considered it to be the very same species. Dr. Giesbrecht, however, who seems to have had an opportunity of examining both these forms, keeps them apart as distinct, though very nearly allied species.

*Occurrence.*—This is one of our commonest Calanoids, being met with along the whole Norwegian coast, both in the fjords and in the open sea. Off the south and west coasts especially, it is often found in great abundance, forming indeed an essential part of the zoöplankton, and in all probability therefore, having great significance as fish-food. In the Christiania Fjord I have met with it during all seasons, even in the immediate neighbourhood of the town. In habits it is a true pelagic form, occurring as a rule close to the surface of the sea. It moves in a peculiar revolving manner, and this seems to be the case with all the species of this genus, and may have given rise to the specific name *turbinata* applied by Dana to one of them.

*Distribution.*—British Isles (Brady), coast of France (Canu), Shetland Isles, Iceland (Cleve), Baltic (Giesbrecht), Finnish coast (Nordqvist), Atlantic Coast of North America (Cleve), Atlantic Ocean from lat. 40° to 72° N. (Cleve).

Gen. 16. **Eurytemora**, Giesbrecht, 1881.

Syn: *Temora* (part), Lilljeborg.

" *Temorella*, Claus.

*Generic Characters.*—Body of comparatively slender form, with the anterior division far less tumefied than in *Temora*. Cephalosome, as a rule, with a gibbous prominence at the end above, similar to that occurring in *Temora*, front only very slightly prominent, and provided below with 2 extremely small, soft lappets. Last segment of metasome defined from the preceding one by a distinct suture, its lateral parts in some cases greatly expanded. Urosome slender, with the genital segment in female somewhat protuberant below. Caudal rami elongated and slightly divergent, setæ present in the normal number. Eye of moderate size. Anterior antennæ comparatively short, scarcely exceeding in length the anterior division, and in female 24-articulate; right antenna in male distinctly geniculate. Posterior antennæ with the outer ramus longer than the inner, and 7-articulate. Anterior lip rather prominent below. Mandibles, maxillæ and anterior maxillipeds about as in *Temora*. Posterior maxillipeds, however, shorter and stouter, with the 2nd basal joint remarkably dilated, and the terminal part somewhat recurved and clothed with delicate ciliated setæ. Inner ramus of 1st pair of natatory legs uniarticulate, that of the other pairs biarticulate; terminal joint of outer ramus in the latter pairs with only 2 spines outside, apical spine finely denticulate on the outer edge. Last pair of legs in female 4-articulate, penultimate joint produced inside to a strong unguiform process, last joint very small, with 2 unequal spines on the tip; those in male rather large and less asymmetrical than in *Temora*, both legs of nearly same size, 4-articulate, and more or less incurved. terminal joint of right leg claw-shaped, that of left spatulate at the end. Ovisac present in female.

*Remarks.*—The species of this genus were formerly referred to *Temora*: but in the year 1881 Claus established a new genus, *Temorella*, for their reception. In the same year, and at a somewhat earlier date, Dr. Giesbrecht had proposed another name, viz., *Eurytemora*, and though this name was merely used to designate a subgenus of *Temora*, it has, on account of its earlier date, been preferred

by most recent carcinologists to that given by Claus. The genus, though evidently belonging to the same family as *Temora*, differs very markedly from that genus in several characters, among which may be named the very different structure of the last pair of legs in both sexes. We know at present 7 or 8 species referable to this genus, some of which have been found in brackish water, some in perfectly fresh water, and some both in the sea and in inland lakes. To the fauna of Norway belong 3 species, to be described below.

#### 42. *Eurytemora velox* (Lilljeborg).

(Pl. LXVII & LXVIII).

*Temora velox*, Lilljeborg, Crust. de ordinibus tribus in Scania occurrentibus, p. 177, Pl. 20, figs. 2—9 (♀).

Syn: *Cyclopsina lacinulata*, Fischer (not Müller).

„ *Temora Clausii*, Hoek.

„ *Temorella Clausii*, Claus.

„ *Eurytemora lacinulata*, Rich.

„ *Eurytemora Clausii*, Brady.

„ *Temorella lacinulata*, G. O. Sars.

*Specific Characters.—Female.*—Body moderately slender, with the anterior division, seen dorsally, oblong oval in form, greatest width not attaining half the length, and occurring about in the middle, anterior extremity broadly rounded, posterior scarcely at all contracted; seen laterally only slightly vaulted above. Cephalosome scarcely longer than the 3 succeeding segments combined, and exhibiting at the end above a well-marked knob-like prominence. Lateral parts of last segment of metasome greatly expanded, forming broad posteriorly-extending lamellæ, each terminating in a somewhat outward-curving point, and clothed with delicate sensory hairs. Urosome somewhat exceeding  $\frac{2}{3}$  of the length of the anterior division, genital segment but slightly dilated in the middle, anal segment of about the same length, and smooth above. Caudal rami but little longer than the anal segment, and clothed both inside and dorsally with delicate hairs; caudal setæ unusually short and conspicuously dilated at the base, that of the outer edge occurring not far from the others. Anterior antennæ, when reflexed, reaching about to the end of the anterior division of the body, and rather richly supplied with bristles. Last pair of legs with the penultimate joint armed outside with a single spine only, claw-like process comparatively short and distinctly denticulated outside, extending obliquely backwards. Ovisac large, rounded.

*Male* considerably more slender than female, and having the lateral parts of last segment of metasome simple, rounded. Urosome rather narrow and

elongated; caudal rami equalling in length the last 2 segments combined, and having the apical setæ more elongated than in female. Right anterior antenna rather strongly built, with the middle section considerably tumefied. Last pair of legs with the 2nd joint but slightly dilated, terminal joint of both legs exhibiting a slight median subdivision, that of left leg terminating in 2 obtuse lobes.

*Colour.* Body more or less pellucid, in some cases, however, tinged with yellowish brown.

Length of adult female reaching to 2.20 mm., that of male to 1.85 mm.

*Remarks.*—This form was first described (in the year 1853) by Seb. Fischer under the name of *Cyclopsina lacimulata*, being regarded as identical with O. Fr. Müller's *Cyclops lacimulatus*, which, however, is evidently a very different form, and is probably referable to *Diaptomus castor* Jurine. The same species was subsequently observed by Prof. Lilljeborg, who described it as a new species of the genus *Temora* (*T. velox*). It is, however, only the female that is referable to the present species, whereas the male described by Prof. Lilljeborg belongs to another nearly-allied species, to be described farther on. The *Temora Clausii* of Hoek is unquestionably the present form. It is the largest of the known species, and moreover easily recognizable, at any rate in the female sex, by the peculiar form of the lateral expansions of the last segment of the metasome, as also by the less elongated caudal rami.

*Occurrence.*—I have found this form rather abundantly in small pools on 2 islands lying off Arendal. The pools were located at only a short distance from the shore, and it is very probable therefore that at times the water is mingled with sea-spray. This is evident from the circumstance that in the same pools the well-known Harpacticid, *Tigriopus fulvus* Fischer, occurred very plentifully. I have, however, met with this Calanoid also in perfectly fresh water, for instance in the Vansjø at Moss, and in tranquil creeks of the river Glommen (at Nipen), many miles from its mouth. The specimens in these places, however, were of far inferior size to those found in the brackish pools, and also much more pellucid. The animal moves very rapidly in abrupt bounds, and thus fully deserves the specific name given to the species by Prof. Lilljeborg.

*Distribution.*—Russia (Fischer), Germany (Schmeil), Britany (Brady), France (Richard), Holland (Hoek), Skåne (Lilljeborg), the Baltic (Nordqvist), fresh-water estuaries of the Caspian Sea (the present author)

43. *Eurytemora hirundoides* (Nordqvist).

(Pl. LXIX).

*Temorella affinis*, var. *hirundoides*, Nordqvist. Die Calaniden Finlands, p. 48. Pl. IV, figs. 5—11; Pl. V, fig. 5.

Syn: *Temora velox*, Lilljeborg ♂.

„ *Temora inermis*, Boeck (immature).

*Specific Characters.*—*Female.*—Body exceedingly slender, with the anterior division, seen dorsally, narrow oblong in form, greatest width about equalling  $\frac{1}{3}$  of the length, and occurring somewhat in front of the middle, anterior extremity narrowly rounded, posterior slightly contracted. Cephalosome somewhat exceeding in length the 3 succeeding segments combined, and exhibiting a well-marked dorsal prominence behind. Last segment of metasome with the lateral parts expanded into triangular, somewhat divergent lamellæ, which, however, do not extend as far as the genital segment. The latter somewhat dilated in the middle, and abruptly contracted behind. Anal segment fully as long as the genital segment, and clothed dorsally with delicate spikes. Caudal rami very slender and elongated, somewhat exceeding in length the last 2 caudal segments combined, and, like the anal segment, clothed dorsally with delicate spikes, apical setæ comparatively more elongated than in *E. velox*; that of the outer edge situated at rather a long distance from the others. Anterior antennæ, when reflexed, reaching scarcely to the end of the anterior division. Natatory legs considerably more slender than in *E. velox*, otherwise of same structure. Last pair of legs with the penultimate joint armed outside with 2 slender spines, unguiform process comparatively larger than in *E. velox*, and quite smooth, extending obliquely backwards. Ovisac large, oblong oval in form.

*Male* still more slender than female, and, as usual, having the last segment of metasome simple, not expanded laterally. Right anterior antenna with the middle section considerably tumefied. Last pair of legs with the 2nd joint on both sides conspicuously dilated, exhibiting inside a rounded expansion, terminal joint without any median subdivision, that of right leg conspicuously dilated at the base, that of left leg terminating in 3 lobules with a hollow space between them.

*Colour.*—Body in both sexes highly pellucid and almost colourless.

Length of adult female reaching to 1.15 mm.

*Remarks.*—This form has generally been considered as only a variety of *E. affinis*, Poppe. In my opinion, however, it ought to be specifically distinguished with fully as much reason as the 3 forms, *E. hirundo*, Giesbrecht, *E. lacustris*, Poppe, and *E. gracilis*, G. O. Sars. All the 4 species are certainly very closely

related, and in all probability stand in a close genealogical relation to each other; but as long as no distinct transitions between them have been demonstrated to exist, they must be kept apart. The true *E. affinis*, Poppe, of which I have had specimens for examination, is a much more robust form, and differs moreover, at any rate in the female sex, in the larger size of the lateral expansions of the last segment of the metasome, as also in the shape of the genital segment. The specimen described by Prof. Lilljeborg as the male of his *Temora velox*, is undoubtedly referable to the present species, and this is also the case with the form recorded by Boeck as *Temora velox*, and that named *T. inermis*, the latter supposed species being only founded on immature specimens, in which the lateral expansions of the last segment of the metasome have not yet been formed.

*Occurrence*.—I have found this form both in the sea and in brackish lakes and ditches round the greater part of the Norwegian coast. On the other hand, I have never met with it in perfectly fresh water. At the Zoological Station at Dröbak, it is often taken close to the shore in comparatively salt water, and I have also occasionally found it in plankton-samples taken in the Brevik Fjord. I have come across it in quite extraordinary abundance in a brackish lake at Kolvereid, Namdal, and this is the most northerly place where I have observed it.

*Distribution*.—Skåne (Lilljeborg), Finnish coast (Nordqvist).

#### 44. *Eurytemora lacustris*, Poppe.

(Pl. LXX).

*Temorella lacustris*, Poppe, Zeitschr. f. wiss. Zool. Vol. 45, p. 278, Pl. 15, figs. 10—13.

Syn: *Temorella intermedia*, Nordqvist.

*Specific Characters*.—*Female*. Body somewhat less slender than in *E. hirundoïdes*, with the anterior division, seen dorsally, oblong oval in form, greatest width exceeding  $\frac{1}{3}$  of the length and occurring quite in front, across the middle of the cephalosome, anterior extremity rounded, posterior somewhat contracted. Cephalosome occupying about half the length of the anterior division, and exhibiting in the middle dorsally a slight cervical depression, and at the end a well-marked knob-like prominence. Last segment of metasome scarcely at all expanded laterally. Urosome rather slender, genital segment but slightly dilated in the middle, anal segment fully as long, but much narrower, and perfectly smooth above. Caudal rami not quite attaining the length of the 2 preceding segments combined, but like them smooth above; setæ of moderate length, that of the outer edge scarcely shorter than the others, and situated at rather a long

distance from them. Anterior antennæ, when reflexed, reaching to about the end of the anterior division of the body. Natatory legs exactly as in *E. hirundoides*. Last pair of legs with the penultimate joint armed outside, as in *E. hirundoides*, with 2 spines, which however are considerably shorter; outer apical spine likewise shorter than in the said species; unguiform process rather strong and extending straight inwards, at a right angle with the axis of the leg. Ovisac of moderate size, rounded.

*Male* resembling that of *E. hirundoides*, but differing slightly in the structure of the last pair of legs, the 2nd joint of which is less dilated; terminal joint of right leg very slender, being scarcely at all dilated at the base, that of left leg terminating in 2 rounded lobes.

*Colour*.—Body in both sexes highly pellucid and almost colourless.

Length of adult female 1.30 mm.

*Remarks*.—This form was first described by Poppe as *Temorella lacustris*, and was subsequently recorded by Nordqvist under another specific name, viz., *T. intermedia*. It is closely allied to *E. hirundoides*, though differing conspicuously in the simple structure of the last segment of the metasome, which does not form any lamellar expansions in the adult female. Moreover the delicate spikes with which the anal segment and the caudal rami in *E. hirundoides* are clothed, are wanting here. Finally, the last pair of legs exhibit in both sexes some small differences referred to in the above diagnosis.

*Occurrence*.—I have hitherto only found this form in a single locality, viz., in the Femsjö, where some few specimens were captured. It is never found except in perfectly fresh water; hence the specific name proposed by Poppe.

