AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

WITH SHORT DESCRIPTIONS AND FIGURES OF ALL THE SPECIES

BY

G. O. SARS

VOL. IV

COPEPODA

CALANOIDA

PARTS XIII & XIV

PARAPONTELLIDÆ, ACARTIIDÆ, SUPPLEMENT

WITH 12 AUTOGRAPHIC PLATES

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appearance, the basal part being very slender, almost cylindric in form, inner ramus abruptly reflexed, outer quite rudimentary and occurring at rather a long distance from the inner. Maxillæ with the palp much produced, vibratory plate rudimentary. Anterior maxillipeds with strong, claw-like spines on the distal part, proximal lobes very small. Posterior maxillipeds with the 1st basal joint considerably produced in front, and carrying strongly developed setæ, distal part very small, with the setæ rudimentary. Inner ramus of 1st pair of legs 3-articulate, that of the 3 succeeding pairs biarticulate. Last pair of legs in female with both rami uniarticulate, outer slender and linear, inner short, conical; those in male 3-articulate, terminal joint in both legs spatulate, though of somewhat different form.

Remarks.—This genus was established in the year 1878 by Prof. Brady, to include a form previously described by Lubbock as a species of the genus *Pontellina* of Dana. The removal of this form, not only from that genus, but also from the family *Pontellidæ*, is justified by a number of well marked differences, which have been mentioned in the preceding pages. The genus comprises at present only a single species, to be described below.

61. Parapontella brevicornis (Lubbock).

(Pl. XCVII & XCVIII).

Pontellina brevicornis, Lubbock, in Ann. Nat. Hist., 2nd series, Vol. XX, p. 407, Pl. XI, figs. 4—8.

Specific Characters.—Female. Anterior division of body, seen dorsally, oval in form, greatest width slightly exceeding half the length, and occurring in the middle, anterior extremity somewhat contracted and narrowly rounded at the tip, posterior but slightly attenuated. Cephalosome about the length of the 3 succeeding segments combined, and evenly vaulted above. Lateral lobes of last segment of metasome somewhat deflexed and narrowly rounded at the tip. Urosome scarcely attaining half the length of the anterior division, genital segment slightly tumefied in its proximal part and rather protuberant below, 2nd segment armed at the posterior edge with 2 sub-dorsal, posteriorly-pointing spines. Caudal rami about 3 times as long as they are broad, sublinear in form, and scarcely divergent, marginal setæ of moderate length, the outermost issuing from the outer edge, at some distance from the others. Anterior antennæ much shorter than the anterior division of the body, reaching, when reflexed, to about the end of the 2nd pedigerous segment, proximal part somewhat tumefied and clothed inside with a number of partly plumose setæ, apical bristles likewise ciliated.

Posterior antennæ with the outer ramus considerably longer than the inner, and composed of 5 joints only, last joint rather narrow, with only 2 apical setæ. Last pair of legs with the outer ramus very narrow and slightly curved, being produced at the end inside to a spiniform projection, tip armed with a slender spine, outer edge with 2 much smaller spines, the distal one placed near the tip; inner ramus about half the length of the outer, and produced at the tip to 2 short digitiform projections.

Male much more slender than female, with the right corner of last segment of metasome remarkably expanded and conically produced behind. Urosome very slender and somewhat asymmetrical, being generally turned out of the axis of the body to the left, 3rd and 4th segments each produced on right side to a small dentiform process. Right anterior antenna longer than left and much more strongly built, middle section moderately tumefied in its proximal part, its penultimate joint produced at the end anteriorly to a short dentiform projection, last joint with a serrated lamella in front; terminal section exserted at the tip to a strong mucroniform projection, at the base of which, posteriorly, issue the apical bristles. Last pair of legs rather asymmetrical, the right one being the larger, with the 1st joint considerably dilated, and produced inside to a narrow digitiform process; 2nd joint of both legs with a short dentiform projection inside; terminal joint of right leg somewhat lozenge-shaped, being suddenly dilated near the base, and exserted at the end to a slender acuminate lappet pointing straight downwards, that of left leg broadly oval in outline and partly ciliated on the edges, apical lappet quite short and pointing inwards, outer edge with 2 dentiform projections.

Colour. Body of female generally pellucid, with a faint yellowish tinge, and exhibiting dorsally at the end of each of the pedigerous segments an interrupted transverse band of a dark reddish hue; in some cases, however, rather deeply tinged with a reddish brown pigment, both on the anterior and posterior divisions. Body of male always of a uniform yellowish hue.

Length of adult female 1.55 mm., of male 1.35 mm.