*Distribution*.—Sweden (Lilljeborg), northern Germany (Poppe), Finland (Nordqvist), Ladoga (idem).

## Gen. 17. *Heterocope*, G. O. Sars, 1863.

*Generic Characters*.—Body more or less robust, with the anterior division moderately vaulted above. Cephalosome somewhat expanded in the middle and having above a distinct cervical depression, front quite unarmed below. Last segment of metasome confluent with the preceding one, and without any lateral expansions. Urosome moderately slender, genital segment in female much the largest and more or less protuberant below. Caudal rami comparatively short

and broad, transversely truncated at the tip, setæ much reduced in number, only 3 on each ramus being fully developed. Eye rather large and situated far forward. Anterior antennæ slender, and composed in female of 25 articulations, the last rather small, but well defined from the preceding one; right anterior antenna in male geniculate. Posterior antennæ with the outer ramus much narrower than the inner, and composed of 6 joints only. Anterior lip comparatively large and broad, with the median lobe densely hairy. Mandibles with the cutting teeth simple, not bidentate, palp with the inner ramus much longer than the outer. Maxillæ normal. Maxillipeds rather strongly built, the anterior ones with the terminal appendages claw-like, though comparatively short; the posterior ones with the 1st basal joint comparatively broad, and carrying anteriorly unusually strong setæ, terminal part composed of 4 joints only. Inner ramus of all the natatory legs very small and unarticulate, terminal joint of outer ramus with only 2 spines outside, apical spine in 2nd to 4th pairs coarsely serrate on the outer edge. Last pair of legs in female 4-articulate, 1st joint confluent with that on the other side, terminal joint of different form in the different species and coarsely dentate, apical denticle generally much elongated and claw-like; those in male on the whole built upon the same type as in the genus *Temora*, the left leg being much the larger, and having a long curved, thumb-like process issuing from inside the 2nd joint. Ovisac in female wanting, or at any rate imperfectly developed.

*Remarks.*—This genus was established in the year 1863 by the present author, to comprise 2 Norwegian fresh-water Calanoids, one of which had been described at a somewhat earlier date by Prof. Lilljeborg as a species of *Diaptomus*. The genus is unquestionably referable to the family *Temoridae*, as here defined, the last pair of legs in particular exhibiting an evident resemblance in their structure to those in the typical genus *Temora*. Yet this genus is clearly characterised both from *Temora* and the other genera comprised in this family by several peculiarities, among which may be mentioned the rudimentary condition of the inner ramus of the natatory legs, a character which has given rise to the generic name. We know at present 4 species of this genus, one of which has been found in the Caspian Sea, whereas the other 3 are true fresh-water forms. These 3 species belong to the fauna of Norway, and will be described below.

45. *Heterocope saliens* (Lilljeborg).

(Pl. LXXI &amp; LXXII).

*Diaptomus saliens*, Lilljeborg. Öfvers. Vet. Akad. Förh. Vol. 19, p. 395, Pl. 3, figs. 18—31.Syn: *Heterocope robusta*, G. O. Sars." — *alpina*, G. O. Sars (immature)." — *romana*, Imhof.

*Specific Characters.*—*Female.* Body comparatively robust, with the anterior division, seen dorsally, oblong oval in form, greatest width not attaining half the length, and occurring about in the middle, anterior extremity abruptly contracted and obtusely truncated at the tip, posterior slightly attenuated. Urosome scarcely attaining half the length of the anterior division, genital segment about the length of the other 2 combined, and having the genital protuberance simple, without any spines or appendages, anal segment shorter than the middle one. Caudal rami about the length of the anal segment, and scarcely widening distally, each carrying outside the 3 apical setæ a small unciliated bristle, not attaining the length of the ramus. Anterior antennæ, when reflexed, reaching somewhat beyond the 2nd caudal segment. Last pair of legs with the terminal joint considerably dilated, lamellar, carrying outside 2 spinules, inside 4 distinctly bidentate denticles, apical spine very long and coarsely denticulate in its distal part.

*Male* of about the same size as the female, and not very different in shape, though the urosome is comparatively more slender, and, as usual, 5-articulate. Right anterior antenna with the middle section but slightly tumefied. Natatory legs of same structure as in the female. Right last leg with the outer 2 joints well defined, and together about the length of the antepenultimate one, the latter without any protuberance of the inner edge; terminal joint of left leg oblong oval in form, about 3 times as long as it is broad, and finely ciliated inside, inner apical spine rather elongated.

*Colour.*—Body generally of a beautiful ultramarine hue, antennæ, oral parts and urosome often tinged with dark orange.

Length of adult female about 3 mm.

*Remarks.*—As stated above, this form was first described by Prof. Lilljeborg as *Diaptomus saliens*, and the same form was somewhat later recorded by the present author under the name of *Heterocope robusta*, Prof. Lilljeborg's paper being at that time unknown to him. The *Heterocope romana* of Imhof is unquestionably the same species, and this is also the case with the form recorded by the present author as *H. alpina*, which was only founded on immature specimens of *H. saliens*. It may be regarded as the type of the present genus.

*Occurrence.*—I have met with this beautiful Calanoid in many places in Norway, in the lowland, and especially in the mountain lakes. According to the recent investigations of Mr. Huitfeldt-Kaas, it is generally distributed in almost all the lakes of the western part of Norway, and it has been found occasionally by Mr. Rabot in the great lake Rös vand in Nordland. The most northerly place where I have met with it, is at Bodö, located somewhat north of the Arctic Circle. As a rule, it is found as a true limnetic form in larger lakes, where it constitutes an essential food of the trout; but occasionally it also occurs in comparatively small tarns and ditches. It moves in a peculiar jerky manner, chiefly by rhythmical strokes of the posterior antennæ, only now and then making a quick bound by employing its natatory legs and urosome. The specific name proposed by Prof. Lilljeborg refers to this peculiar motion.

*Distribution.*—Lakes of Sweden (Lilljeborg), Russia (Poggenpol), central Germany (Gruber, etc.), Bohemia (Fric), North Italy (Pavesi), Switzerland (Imhof).

#### 46. *Heterocope borealis* (Fischer).

(Pl. LXXIII).

*Cyclopsina borealis*, Fischer, in „Middendorf's Sibirische Reise“. Zool. p. 158.

Pl. VIII, figs. 40—46.

SYN: *Heterocope robusta*, Gruber (not G. O. Sars).

„ — *saliens*, Nordqvist (not Lilljeborg).

„ — *Weismanni*, Imhof.

*Specific Characters.*—*Female.* Body considerably more robust than in the preceding species, with the anterior division, seen dorsally, oval in form, greatest width nearly attaining half the length, and occurring about in the middle. Urosome about the length of the metasome, genital segment fully as long as the other 2 combined, hind part of genital area with a slight incurved dentiform projection on each side, anal segment shorter than the middle one. Caudal rami short and broad, widening distally, and slightly divergent, apical setæ conspicuously dilated at the base, the middle one somewhat longer than the other 2, bristle outside them comparatively larger than in *H. saliens*, attaining the length of the caudal rami. Anterior antennæ, when reflexed, reaching but little beyond the genital segment. Last pair of legs with the terminal joint comparatively narrower than in *H. saliens*, and having the denticles of the inner edge less distinctly bidentate, apical spine very slender.

*Male* resembling that of *H. saliens*, but more robust of form, with the middle section of right anterior antenna more tumefied. Outer ramus of 2nd to

4th pairs of legs peculiarly transformed on right side. Last pair of legs on the whole resembling those in the male of *H. saliens*, though exhibiting some small differences: right leg with the 2nd joint produced inside to a knob-like prominence, the last 2 joints imperfectly defined from each other; left leg with the terminal joint comparatively narrower and more elongated, exceeding in length the 2 preceding joints combined.

*Colour*.—Body generally of a dark olivaceous hue, anterior antennæ and caudal rami tinged with reddish brown.

Length of adult female somewhat exceeding 3 mm.

*Remarks*.—There cannot in my opinion be any doubt that this is the *Cyclopsina borealis* originally described by Seb. Fischer, since, as shown by the present author, it is the only species of *Heterocope* occurring in the tract from which Fischer received his material. Owing to the imperfect description given by that author, it was not recognized, however, by subsequent carcinologists, and in the year 1890 it was re-described by Dr. Imhof as a new species under the name of *H. Weismanni*. By some other authors (Nordqvist, Gruber) it was confounded with *H. saliens*, Lilljeb., to which species it certainly bears a great resemblance. On a closer comparison, however, it may be easily distinguished by its considerably more robust body, the comparatively shorter anterior antennæ, and also by some slight differences in the structure of the caudal rami and the last pair of legs in both sexes. A character quite peculiar to the present species, and not found in any other known Calanoid, has been first pointed out by Dr. Gruber, viz., the peculiar transformation in the male of the outer ramus on the right side of the 2nd to 4th pairs of legs. This transformation is perfectly constant, and will alone suffice to distinguish the male of the present species.

*Occurrence*.—I have only met with this form in the eastern part of Finmark, where it seems to be generally distributed in small tarns and ditches. It occurs in this way in great abundance on the mainland opposite Vardö, as also at Matsjök, an affluent to the river Tana. In habits it agrees with *H. saliens*, moving in a similar jerky manner.

*Distribution*.—Siberia, in the rivers Taimyr and Boganida (Fischer), Iana territory, New Siberian Islands, territory of Akmolinsk (the present author), Kola Peninsula and Nova Zembla (Lilljeborg), Bodensee (Imhof).

47. *Heterocope appendiculata*, G. O. Sars.

(Pl. LXXIV).

*Heterocope appendiculata*, G. O. Sars. Oversigt af de indenlandske Ferskvandscopepoder.  
Chr. Vid. Selsk. Forh. 1862, p. 15.

*Specific Characters.*—*Female.* Body considerably more slender than in the 2 preceding species, with the anterior division, seen dorsally, oblong in form, greatest width but slightly exceeding  $\frac{1}{3}$  of the length, and occurring somewhat in front of the middle. Urosome exceeding half the length of the anterior division, genital segment shorter than the other 2 combined, and carrying in front of the genital orifice a transverse row of 8 peculiar, reflexed appendages; anal segment longer than the middle one. Caudal rami about twice as long as they are broad, bristle at the outer corner wanting, and replaced by a slight dentiform projection. Anterior antennæ very slender and elongated, reaching, when reflexed, beyond the caudal rami. Last pair of legs with the terminal joint very narrow, denticles of the inner edge simple, apical spine very slender.

*Male* still more slender than female, and having the middle section of right anterior antenna only slightly tumefied. Last pair of legs differing conspicuously from those in the 2 preceding species, right leg rather produced and peculiarly contorted, having the 3 outer joints confluent into a falciform piece; left leg with the thumb-like process bulbously dilated at the tip, terminal joint rather narrow, with the apical spine quite short.

*Colour.*—Body semipellucid and generally of a light bluish green hue, anterior antennæ and urosome in male tinged with orange.

Length of adult female 2.20 mm.

*Remarks.*—This species may at once be distinguished from the 2 preceding ones by its more slender form of body, the greatly elongated anterior antennæ, and the peculiar appendages occurring in front of the female genital orifice, the latter character having given rise to the specific name. It is also rather inferior in size to the other 2 Norwegian species, and exhibits a somewhat different structure in the last pair of legs.

*Occurrence.*—In the southern part of Norway, this species is by far the commonest, occurring in great abundance in almost all the larger lakes, and there constituting an essential part of the food of several fresh-water fishes. In the northern and western parts of the country, as also in the mountain lakes, its place is taken by *H. saliens*, with which it agrees perfectly in habits.

*Distribution.*—Sweden (Lilljeborg), Finland (Nordqvist), Ladoga (idem), Northern Germany (Zacharias), Russian Lapland (Richard).

## Fam. 16. Metridiidæ.

*Characters.*—Body of comparatively slender form, with the cephalosome well defined from the 1st pedigerous segment, front somewhat produced and carrying below 2 delicate, ciliated filaments. Last 2 segments of metasome united. Urosome more or less elongated, and consisting in female of 3, in male of 5 segments. Caudal rami comparatively broad, flattened, with the full number of setæ. Eye very small, subventral. Anterior antennæ moderately slender, and consisting in female of 24 articulations, the 7th and 8th being united; left antenna in male, as a rule geniculate, and richly supplied with sensory appendages. Posterior antennæ and oral parts on the whole normal. The 4 anterior pairs of legs with both rami 3-articulate, outer ramus of 2nd to 4th pairs very large, more or less lamellar, with comparatively short spines, 3 of which occur outside the terminal joint. Inner ramus of 2nd pair with the 1st joint peculiarly transformed. Last pair of legs simple, not natatory, being very small in female, in male, as usual, somewhat larger and prehensile, right leg the larger. No ovisac present in female.

*Remarks.*—In this new family I propose to include the 2 nearly-allied genera *Metridia*, Boeck and *Pleuromamma*, Giesbrecht. These genera, it is true, in some respects apparently exhibit a close resemblance to the *Temorida*; but the structure of the natatory legs is essentially different, and more resembles that in the next family (*Heterorhabdidae*). With this family they also agree in the circumstance that the left anterior antenna in the male is generally prehensile. Finally, a peculiarity, not mentioned in the above diagnosis, may be here named, viz., the luminous power of the animal, when alive. This power seems to be common to all the Metridiidæ, whereas it has not been observed in any other Calanoids. In one of the genera (*Pleuromamma*), a special luminous organ is present, and though this organ is wanting in *Metridia*, all the species of that genus observed in the living state, have been found to emit light when disturbed. Both genera are represented in the fauna of Norway, and will be treated of below.

### Gen. 18. *Metridia*, Boeck, 1864.

*Generic Characters.*—Body slender and elongated, with the anterior division only slightly tumefied. Cephalosome without any cervical depression above, rostral projection smooth in front, tentacular filaments very slender. Lateral

parts of last segment of metasome not expanded, though in some cases angular at the tip. Urosome narrow and elongated, genital segment scarcely at all protuberant below, anal segment slightly widening distally. Caudal rami flattened, with the setæ comparatively short, one of them attached to the outer edge, at some distance from the others. No special luminous organ present. Anterior antennæ conspicuously attenuated, with some of the proximal joints projecting into small denticles, last joint very small, but well defined from the preceding one, which carries anteriorly an unusually long and slender bristle; prehensile antenna of male (generally the left) with the sensory appendages of moderate size and uniform appearance. Posterior antennæ with the outer ramus scarcely longer than the inner, and 6-articulate. Anterior lip somewhat prominent, and defined in front by a slight sinus. Posterior maxillipeds very slender, with the terminal part 5-articulate and longer than the 2nd basal joint. Inner ramus of 2nd to 4th pairs of legs about half the length of the outer, its terminal joint with 2 setæ on the outer edge, 1st joint in 2nd pair with strong hamiform processes inside; outer ramus of these pairs moderately dilated, with the apical spine well developed and finely denticulate on the outer edge; its 1st joint in 3rd pair somewhat larger than in the other pairs, and having a small incision at the end outside. Last pair of legs in female 3- or 4-articulate, with slender setæ at the tip; those in male 5-articulate and more or less strongly incurved, right leg with the terminal joint but slightly dilated, antepenultimate joint, as a rule, with a slender spiniform process inside.

*Remarks.*—This genus was established in the year 1864 by Boeck, to comprise 2 Norwegian species, and its near relation to the genus *Pleuromma* of Claus (= *Pleuromamma*, Giesbr.) was at the same time mentioned. The chief distinction between these 2 genera consists in the presence or absence of a special luminous organ, the latter being constantly found in the genus *Pleuromamma*, whereas in *Metridia* no such organ exists. In addition to this character, some other differences may, on a closer comparison, be demonstrated to exist, justifying the separation of these 2 genera, the more so as several species of each of them have been found. We know at present no less than 9 species referable to the present genus, 2 of which belong to the Norwegian fauna and will be described below.

48. *Metridia longa* (Lubbock).

(Pl. LXXV &amp; LXXVI).

*Calanus longus*, Lubbock. On some Arctic Species of Calanidae, Ann. nat. hist., ser. 2, Vol. 14, p. 127, Pl. 5, fig. 10.

Syn: *Metridia armata*, Boeck.

*Specific Characters.*—*Female.* Body exceedingly slender, with the anterior division, seen dorsally, oblong in form, greatest width but slightly exceeding  $\frac{1}{3}$  of the length, and occurring about in the middle, anterior extremity somewhat contracted and narrowly rounded at the tip, posterior gradually attenuated. Cephalosome much shorter than metasome, and having the dorsal face quite evenly vaulted, rostral projection somewhat prominent. Lateral parts of last segment of metasome rounded off at the tip. Urosome very slender, exceeding in length the metasome, genital segment about the length of the other 2 combined, and only very slightly dilated in front. Caudal rami comparatively large, fully as long as the anal segment, and somewhat widening distally, apical setæ rather short, the innermost but one the longest, seta of the outer edge occurring at about  $\frac{2}{3}$  of the length of the caudal ramus. Anterior antennæ, when reflexed, reaching about to the middle of the genital segment, 1st, 2nd, 4th, 5th, 6th and 10th joints each produced at the end anteriorly to a small dentiform projection. Last pair of legs distinctly 4-articulate, last joint the smallest, and carrying 3 slender ciliated setæ, the innermost the longest, and extending obliquely inwards.

*Male* rather smaller than female and still more slender, with the urosome very narrow and elongated. Left anterior antennæ (more rarely the right) geniculate, with the middle section only slightly tumefied. Last pair of legs exhibiting the structure characteristic of the genus, terminal joint of both legs oblong in form, with the distal part somewhat contracted, spiniform process of antepenultimate joint of right leg rather elongated, slightly sigmoid and finely denticulated on one side distally.

*Colour.*—Body in both sexes highly pellucid, almost hyaline, sometimes with a slight brimstone-coloured shade on the anterior part of the cephalosome.

Length of adult female reaching to 4.30 mm., of male to 3.70 mm.

*Remarks.*—This form was described, though rather imperfectly, by Lubbock in the year 1854 as *Calanus longus*. The same form was subsequently found off the Norwegian coast by Boeck, who describes it as *Metridia armata*, the specific name being probably derived from the dentiform projections which some of the articulations of the anterior antennæ form in front. It may be regarded

as the type of the genus, and is easily recognizable from most other Calanoids by its very slender and elongated form.

*Occurrence.*—I have met with this form along the whole Norwegian coast, from the Christiania Fjord to Vadsö, but as a rule only in greater depths, below 100 fathoms. This form often occurs in great abundance, especially in the deep fjords; and it was also found rather frequently in some of the samples of plankton taken from deep water in the open sea during the cruise of the "Michael Sars". In the living state it is so exceedingly pellucid, that in spite of its comparatively large size, it is not easy to detect. It moves in the usual manner, now proceeding at quite an even rate by rapid vibrations of the posterior antennæ, now jumping along abruptly by powerful strokes of the natatory legs and urosome. When disturbed, it sends out from its body a bright flash of a bluish colour. This flash is so intense, that even by full day-light it can easily be seen.

*Distribution.*—Faroe Channel (Norman), Baffin's Bay (Hansen), Spitsbergen (Lilljeborg), the Kara Sea (Hansen), Polar basin crossed by Nansen (the present author), Atlantic Ocean from lat.  $56^{\circ}$  to  $76^{\circ}$  N. (Giesbrecht).

#### 49. *Metridia lucens*, Boeck.

(Pl. LXXVII).

*Metridia lucens*, Boeck. Oversigt over de ved Norges Kyster forekomne Copepoder. Chr. Vid. Selsk. Forh. 1864, p. 238.

Syn: *Metridia armata*, Brady (not Boeck).

" *Paracalanus hibernicus*, Brady & Roberts.

" *Metridia hibernica*, Giesbrecht.

*Specific Characters.*—*Female.* Body somewhat less slender than in the preceding species. Cephalosome about the length of the metasome, and remarkably vaulted above in the middle. rostral projection less prominent than in *M. longa*. Lateral parts of last segment of metasome acutangular at the tip. Urosome comparatively shorter than in *M. longa*, genital segment not attaining the length of the other 2 combined. Caudal rami scarcely as long as the anal segment, and of nearly uniform breadth throughout, outermost seta situated about in the middle of the outer edge. Anterior antennæ, when reflexed, reaching but slightly beyond the anterior division of the body, structure about as in *M. longa*, except that the dentiform projection is wanting in the 10th articulation. Last pair of legs composed of only 3 joints, the last 2 being united.

*Male* resembling that of *M. longa*, but having the cephalosome more strongly vaulted above. Left anterior antenna (more rarely the right) geniculate.

Last pair of legs of a structure similar to that in *M. longa*, but with the terminal joint on both legs less attenuated distally.

*Colour*.—Body in both sexes highly pellucid, and almost colourless.

Length of adult female 2.50 mm., of male 2.30 mm.

*Remarks*.—This form is closely allied to *M. longa*, but is of much inferior size, and moreover easily distinguished by its somewhat less slender form, the shorter caudal rami, and the much more strongly vaulted cephalosome. Finally, the last pair of legs in the female are only 3-articulate, the outer 2 joints being confluent. The form described by Brady in his work on the British Copepoda as *M. armata* is unquestionably the present species. It was subsequently recorded by the same author under another name, viz., *Paracalanus hibernicus*, and Dr. Giesbrecht in his great work records it as *Metridia hibernica*, not being at that time aware of its identity with Boeck's species.

*Occurrence*.—Whereas *M. longa* must be regarded as a true Arctic form, the present species is evidently of a more southern range. I have found it rather commonly along the south and west coasts of Norway and, unlike what is the case with *M. longa*, it is often met with near the surface of the sea. It extends northwards at least to the Lofoten Islands, and it was also found in some of the plankton-samples taken in the open sea during the cruise of the "Michael Sars". On the other hand, I have never found it in any samples from the Arctic Ocean. The luminous property of this form is mentioned by Boeck, who for this reason proposed for it the specific name *lucens*.

*Distribution*.—British Isles (Brady), Iceland, Faroe Channel (Norman), Atlantic Ocean between lat. 50° and 62° N. (Cleve).

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## Gen. 19. **Pleuromamma**, Giesbrecht, 1898.

Syn: *Pleuromma*, Claus (not Doneschall).

*Generic Characters*.—Form of body generally less slender than in *Metridia*, in some cases rather different in the two sexes. Cephalosome with a very conspicuous dark-coloured mammilliform knob (luminous organ) on right side, at the base of the posterior maxillipeds, rostral prominence generally with 1 or 2 dentiform ledges in front, tentacular appendages shorter than in *Metridia*. Lateral parts of last segment of metasome rounded off. Urosome less slender than in *Metridia*, with the genital segment in female considerably protuberant below; anal segment

somewhat flattened, widening distally, and projecting on each side in a conspicuous angular corner. Caudal rami comparatively smaller than in *Metridia*. Anterior antennæ resembling in structure those in the above-named genus, some of the proximal articulations being produced as more or less conspicuous dentiform projections, generally wanting in male; left antenna in the latter as a rule geniculate, and having the proximal sensory appendages very large, leaf-like. Posterior antennæ with the outer ramus longer than the inner, and distinctly 7-articulate. Anterior lip rather prominent and defined in front by a deep transverse sinus. Oral parts scarcely differing in their structure from those in *Metridia*. Natatory legs, on the other hand, much more strongly built, with the outer ramus of 2nd to 4th pairs very large and expanded, with comparatively short spines and setæ; that of 3rd pair with a very deep incision at the end of the 1st joint. Inner ramus in these pairs not attaining half the length of the outer, and having only a single seta outside the terminal joint; that of 2nd pair with the 1st joint distinctly hooked inside. Last pair of legs in female 2- or 4-articulate; those in male 5-articulate, with the terminal joint of right leg securiformly dilated, and the penultimate joint of same leg armed inside with a short spiniform process.

*Remarks.*—This genus was established by Claus, to include the *Diaptomus abdominalis*, Lubbock, and another Mediterranean species *P. gracile*, Cls.; but as the generic name proposed, *Pleuromma*, had been previously appropriated in Zoology, Dr. Giesbrecht has recently changed it to *Pleuromamma*. This change becomes the more necessary, as the organ regarded by Claus as an eye, has turned out to be of a very different nature, being undoubtedly, as first suggested by Dr. Dahl, a special luminous organ. The genus is very nearly related to *Metridia*, though differing not only in the presence of the above-named organ, but also in some other features mentioned in the above diagnosis. We know at present of 6 species of this genus, one of which belongs to the fauna of Norway, and will be described below.

#### 50. *Pleuromamma robusta* (Dahl).

(Pl. LXXVIII & LXXIX).

*Pleuromma robustum*, F. Dahl in „Zool. Anzeiger“, Vol. 16, p. 105.

*Specific Characters.*—*Female.* Body, as compared with the other species, somewhat robust, with the anterior division, seen dorsally, oblong oval in form, greatest width exceeding  $\frac{1}{3}$  of the length, and occurring a little behind the middle, anterior extremity somewhat contracted and triangularly produced at the tip, posterior only slightly attenuated. Cephalosome not attaining the length of

the metasome, dorsal face considerably vaulted, rostral projection somewhat prominent, and having in front 2 dentiform ledges. Lateral parts of last segment of metasome obtusely rounded. Urosome slightly exceeding half the length of the anterior division, genital segment bulging considerably below. Caudal rami comparatively small, shorter than the anal segment, outermost seta occurring in about the middle of the outer edge. Anterior antennæ, when reflexed, reaching beyond the middle of the 2nd caudal segment, dentiform projections of the proximal joints comparatively small and not recurved. Last pair of legs distinctly 4-articulate, terminal joint lamellarly dilated and oval in form, being finely ciliated on both edges and armed at the tip with 3 setæ, the outer 2 rather short, the innermost very slender and elongated, extending obliquely inwards.

*Male* much smaller than female and of more slender form, with the urosome perfectly symmetrical and very narrow, 2nd and 3rd segment partly hairy outside. Left anterior antenna distinctly geniculate, and having the sensory appendages of the proximal joints very large. Second pair of legs with the inner ramus of same structure on both sides, and agreeing with that in the female. Last pair of legs very asymmetrical, right leg much the larger and having the terminal joint considerably dilated, securiform, that of left leg much narrower, oblong.

*Colour* not yet ascertained.

Length of adult female 4.30 mm., of male 3.50 mm.

*Remarks.*—This species has been briefly mentioned by Dr. F. Dahl in the above-quoted *Journal*; but no detailed description or figures have as yet been published. I think, however, that I am right in identifying the present form with Dahl's species, as it seems to agree pretty well with it both in size and in some of the anatomical details mentioned by that author.

*Occurrence.*—Some few specimens of this handsome species were found in a plankton-sample taken during the cruise of the "Michael Sars" in 1900, at Stat. 9, located somewhat North of the Faroe Islands, the depth being recorded to be from 200 to 400 metres. A single female specimen also occurred in another plankton-sample taken during the same cruise in the Storfjord, inland from Aalesund (Stat. 4), its occurrence here evidently proving this form to be a true member of the Norwegian fauna.

*Distribution.*—Atlantic Ocean in depths from 100 to 1500 meters (Dahl), Faroe Channel, West of Ireland (Norman's collection)<sup>1</sup>).

<sup>1</sup>) Determined by the present author.