Remarks.—This form was described by Lubbock as early as the year 1857, and was at that time referred to the genus *Pontellina* of Dana, apparently owing to a slight resemblance in the general form of the body. It is, however, in reality very different from that genus, and is also easily recognizable from any of the other known Calanoida.

Occurrence.—I have met with this Calanoid occasionally in 3 different localities of the west coast of Norway, viz., Molde, Christiansund and Kalvaag. In all these localities it occurred close to the shore, at a depth of a few fathoms,

among algæ. On the other hand, I have never met with it in any of the numerous plankton-samples examined by me, for which reason I have come to the conclusion that, at any rate off the Norwegian coast, this Calanoid is a strictly littoral form. It moves in the usual manner, now proceeding rather slowly in a somewhat jumping manner by rhythmical strokes of the posterior antennæ and mandibular palps, now starting away more suddenly by employing the natatory legs and the urosome.

Distribution. — British Isles (Brady), coast of France (Canu), Mediterranean (Giesbrecht), Atlantic Ocean between 50° and 59° N. Lat. (Giesbrecht).

Fam. 23. Acartiidæ.

Characters. — Body more or less slender, with the anterior division but slightly vaulted. Cephalosome well defined from the 1st pedigerous segment; front without any rostrum. Last 2 segments of metasome united. Urosome consisting in female of 3, in male of 5 segments. Caudal rami with the full number of setæ. A single eye present. Anterior antennæ very slightly attenuated and of a peculiar nodular appearance, the articulations being rather irregular and sometimes indistinctly defined, bristles very unequal; right antenna in male slightly transformed, and imperfectly geniculate. Posterior antennæ very delicate, with the inner ramus very slender, outer poorly developed. Oral parts conspicuously differing from those in other Calanoids; posterior maxillipeds, however, built upon a somewhat similar type to that in the *Pontellidæ*. The 4 anterior pairs of legs very slender and delicate, with unusually long natatory setæ; inner ramus in all these pairs biarticulate. Last pair of legs not natatory, uniramous in both sexes, very small in female, somewhat larger and subprehensile in male. No ovisac present in female.

Remarks. — This family is established to include the genus *Acartia* of Dana, which in several respects differs materially from the other known Calanoida, representing quite a particular type. It is only in the structure of the maxillipeds that some agreement is found to the *Pontellidæ*, to which family this genus has often been referred; but otherwise it is widely different. In addition to the typical genus, another nearly-allied genus has recently been established by Th. Scott as *Paracartia*. Only the former genus is represented in the northern seas.

Gen. 29. **Acartia**, Dana, 1846.

Syn: *Dias*, Lilljeborg.

Generic Characters.—Form of body slender and elegant. Cephalosome attenuated anteriorly, with the front unarmed, or in some cases carrying 2 delicate tentacular filaments below. First segment of metasome much larger than the others; lateral parts of last segment generally rounded. Urosome of moderate size, genital segment in female comparatively large, penultimate segment in male very short, and imperfectly defined from the last one. Caudal rami of different form in the different species, and, as a rule, shorter in male than in female; appendicular bristle well developed and finely plumose, arising with a bulbous base from the dorsal face of the rami. Eye comparatively large and placed close to the front. Anterior antennæ in female consisting of 17 or 18 articulations, some of the bristles rather elongated and partly plumous; those in male with some of the articulations confluent, middle section of right antenna very slightly tumefied, terminal section consisting of 3 articulations. Posterior antennæ with the junction of the inner ramus with the basal part imperfectly defined, and having the distal joint unusually prolonged, outer ramus consisting of 3 joints only, the outer 2 very small. Anterior lip trilobate, with the middle lobe very prominent. Mandibles not very strong, outermost cutting tooth larger than the others and claw-shaped, palp with the inner ramus imperfectly separated from the basal part and, like the outer, carrying very long and slender setæ. Maxillæ with a single appendicular lobe, inner ramus of palp replaced by a plumose seta, outer ramus large and reflexed, with very long setæ. Anterior maxillipeds short and stout, with long curved spines anteriorly, digitiform lobes well developed. Posterior maxillipeds resembling those in the *Pontellidæ*. Natatory legs without any plumose seta inside the 1st basal joint, 2nd basal joint of 4th pair carrying a slender deflexed seta at the outer corner; outer ramus in this and the 2 preceding pairs without distinctly defined spines outside, each of the joints being only produced at the end to a short dentiform projection, apical spine very slender, sword-shaped, with the outer edge closely serrate. Last pair of legs in female 3-articulate, 2nd joint somewhat dilated and carrying a long plumose seta outside, terminal joint gradually exserted to a slender point, which in some cases is spiniform, in others setiform; those in male 4-articulate and somewhat asymmetrical, right leg the larger, with some of the joints lamellarly expanded inside, terminal one securiform or slightly hooked; left leg with the terminal joint somewhat spoon-shaped.

Remarks.—This genus was established by Dana as early as the year 1846, to comprise some species chiefly from the Pacific Ocean. The genus *Dias* of Prof. Lilljeborg is unquestionably identical with Dana's genus. It is easily recognizable by the slender, pellucid body, and the very delicate and peculiar structure of the several appendages. We know at present of a considerable number of species from different tracts of the oceans, amounting to about 20 in all. Some of them, however, may probably be referable to the nearly-related genus *Paracartia* of Scott. To the fauna of Norway belong 3 species, to be described below. A 4th species, *A. bifilosa* Giesbrecht, will also in all probability be found to occur off the Norwegian coast, as it has been observed both in the Baltic and off the British coast.

62. Acartia longiremis (Lilljeborg).

(Pl. XCIX & C).

Dias longiremis, Lilljeborg, De Crustaceis ex ordinibus tribus in Scania occurrentibus, p. 181, Pl. XXIV.

Specific Characters.—Female. Anterior division of body, seen dorsally, oblong fusiform in outline, greatest width about equalling $^1/_3$ of the length, anterior extremity somewhat contracted and obtusely truncated at the tip, posterior gradually attenuated. Cephalosome attaining nearly half the length of the anterior division, front without any trace of tentacular filaments below. Lateral lobes of last segment of metasome rounded off at the tip, and each carrying dorsally a rather conspicuous, delicate spinule. Urosome about equal in length to $^1/_3$ of the anterior division, genital segment fully as long as the other 2 combined, and, like them, clothed both laterally and at the posterior edge with scattered, very delicate spinules. Caudal rami sublinear in form, their length considerably exceeding that of the anal segment, and slightly asymmetrical, right ramus projecting somewhat beyond the left, and having the appendicular bristle nearer to the tip; marginal setæ densely plumose and somewhat divergent. Anterior antennæ, when reflexed, reaching about to the middle of the genital segment, none of the articulations dentiferous. Length of apical spine of outer ramus in 2nd to 4th pairs of legs considerably exceeding that of the whole ramus. Last pair of legs with the terminal joint exserted to a slender setiform point, and somewhat curved in the middle.

Male considerably smaller than female and easily recognizable by the structure of the anterior antennæ and urosome. Caudal rami comparatively shorter than in female, otherwise of a very similar appearance. Last pair of legs of moderate size, 2nd and 3rd joints of right leg each expanded inside in to a rounded

lamellar projection, terminal joint of same leg securiform, that of left leg comparatively broad.

Colour. Body in both sexes highly pellucid, with a very faint tinge of blue. Length of adult female reaching to 1.25 mm., of male to 1.05 mm.

Remarks.—This form was first described by Prof. Lilljeborg in his well-known treatise on the Entomostraca of Skåne under the name of *Dias longiremis*. It is not easy at once to distinguish this form from some of the other species, to which it bears a great similarity. On a closer examination, however, it may be readily recognized in both sexes by the slender and delicate spinule occurring on the dorsal face of the lateral lobes of the last segment of the metasome, as also by the relative length of the anterior antennæ and caudal rami. Moreover the apical spine of the outer ramus in the 2nd to 4th pairs of legs is more elongated than in most other species, and the difference in the last pair of legs in the female is very distinctly marked by the slenderness of the terminal joint, which is exserted to a very thin, flexible point, whereas in most other species this joint is pronouncedly spiniform.

Occurrence.—This Calanoid is distributed along the whole Norwegian coast, from the Christiania Fjord to Vadsø, sometimes occurring in great numbers. It is a true pelagic form, being often met with far out at sea, and at the very surface. Not unfrequently, however, it is brought by the current close to shore; and it is even often found in tidal pools together with *Paracalanus parvus* and *Temora longicornis*. It moves with great rapidity in abrupt bounds.

Distribution.—British Isles (Brady), Kattegat (Lilljeborg), the Baltic (Giesbrecht), Gulf of Finland (Nordqvist), Färoes Isles (Cleve), Iceland and southern Greenland (idem), Spitsbergen, polar basin, north of the New Siberian Islands (the present author).

63. Acartia Clausi, Giesbrecht.

(Pl. CI).

Acartia Clausii, Giesbrecht, Fauna & Flora des Golfes von Neapel. Pelagische Copepoden, p. 507, Pl. 30, figs. 2, 4, 13—15, 17, 28, 36, 47; Pl. 42, fig. 32; Pl. 43, figs. 3, 5, 14.