## Fam. 17. Heterorhabdidæ.

*Characters.*—Body more or less depressed, and generally highly pellucid. Cephalosome well defined from the 1st pedigerous segment, front more or less produced, and carrying below 2 delicate tentacular filaments. Last 2 segments of metasome united. Urosome consisting in female of 3 or 4 segments, in male of 5 segments. Caudal rami of different shape in the different genera, in some cases asymmetrical; setæ present in the normal number. Anterior antennæ very slender, in some cases of quite an extraordinary length, and composed in female of 25 articulations; left antenna in male generally geniculate. Posterior antennæ with the rami more or less unequally developed. Oral parts, especially mandibles and maxillæ, differing conspicuously in their structure from those parts in other Calanoids. Legs with both rami triarticulate; last pair biramous and natatory, like the preceding pairs, outer rami of this pair slightly transformed in male. No ovisac present in female.

*Remarks.*—The forms belonging to this family, in the restriction here adopted, are chiefly characterised by the pellucid, more or less depressed body, the very slender anterior antennæ, the anomalous structure of some of the oral parts, and finally, by the fact that the last pair of legs are biramous and natatory, like the preceding pairs. In the last-named character, this family agrees with the *Centropagidæ*; but it is otherwise very different. The family comprises at present 3 distinct genera, viz., *Heterorhabdus*, Giesbr., *Haloptilus*, Giesbr. and *Augaptilus*, Giesbr. The first 2 of these genera are represented in the fauna of Norway, and will be treated of below.

### Gen. 20. *Heterorhabdus*, Giesbrecht, 1898.

Syn: *Heterochaeta*, Claus (not Westwood).

*Generic Characters.*—Body more or less robust, with the anterior division somewhat vaulted above, and depressed only in its anterior part. Cephalosome comparatively short, with a well-marked cervical depression above in the middle, front slightly projecting in front and carrying below 2 nearly straight tentacular appendages. Lateral parts of last segment of metasome not produced. Urosome of moderate length, and consisting in female of 4 segments, the last of which, however, is imperfectly defined from the caudal rami; the latter scarcely at all

divergent, and conspicuously asymmetrical, the left one being the larger, and having one of the apical setæ excessively prolonged. Eye wholly wanting. Anterior antennæ greatly attenuated and abruptly curved in their proximal part; left one in the male geniculate. Posterior antennæ with the rami of not very different length, the outer one 7-articulate. Mandibles with the cutting teeth much reduced in number, the outermost one widely separated from the others and claw-shaped, with a peculiar rim outside; palp well developed, with the inner ramus shorter than the outer. Maxillæ with the inner ramus of the palp quite rudimentary, outer ramus greatly produced, and tipped with long setæ. Anterior maxillipeds exceedingly powerful, and armed in their distal part with strong, anteriorly-curving claw-like spines, proximal digitiform lobes rudimentary. Posterior maxillipeds scarcely longer than the anterior ones, and much narrower, with the 2nd basal joint very slender, terminal part 5-articulate, and clothed with comparatively short setæ. Legs powerfully developed, outer ramus in 2nd to 4th pairs very large, with the terminal joint considerably expanded, especially in the 3rd pair, and having both the spines and the setæ unusually short. Last pair of legs in female considerably smaller than the preceding ones, outer ramus with a slender falciform spine inside the 2nd joint; those in male somewhat larger, with the outer rami subprehensile and without any natatory setæ.

*Remarks.*—This genus was established in the year 1863 by Claus, to comprise 2 Mediterranean species. As, however, the generic name, *Heterochata*, proposed by him had been previously appropriated in Zoology, Dr. Giesbrecht has recently changed it to *Heterorhabdus*. It is a very distinct genus, easily recognizable, among other things, by the peculiar asymmetry of the caudal rami, and the excessive length of one of the apical setæ issuing from the left ramus. Dr. Giesbrecht enumerates no less than 13 species belonging to this genus, and a 14th, *H. compactus*, G. O. Sars, has been added by the present author from Nansen's Polar Expedition. Only a single species belongs to the fauna of Norway, and it will be described below.

### 51. *Heterorhabdus norvegicus* (Boeck).

(Pl. LXXX & LXXXI).

*Heterochata norvegica*, Boeck. Nye Slægter og Arter af Saltvandscopepoder.  
Chr. Vid. Selsk. Forh. 1872, p. 40.

*Specific Characters.*—*Female.* Body moderately slender, with the anterior division, seen dorsally, oval fusiform in outline, greatest width somewhat exceeding  $\frac{1}{3}$  of the length, and occurring about in the middle, anterior extremity gradually narrowed and obtusely truncated at the tip, with a knob-like projection in the

middle of the front, posterior extremity only slightly contracted; seen laterally, evenly vaulted above. Cephalosome about equalling in length the 3 succeeding segments combined, and distinctly depressed in its anterior part, front somewhat abruptly bent anteriorly, tentacular appendages very slender and extending obliquely backwards. Lateral parts of last segment of metasome broadly rounded at the tip. Urosome equalling about half the length of the anterior division, genital segment fully as long as the 2 succeeding ones combined, and rather tumefied in the middle, bulging considerably below, and having a slight dorsal depression behind; posterior edge of this and the 2 succeeding segments finely denticulate above. Anal segment not widening at all distally, and on left side wholly confluent with the corresponding caudal ramus, on right side only faintly defined. Left caudal ramus much larger than right, both slightly attenuated, being cut off very obliquely at the end in such a manner that only 2 of the marginal setæ issue from the tip, the other 3 from the outer edge; outer apical seta of left ramus excessively prolonged, even exceeding the whole body in length, and terminating in a very slender, hair-like point. Anterior antennæ about the length of the body, and having the 1st joint rather large and compressed, equalling in length the 5 succeeding joints combined, distal part very slender and generally extended directly laterally. Anterior maxillipeds with the distal claws very strong, though not nearly attaining the length of the stem. Posterior maxillipeds with a remarkably prolonged, subsigmoid spine issuing from the middle of the 1st basal joint anteriorly. Inner ramus of 3rd pair of legs not attaining even  $\frac{1}{3}$  of the length of the outer. Last pair of legs with the outer ramus about twice the length of the inner, falciform spine shorter than the terminal joint and extending almost straight inwards.

*Male* somewhat more slender than female, with the urosome very narrow. Left anterior antenna with the middle section but slightly tumefied, terminal section very slender, and 4-articulate. Last pair of legs somewhat asymmetrical, right leg with a large and abruptly curved, sausage-shaped prominence inside the 2nd basal joint, outer ramus rather strongly built, with the 1st joint remarkably produced at the end outside, 2nd joint oval in form, with an irregular protuberance inside, terminal joint but slightly exceeding in length the 2 preceding ones combined, the apical part being quite short; outer ramus of left leg of about same length as that of the right, terminal joint lamellar and produced at the tip to a slender, somewhat flexuous spine of moderate length.

*Colour*.—Body highly pellucid, with a faint yellowish tinge, and exhibiting within the anterior division a number of clear globular oil-bubbles.

Length of adult female reaching to 4.20 mm, that of male about the same.

*Remarks.*—This form was briefly mentioned by Boeck in the above-mentioned paper, and some figures of it were given by the present author in his account of the Crustacea procured during Nansen's Polar Expedition. It is nearly allied to the 2 Mediterranean species, *H. spinifrons* and *H. papillatus*, recorded by Claus; but it is of larger size than either of them, and moreover differs in the relative length of the anterior antennæ, and in the structure of the last pair of legs in the male.

*Occurrence.*—Boeck first found this form at Haugesund, west coast of Norway. I have myself taken it in several places, from the Christiania Fjord and as far north as the Lofoten Islands, but only in greater depths, of more than 150 fathoms. It also occurred not unfrequently in some plankton-samples taken from deep water in the open sea during the cruise of the "Michael Sars" in 1900.

*Distribution.*—Polar basin crossed by Nansen, in several places rather abundantly (the present author), Greenland, Faroe Channel (Norman's collection).

## Gen. 21. *Haloptilus*, Giesbrecht, 1898.

Syn: *Hemicalanus*, Claus (not Dana).

*Generic Characters.*—Body subdepressed and highly pellucid. Cephalosome comparatively large; more or less produced in front, and without any distinct cervical depression; rostral filaments slender and recurved. Lateral parts of last segment of metasome not expanded. Urosome comparatively short, composed in female of 4, in male of 5 segments. Caudal rami perfectly symmetrical, not much produced, and somewhat divergent, setæ normally developed, and richly plumous. Eye wholly absent. Anterior antennæ very slender and narrow, with some of the bristles much elongated; left antenna in male geniculate. Posterior antennæ with the inner ramus greatly produced, outer ramus comparatively small. Mandibles with the masticatory part very narrow and bifurcate at the tip, palp slender, with the inner ramus much longer than the outer. Maxillæ with the inner ramus of the palp small, but distinct, outer ramus considerably produced, and carrying at the tip long plumous setæ. Anterior maxillipeds of moderate size, with all the lobes distinctly developed, distal setæ not claw-like. Posterior maxillipeds much larger than the anterior, terminal part 5-articulate and clothed with long, anteriorly-curving setæ. Legs not very powerful, outer ramus of 2nd to 4th pairs of moderate size, with the terminal joint far less expanded than in

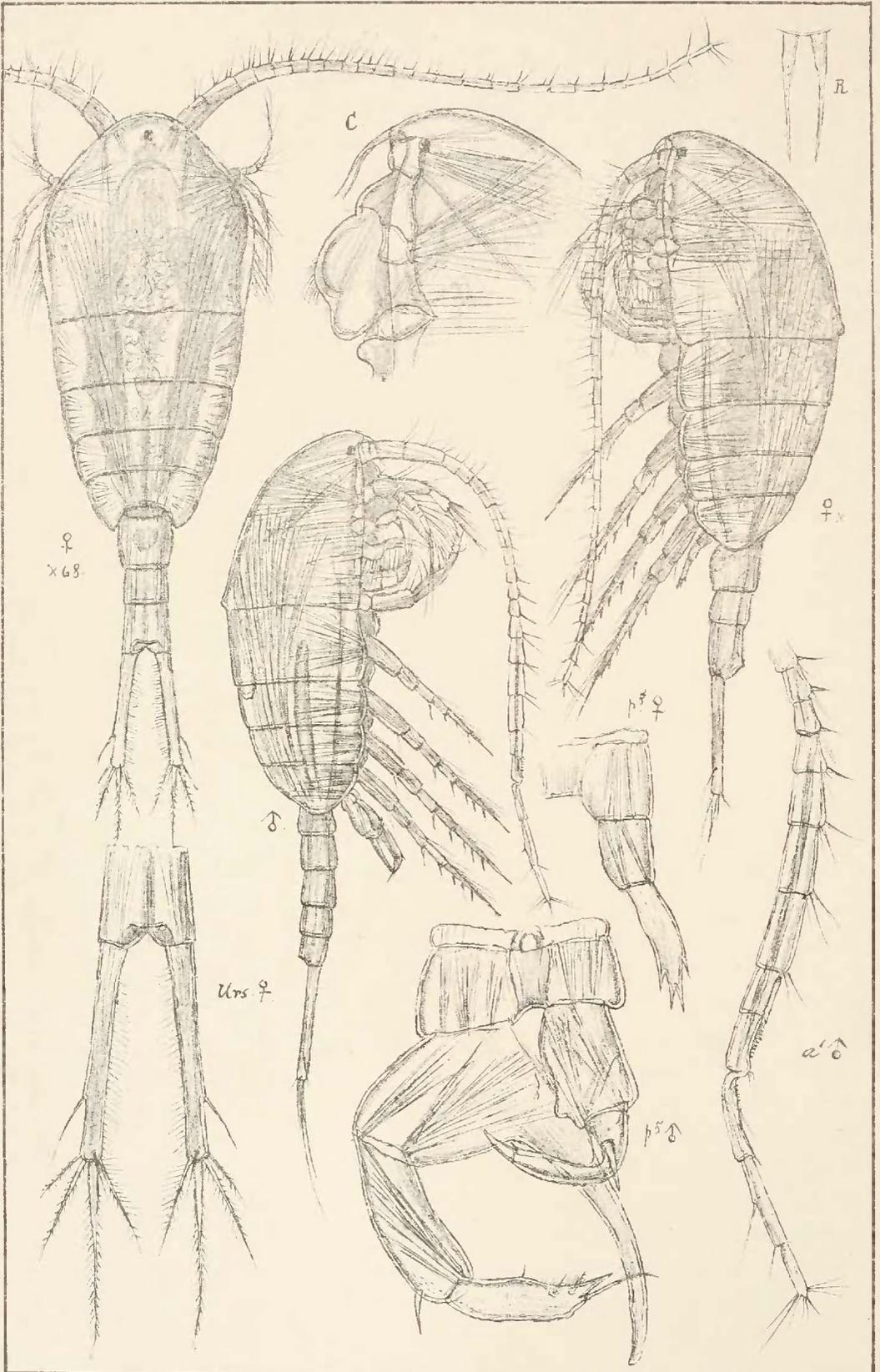


# Copepoda

Calanoida.

Temoridae

Pl. LXV.



G O Sars autogr.

Trykt i den private Opmaalning Chra

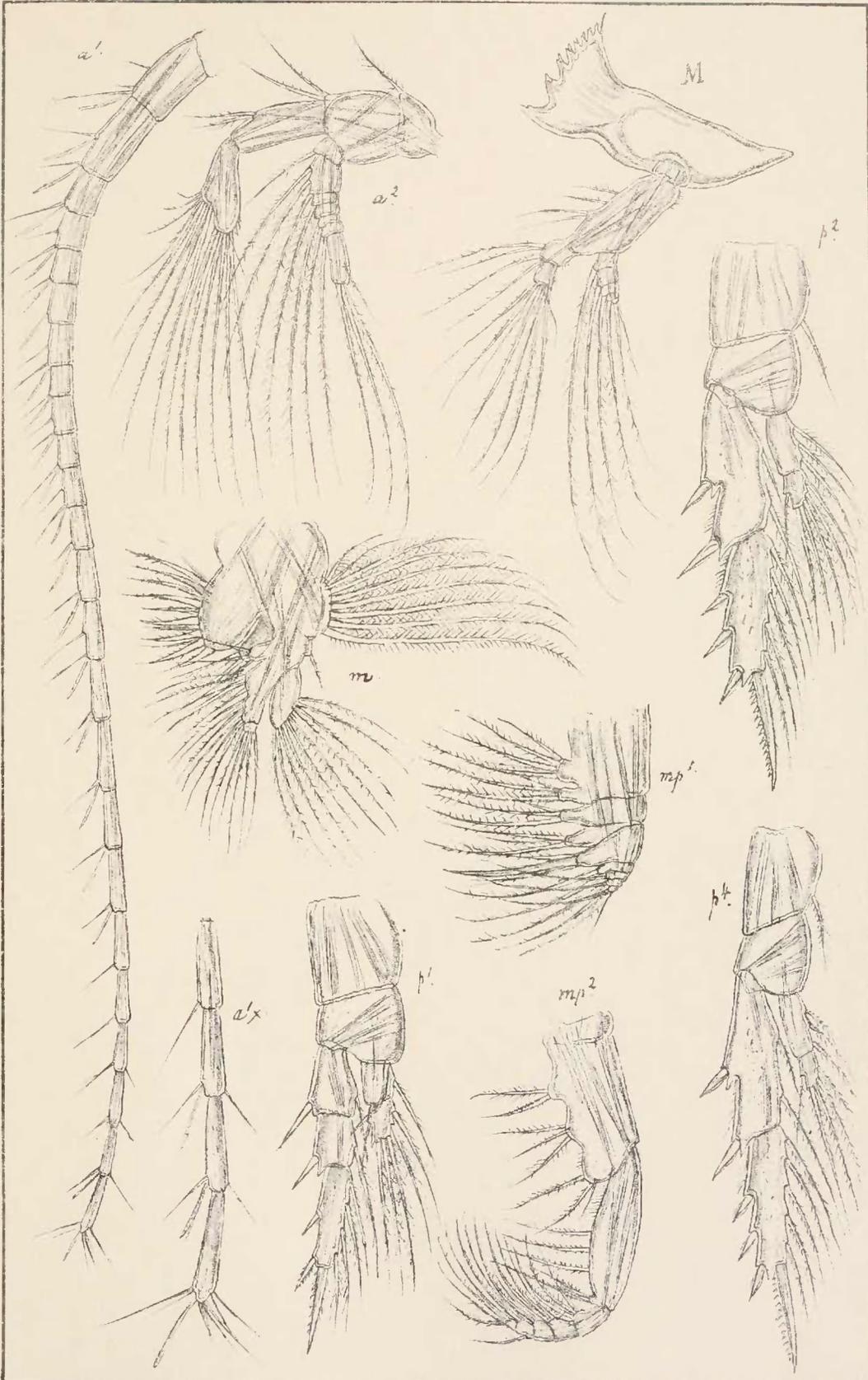
*Temora longicornis* (Müll.)

# Copepoda

## Calanoida.

Temoridae

Pl. LXVI



G.O. Sars autogr.

*Temora longicornis* (Müll.)  
(continued.)

Trykt i den private Opmaaling, Chr.



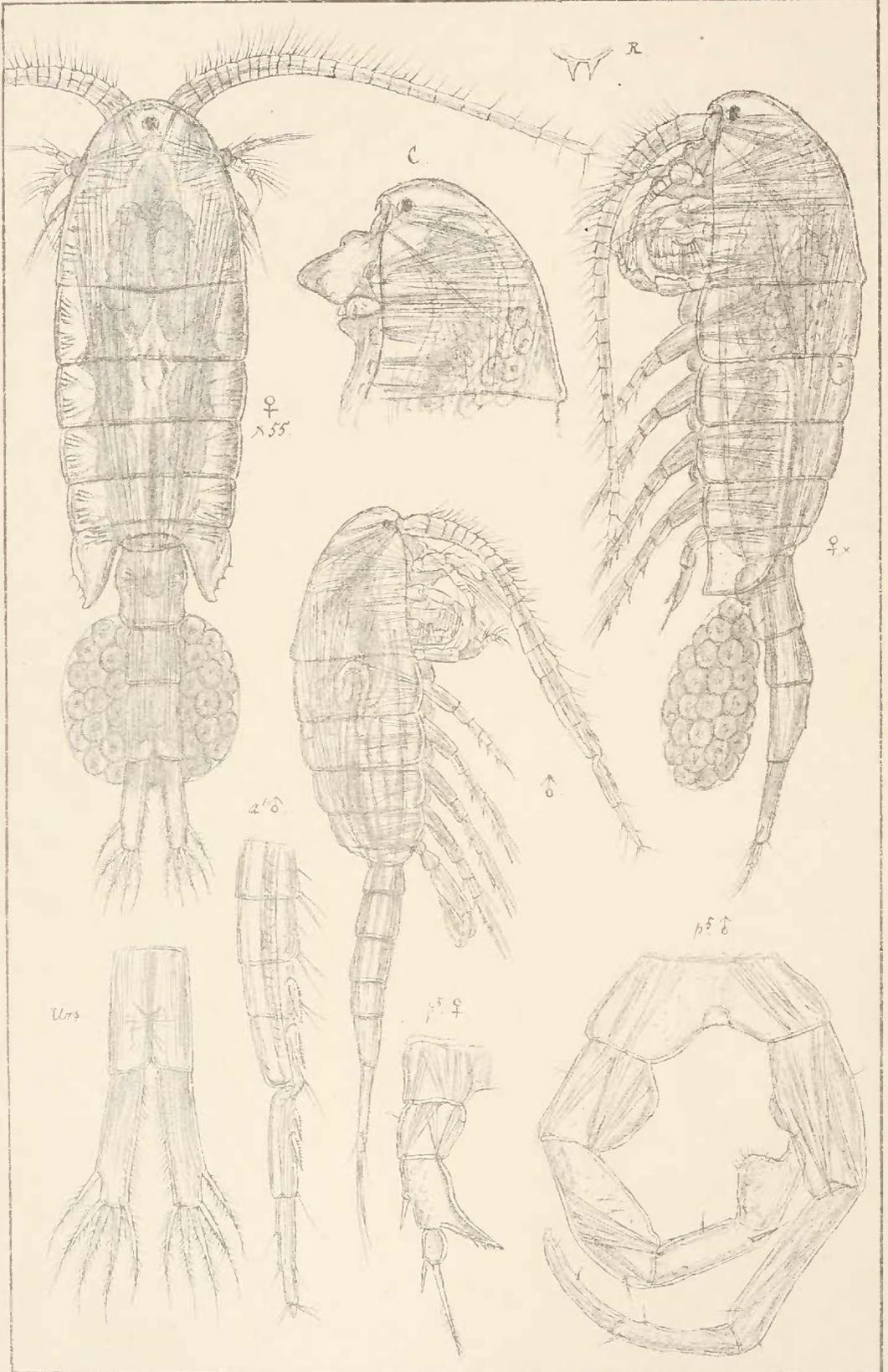


# Copepoda

## Calanoida.

Temoridae

Pl. LXVII



G.O. Sars auctogr

Trykt den private Opmaalng. Chra

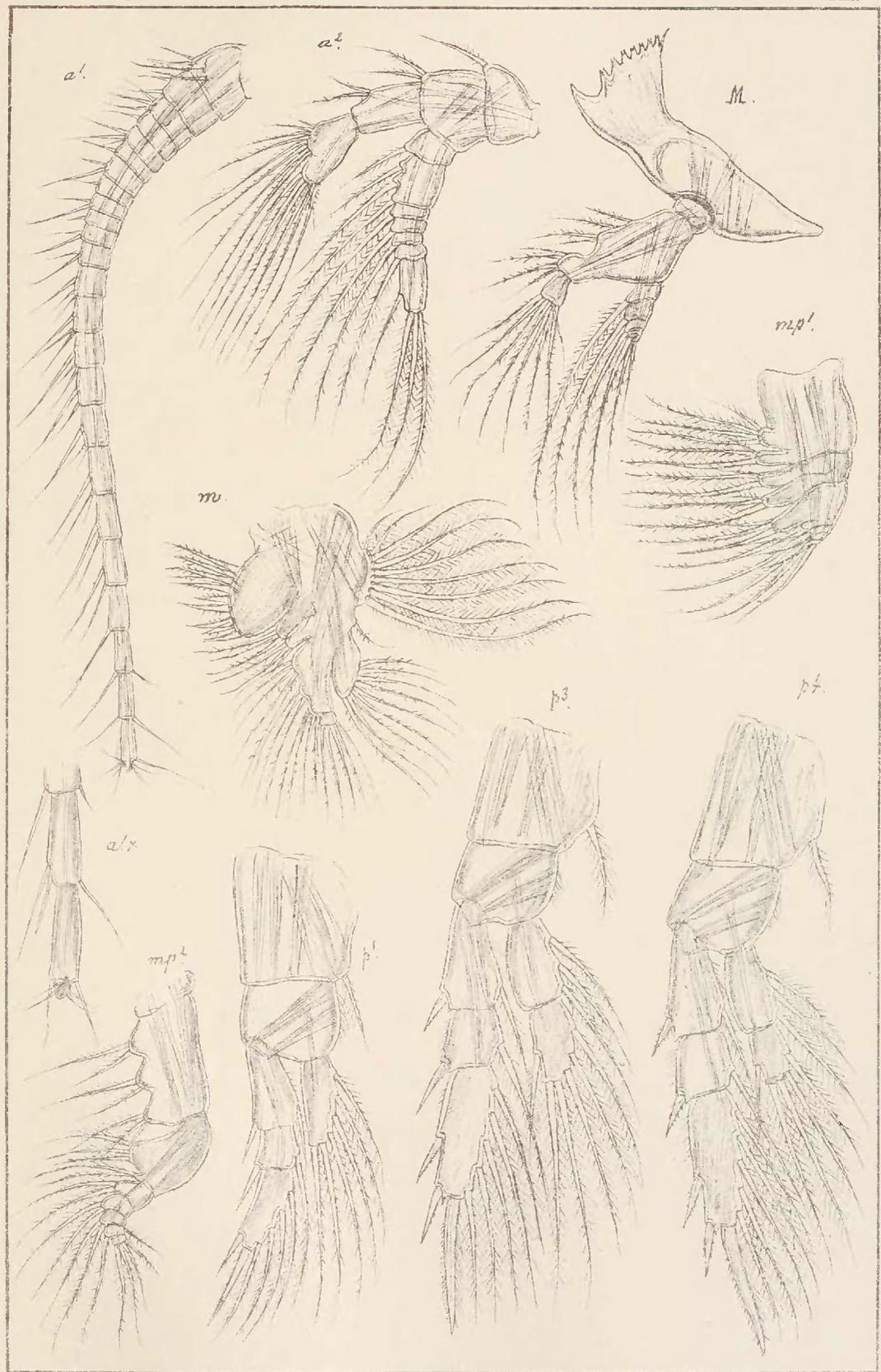
*Eurytemora velox* (Lilljeborg)

# Copepoda

## Calanoida.

Temoridæ

Pl. LXVIII



G. O. Sars autogr.

*Eurytemora velox* (Lilljeborg.)  
(continued)

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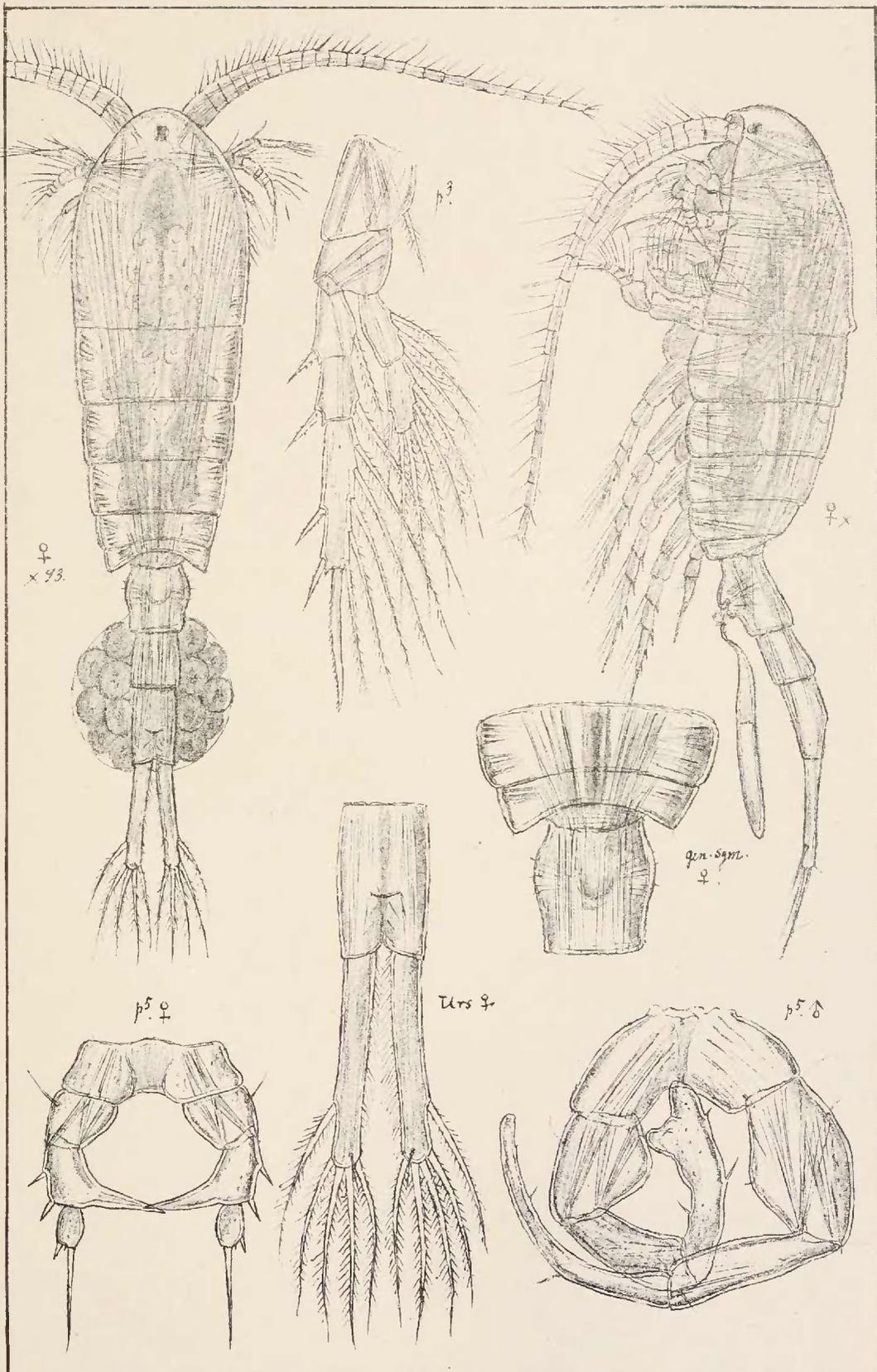


# Copepoda

## Calanoida.

Temoridae

Pl. LXX.