Syn: *Dias longiremis*, Claus (not Lilljeborg).

Specific Characters.—Female. Very like the preceding species both in size and general appearance, and, like the latter, without any trace of tentacular appendages in front. Lateral lobes of last segment of metasome, however, without the dorsal spinule found in *A. longiremis*, but having the edge armed with from 4 to 6 extremely small and closely set denticles. Urosome with the first 2

segments clothed at the end dorsally with a transverse row of still smaller denticles, but having no lateral spinules. Caudal rami comparatively shorter than in *A. longiremis*. Anterior antennæ likewise somewhat shorter, scarcely exceeding the length of the anterior division of the body, 5th articulation with a distinct denticle in front. Length of apical spine of outer ramus in 2nd to 4th pairs of legs scarcely exceeding that of the ramus. Last pair of legs with the terminal joint produced to a strong claw-like spine minutely spinulose outside.

Male resembling that of the preceding species, but having the caudal rami comparatively shorter, and nearly as broad as they are long. Last pair of legs very like those in the male of *A. longiremis*, though having the terminal joint of right leg considerably narrower and that of left leg less expanded.

Colour.—Body in both sexes extremely pellucid and nearly colourless.

Length of adult female 1.15 mm., of male 1.00 mm.

Remarks.—This form is so very like the preceding species that, without a close examination, it may readily be confounded with it. This has also actually been done by Claus, who described it as *Dias longiremis* Lilljeborg; and Brady also seems to have confounded the 2 species. Dr. Giesbrecht, however, has pointed out some minute differences between them, and as these differences are fairly constant, they seem to justify the specific distinction of the two forms. The most conspicuous distinctive characters are the different armature of the lateral lobes of the last segment of the metasome and of the urosome, as also the comparatively shorter anterior antennæ and caudal rami in the present species. The last pair of legs in the female, moreover, conspicuously differ from those in *A. longiremis* in the form of the terminal joint; and these legs in the male also exhibit some slight differences, as shown by the figures here given.

Occurrence.—Off the south and west coasts of Norway this form is fully as common as *A. longiremis*, in company with which species it is often found. On the other hand, I have never met with it in any of the samples of plankton from the Arctic Ocean. It accordingly seems to be a more southern form than *A. longiremis*, and this assumption is also confirmed by what is at present known of its foreign distribution.

Distribution.—British Isles (Scott), Färoe Isles (Cleve), Heligoland (Claus), coast of France (Canu), Mediterranean (Giesbrecht), Black Sea (Karawajew), Azores (Cleve), Atlantic Ocean between 36° and 61° N. Lat. (Giesbrecht); Gulf of Guinea (Scott).

64. Acartia discaudata, Giesbrecht.

(Pl. CII).

Dias discaudatus, Giesbrecht, Die freilebenden Copepoden der Kieler Föhrde. 7te Bericht. d. Commiss. Unters. Deutsch. Meere, p. 148, Pl. III, figs. 4, 22, 23; Pl. V, fig. 18; Pl. VI, fig. 17; Pl. VIII, figs. 32, 33; Pl. IX, fig. 30.

Specific Characters.—Female. Anterior division of body of a form similar to that in the 2 preceding species. Front without any tentacular filaments. Lateral lobes of last segment of metasome rounded off and quite smooth. Urosome likewise without any traces of spinules or denticles, and rather robust, genital segment very large, conspicuously dilated in its proximal part, and very protuberant below in the middle; 2nd segment terminating dorsally in a rounded protuberance; 3rd segment flattened and considerably expanded distally. Caudal rami of rather an unusual appearance, being bulbously dilated, and rounded oval in form, with the marginal setæ comparatively short and conspicuously dilated at the base. Anterior antennæ about the length of the anterior division of the body, and without any denticles in front. Last pair of legs resembling those in *A. Clausi*, the terminal joint being spiniform, though somewhat less strong than in that species.

Male resembling that of the 2 preceding species, though perhaps less slender. Urosome of normal appearance, the caudal rami not, as in the female, bulbously dilated, but of a similar form to that in the male of *A. Clausi*. Last pair of legs considerably larger than in either of the 2 preceding species, right leg much elongated, being more than twice as long as the left, with the lamellar expansions inside the 3 first joints comparatively small, terminal joint rather narrow, almost claw-like.

Colour.—Body of female semipellucid, with a distinct bluish grey hue; that of male paler.

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

Remarks.—This form may at once be distinguished from the other known species, at any rate in the female sex, by the peculiar structure of the urosome, but more especially by the greatly dilated caudal rami. The male differs less conspicuously, though the last pair of legs exhibit well marked peculiarities. Another distinguishing character not mentioned in the above diagnosis, is the large size and peculiar sac-like form of the spermatophore often found attached to the genital segment of the female.