G.O. Sars autogr.

Trykt i den private Opmaalng, Chra

*Eurytemora lacustris*, Poppe.



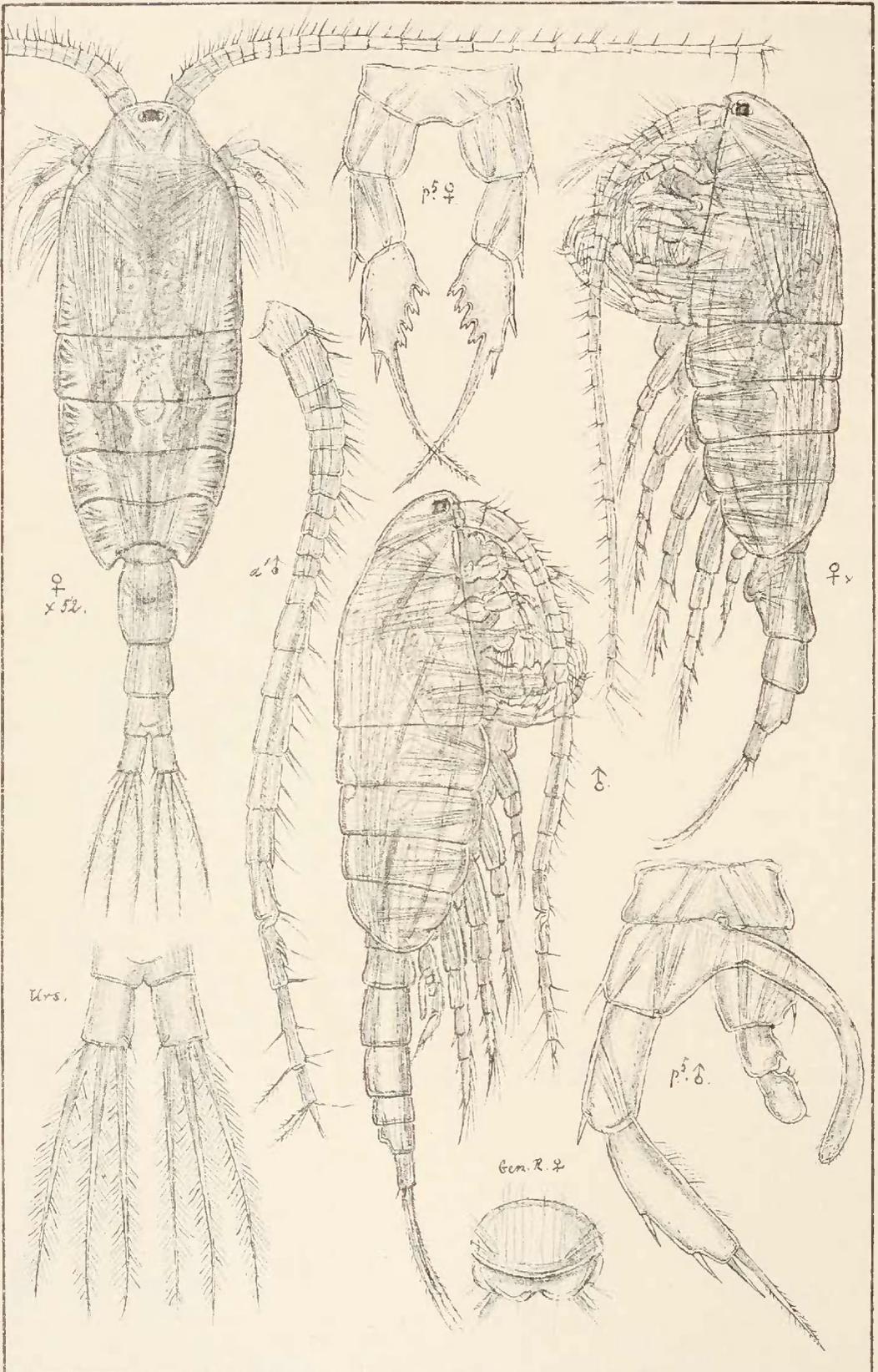


# Copepoda

## Calanoida.

Temoridæ

Pl. LXXI



G O Sars autogr

Trykt i den private Opmaaling, Chra

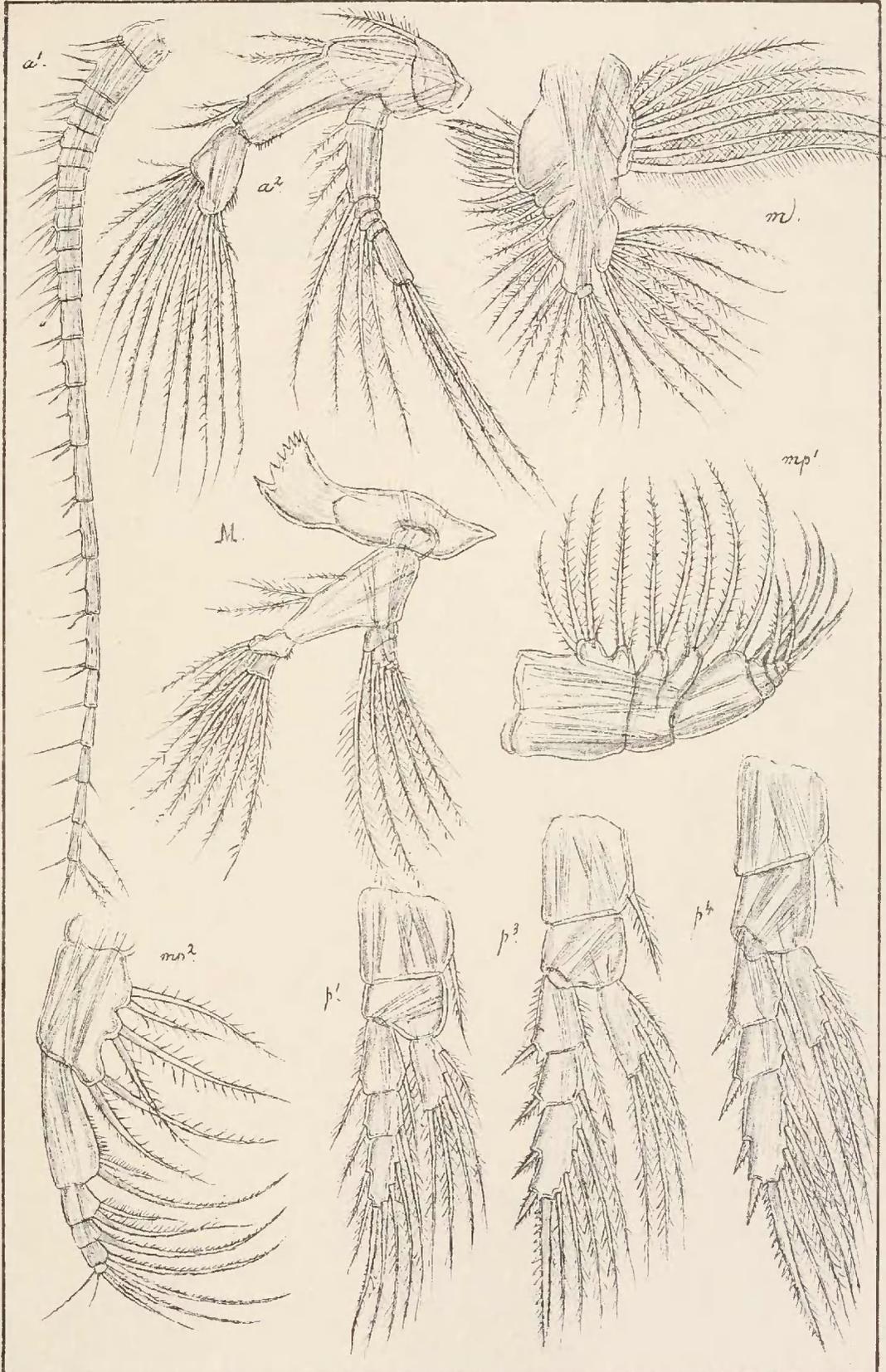
*Hetercope saliens* (Lilljeb.)

# Copepoda

## Calanoida.

Temoridæ

Pl. LXXII



G.O. Sars autogr

*Hetercope saliens* (Lilljeb.)  
(continued).

Trykt i den private Opmaaling, Chra



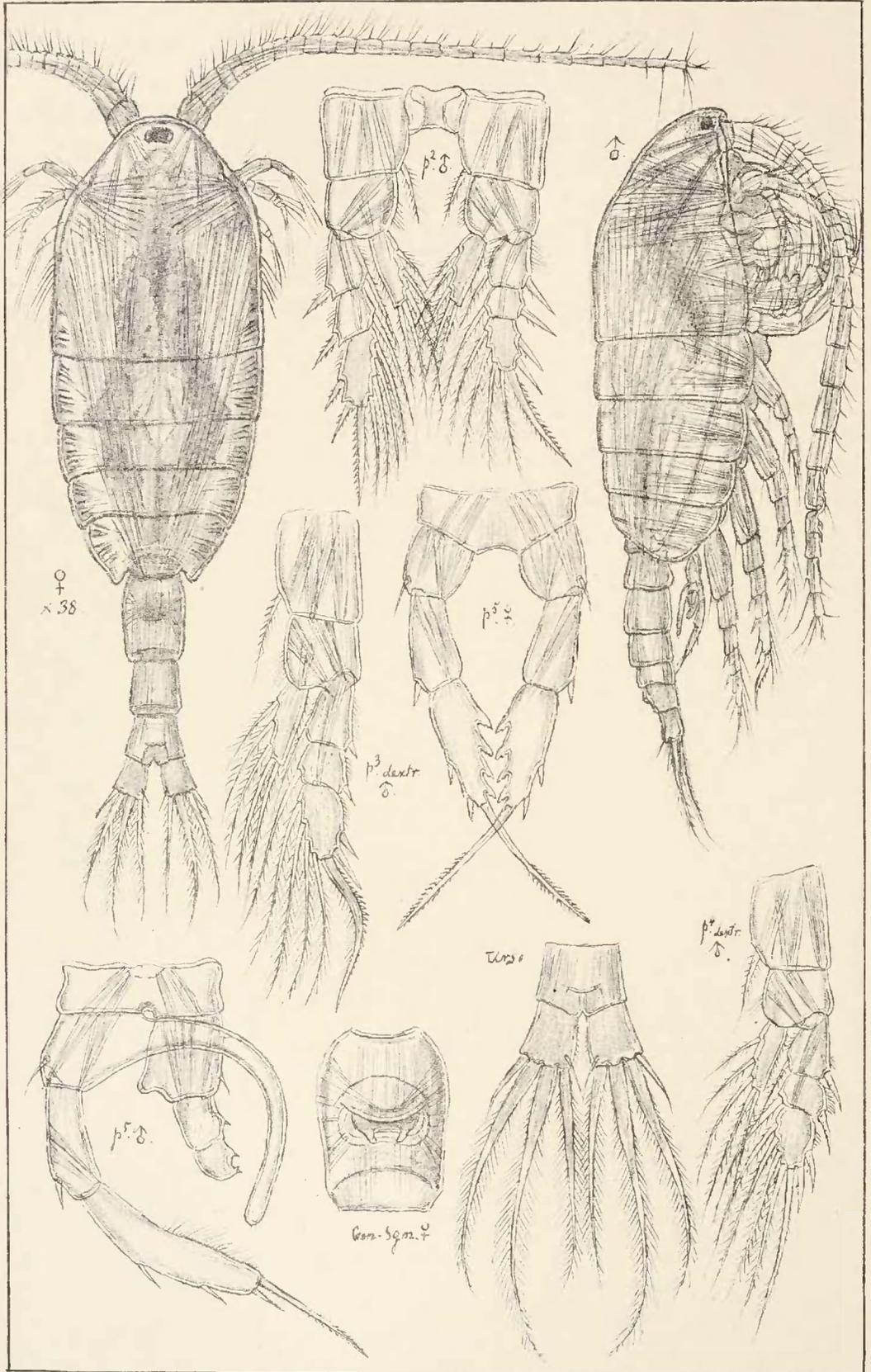


# Copepoda

## Calanoida.

Temoridae.

Pl. LXXIII



60 Sars autogr.

*Hetercope borealis* (Fischer.)

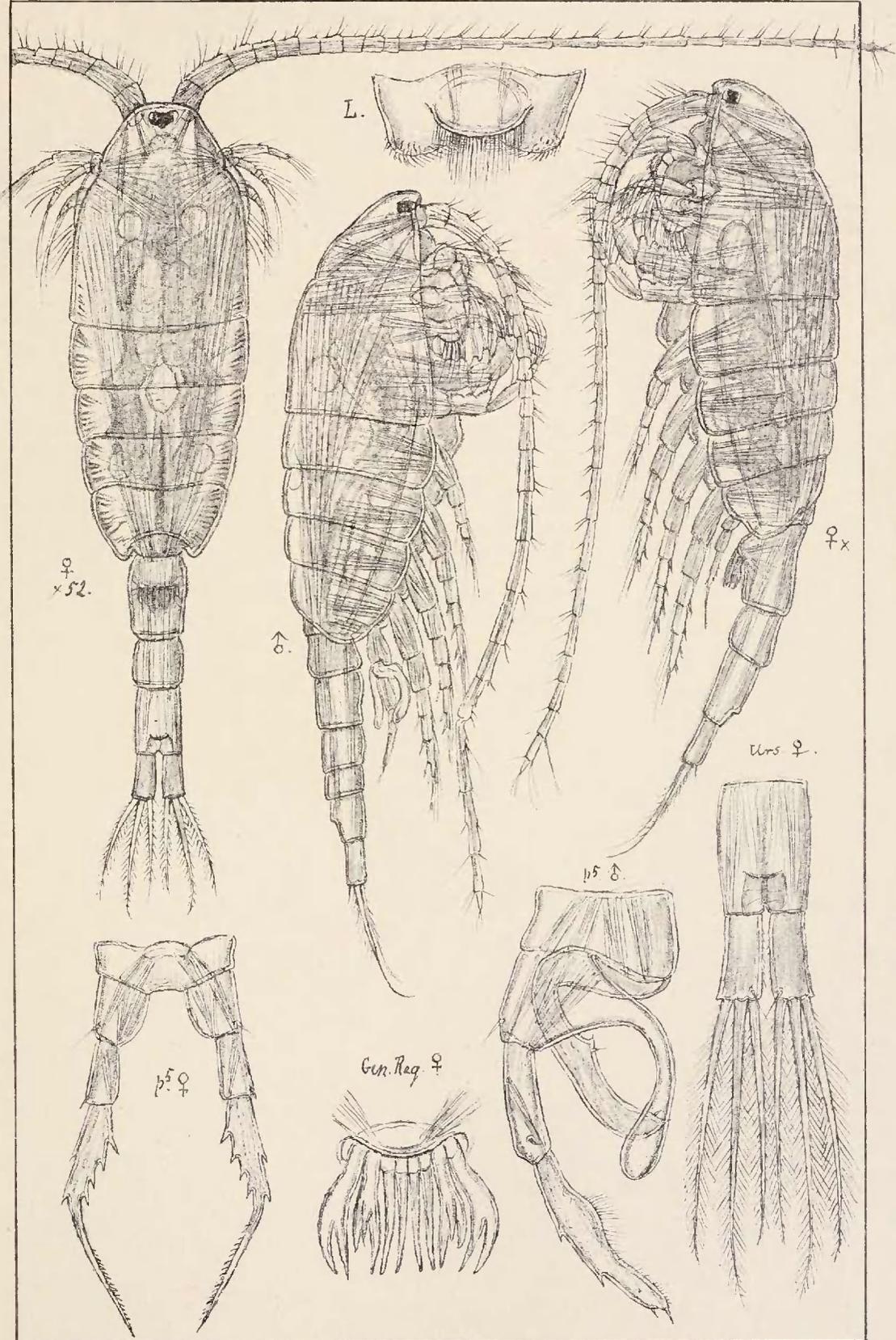
Trykt i den private Opmaalning, Chra

# Copepoda

## Calanoida.

Temoridae.

PL. LXXIV



G.O. Sars autogr.

Trykt i den private Opmaaling, Chra

*Heterocope appendiculata*, G.O. Sars



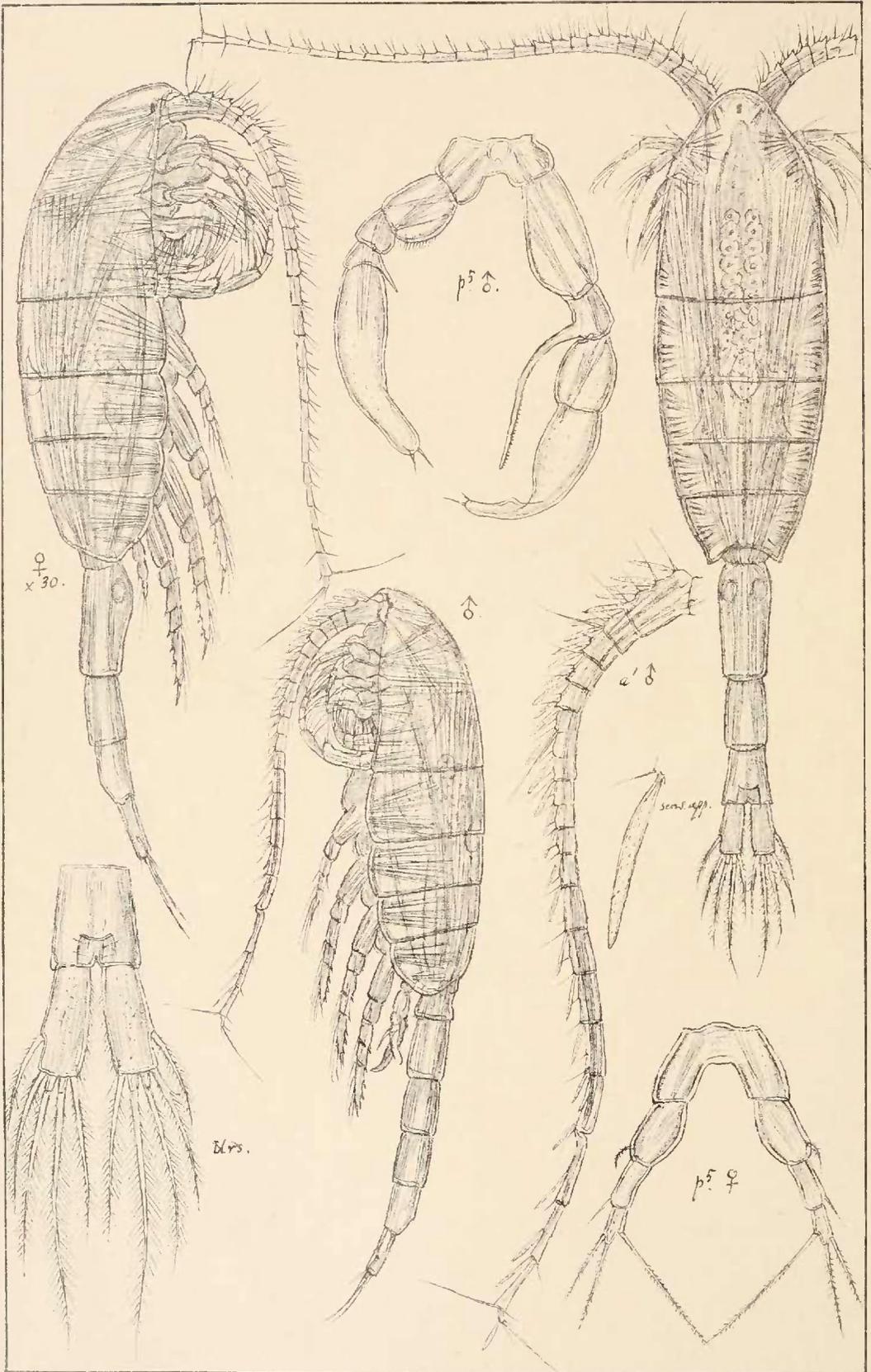


# Copepoda

## Calanoida.

Metridiidæ.

Pl. LXXV



G. O. Sars autogr.

Trykt i den private Opmaaling, Chra

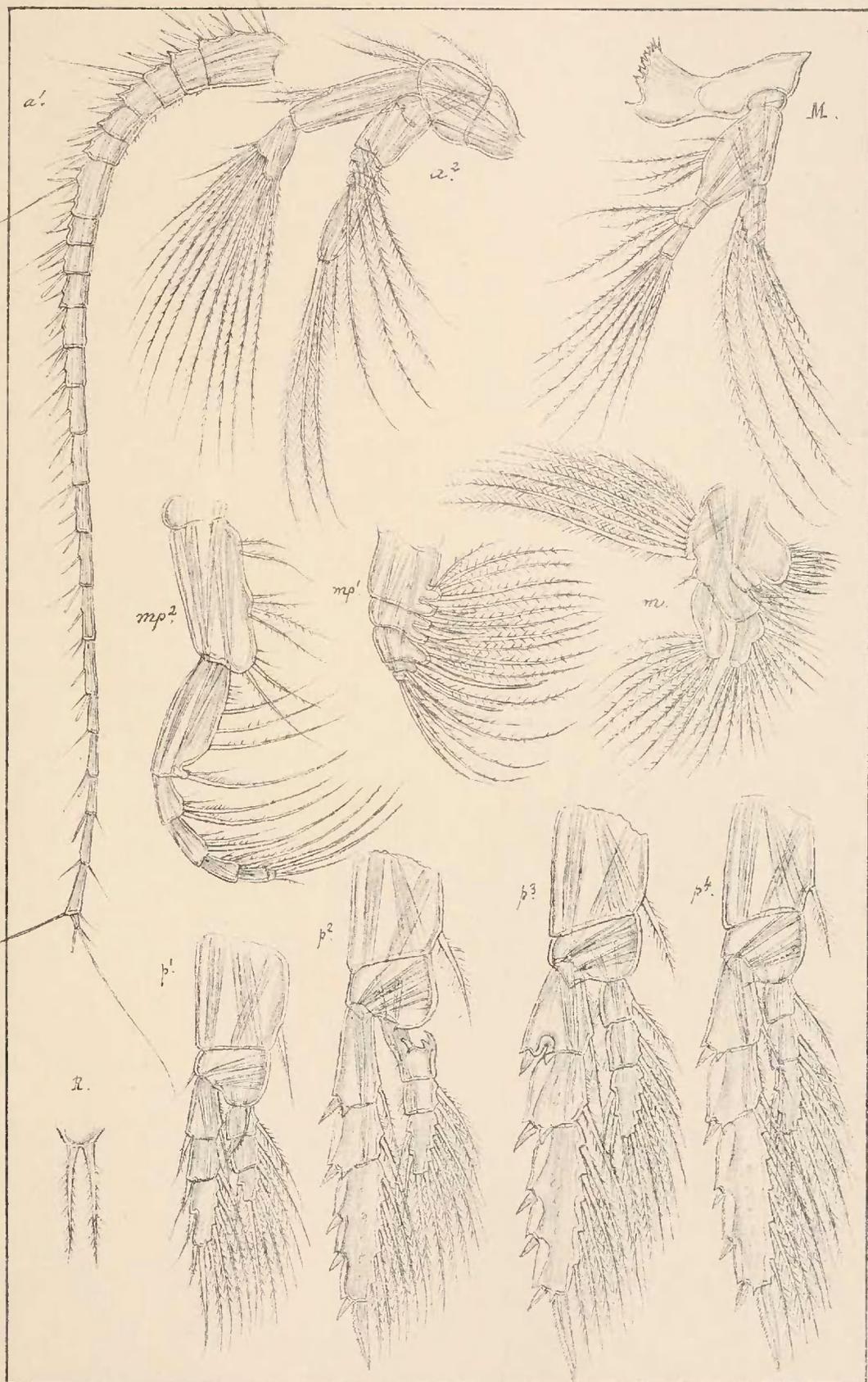
*Metridia longa* (Lubbock.)

# Copepoda

## Calanoida.

Metridiidae.

Pl. IXXVI



G.O. Sars autogr.

*Metridia longa* (Lubbock)  
(continued.)

Figures 1-10 from the original plate.



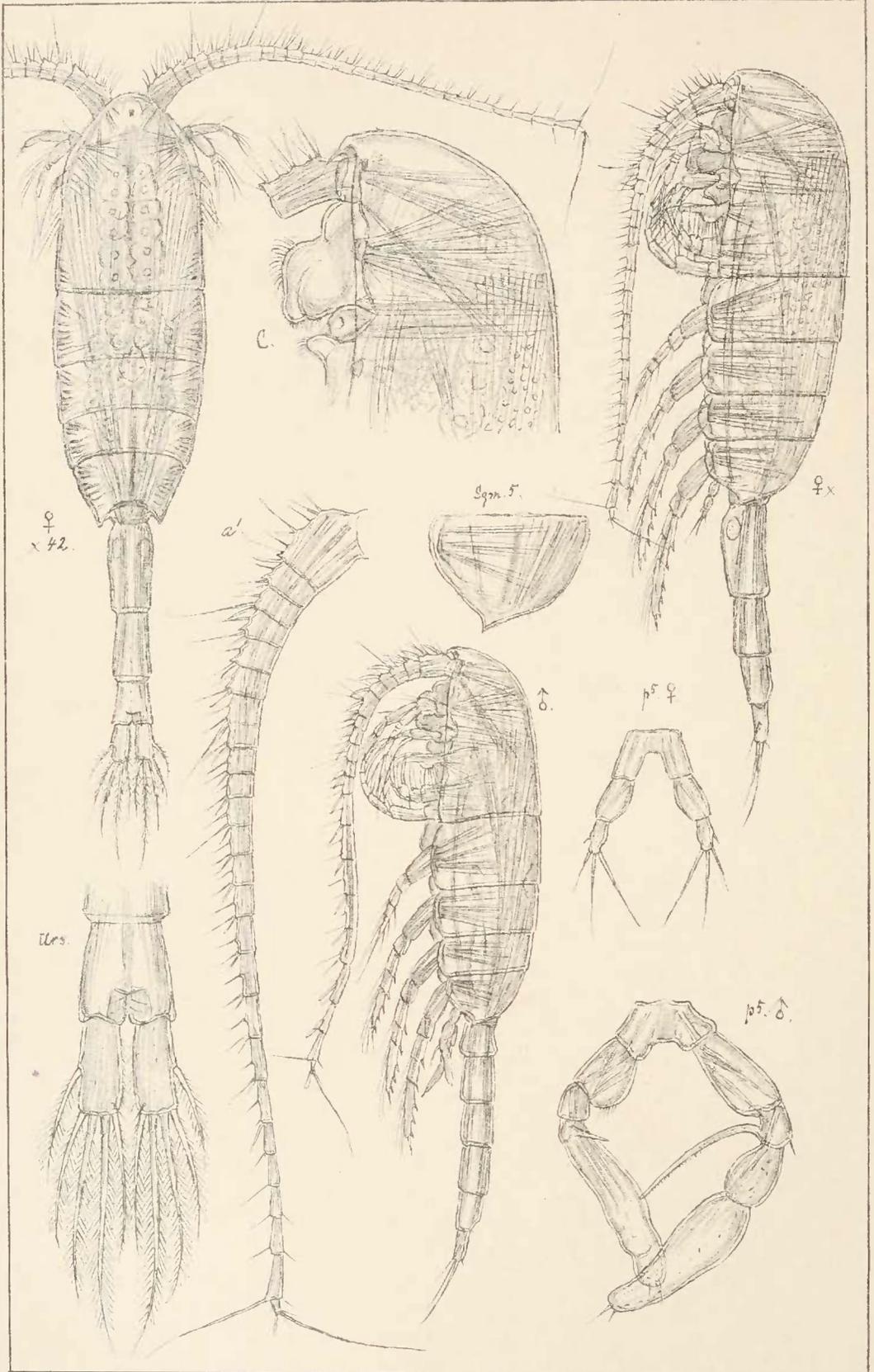


# Copepoda

## Calanoida.

Metridiidæ

Pl. LXXVII



G O Sars autogr.

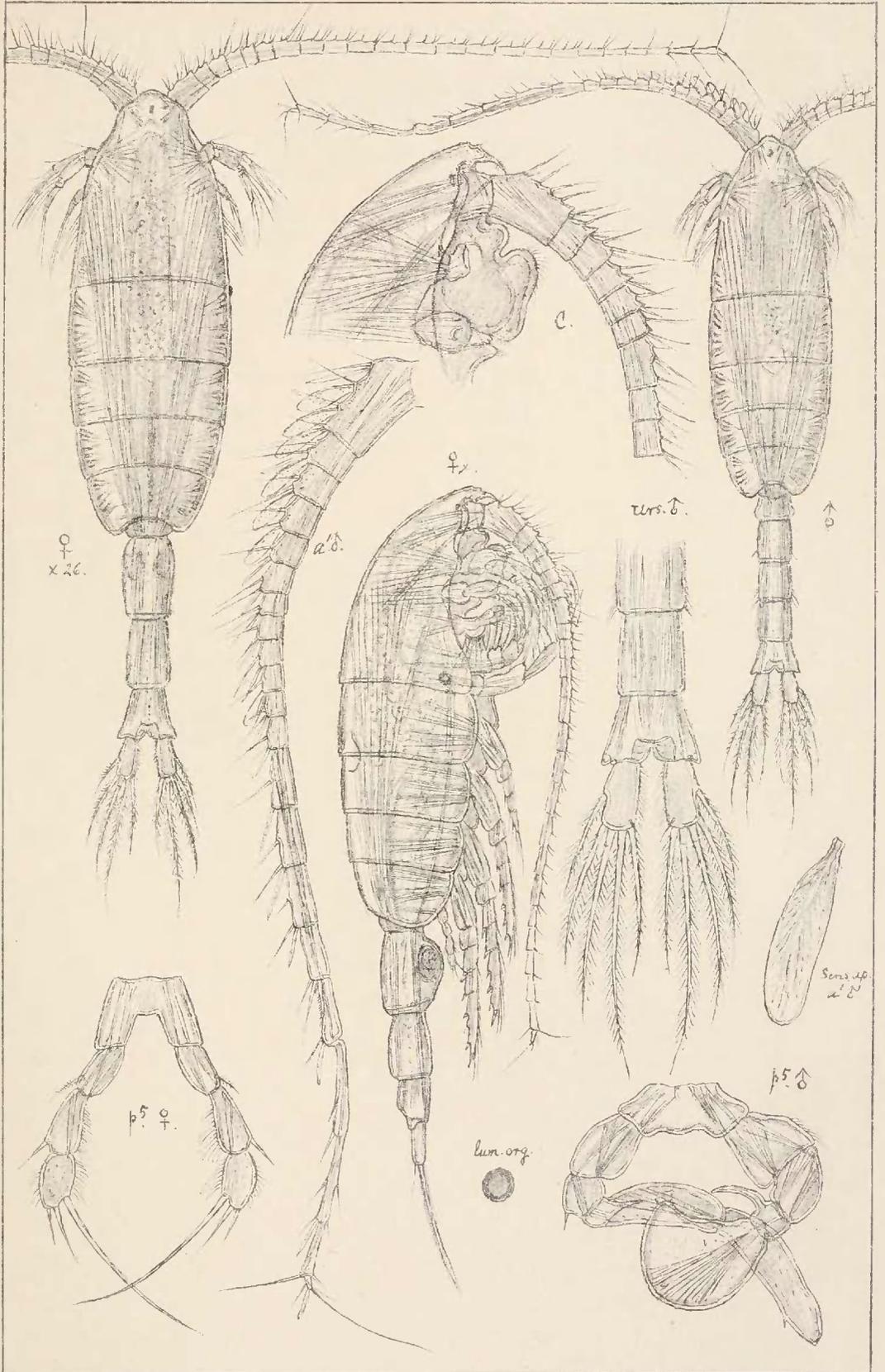
Trykt i den private Opmaalng, Chra

*Metridia lucens*, Boek.

# Copepoda Calanoida.

Metridiidæ.

Pl. IXXVIII



G.O. Sars autogr.

*Pleuromamma robusta* (Dahl)

Tryktiden private Opmaalng, Chra



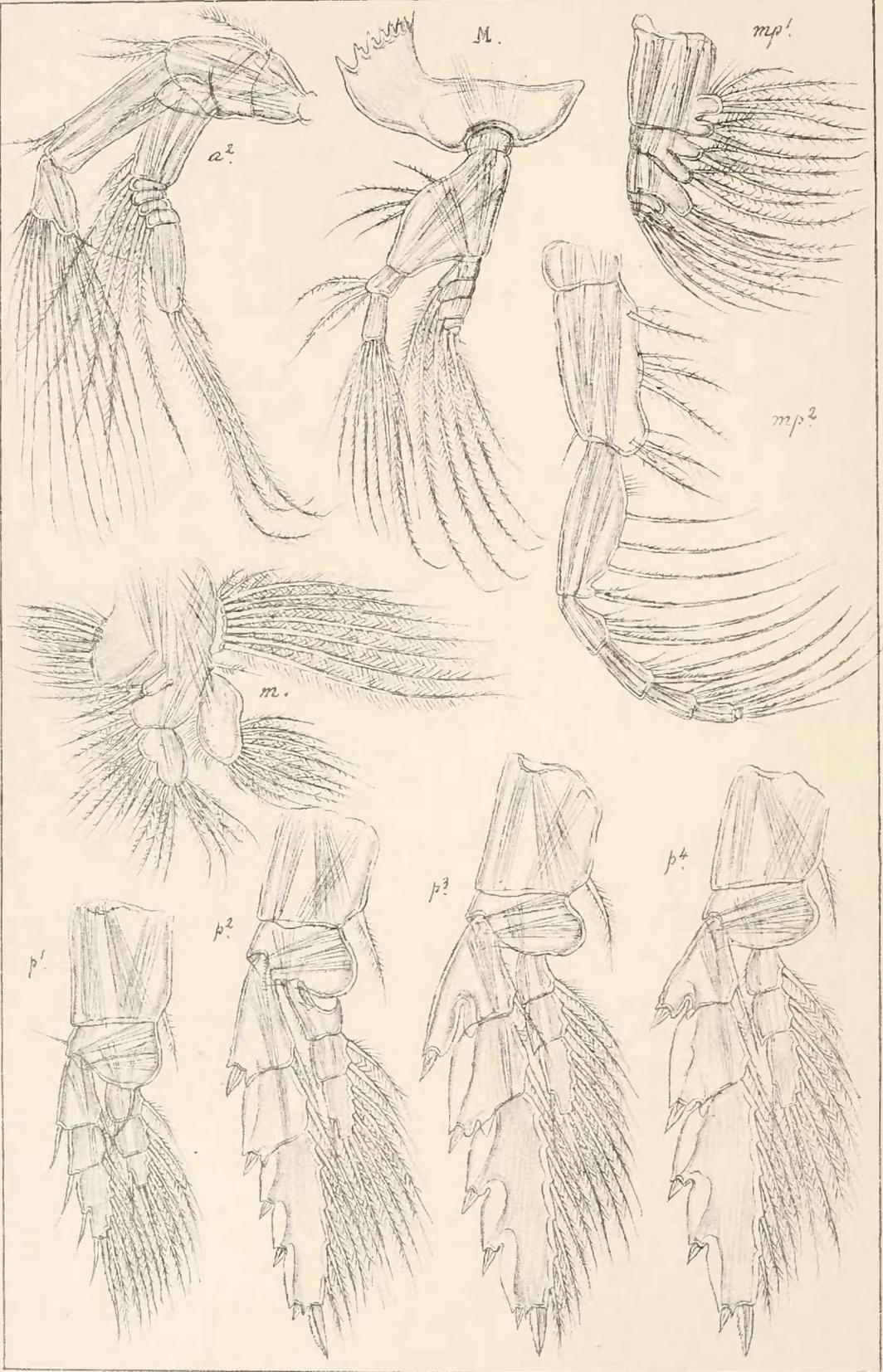


# Copepoda

Calanoida.

Pl. LXXIX.

Metridiidae.



G.O. Sars autogr.

*Pleuromamma robusta* (Dahl)  
(continued)

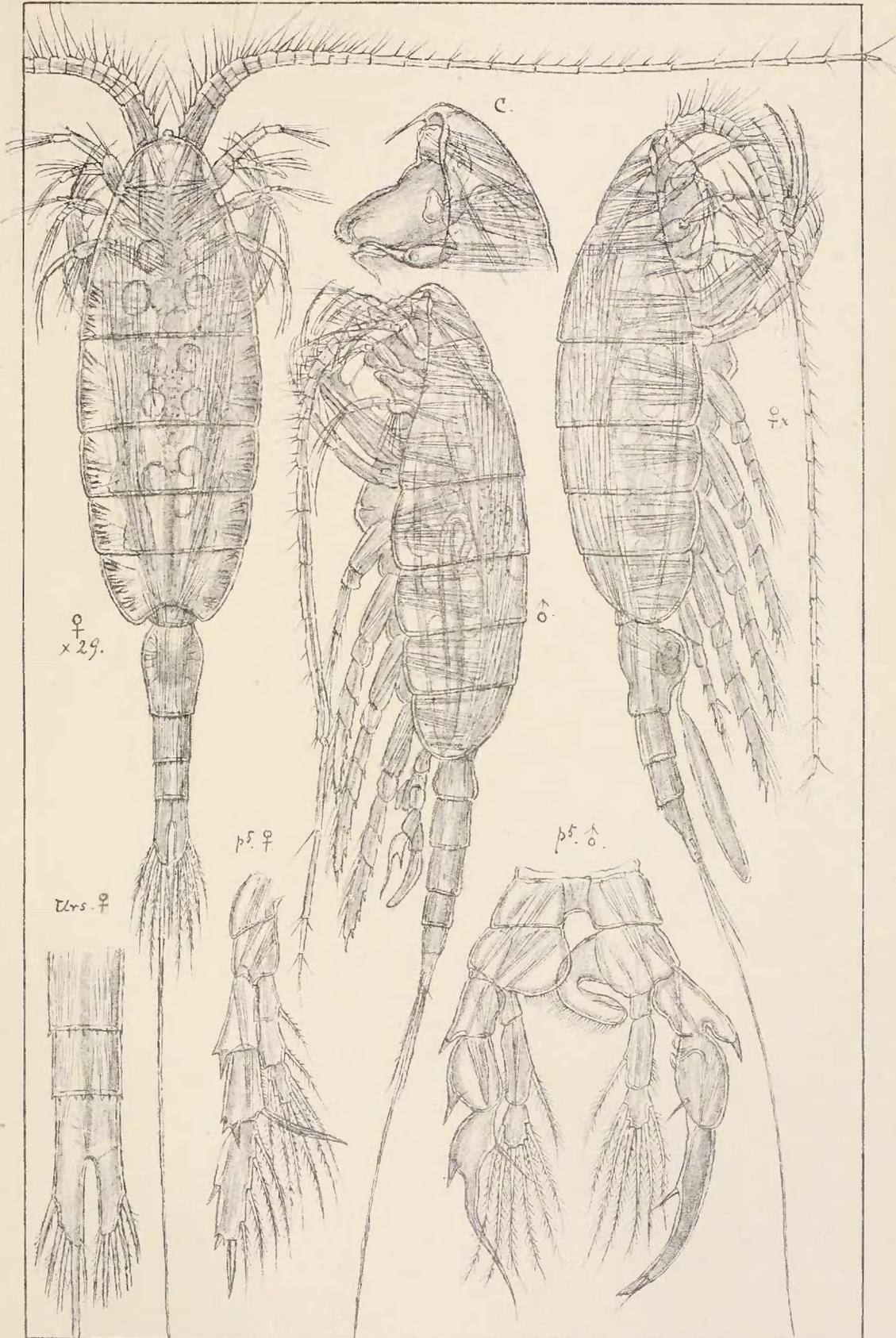
Trykt i den private Opmaaling, Chra

# Copepoda

## Calanoida.

Heterorhabdidae.

Pl. LXXX



60 Sars autogr.

Trykt i den private Opmaaling, Chra

*Heterorhabdus norvegicus* (Boeck)