Occurrence.—I have hithertho only met with this form in 2 localities of the Norwegian coast, viz., Bratholmen and Skjerjehavn, the former situated at some distance south of Bergen, the latter at the mouth of the Sogne Fjord. In both these localities it occurred occasionally close to the shore, together with *A. longiremis*, from which it was at once distinguished by its darker blue colour.

Distribution.—The Baltic (Giesbrecht), Scottish coast (Scott), coast of France (Canu).

SUPPLEMENT.

Page 15. Rhincalanus nasutus, Giesbr.

Remarks.—The form recorded by Th. Scott as *R. gigas*. Brady, is unquestionably the present species.

Distribution.—Scottish coast (Scott).

Page 18. Paracalanus parvus (Claus).

Distribution.—Black Sea (Karawajew), Gulf of Guinea (Scott).

Page 21. Pseudocalanus elongatus, Boeck.

Distribution.—Black Sea (Karawajew).

Page 21. The following species should be added:

Pseudocalanus gracilis, G. O. Sars.

(Suppl. Pl. I).

Specific Characters.—Female. Body of still more slender form than in the typical species, with the anterior division, seen dorsally, narrow oblong in form, greatest width scarcely attaining $^1/_3$ of the length; frontal part conspicuously projecting, and, seen laterally, almost angularly curved in the middle. Lateral parts of last segment of metasome obtusely rounded. Urosome very slender, though scarcely exceeding half the length of the anterior division. Caudal rami comparatively narrower than in *P. elongatus*, and more divergent. Anterior antennæ more elongated, reaching, when reflexed, to the end of the 3rd caudal segment. Legs considerably more slender than in the typical species, with both rami very narrow. Ovisac rather large, rounded oval in form, and somewhat flattened, containing a number of globular, highly pellucid ova.

Male resembling that of *P. elongatus*, but having the anterior antennæ considerably longer. Last pair of legs of a structure very similar to that in the male of the said species.

Colour not yet ascertained.

Length of adult female 1.65 mm., of male 1.15 mm.

Remarks.—This form, though nearly allied to the typical species, is unquestionably distinct, differing, as it does, not only in the more slender form of the body and the gibbously produced frontal part, but also in the greater length of the anterior antennæ, and the more slender form of the natatory legs.

Occurrence.—This form occurred not unfrequently in some of the plankton-samples taken during the cruise of the "Michael Sars", 1900, in the open sea between Finmark and Bear Island; but as the specimens were more or less damaged, and moreover, as shown by the structure of the urosome, had not arrived at sexual maturity, their specific difference from *P. elongatus* was less apparent, for which reason I at first only regarded this form as a variety of the typical species. It was only by the examination of another sample taken by Mr. Amundsen early in the spring of the following year from about the same tract, that I could convince myself of the distinctness of the present form. This sample contained several fully adult and admirably preserved female specimens with the rather large ovisac still attached to the genital segment, and also some few adult male specimens. In the same sample a number of comparatively large, and likewise ovigerous, specimens of *P. elongatus* also occurred, and it was very easy to distinguish between these 2 species, on account of the rather different shape of the frontal part, and the difference in the length of the anterior antennæ. That this undoubtedly true arctic form also occasionally occurs in the immediate neighbourhood of the Norwegian coast, was proved by the examination of one of the plankton-samples taken during the cruise of the „Michael Sars" in the Lyngenfjord, Finmark. This sample contained some young specimens of a *Pseudocalanus* evidently belonging to the present species.

The following genus is also to be added:

Microcalanus, G. O. Sars 1901.

Syn: *Pseudocalanus*, G. O. Sars (part).

Generic Characters.—Body of comparatively small size, and rather short and compact form, recalling that of *Paracalanus*. Cephalosome completely coalesced with the 1st pedigerous segment; front carrying 2 extremely small tentacular appendages below. Urosome in female comparatively short, with the genital segment more or less dilated, in male considerably more slender. Caudal rami

small, each with 4 subequal apical setæ. Anterior antennæ more or less slender, composed in female of 24 articulations, and in male transformed in much the same manner as in *Pseudocalanus*. Posterior antennæ and oral parts resembling in structure those parts in the said genus. Posterior maxillipeds, however, more slender, and having the terminal part reflexed. Natatory legs on the whole built upon the same type as in *Pseudocalanus*. Last pair of legs in female wholly absent, in male comparatively small and very asymmetrical, left leg slender, 6-articulate, right very small, 3-articulate, last joint not styliform.

Remarks.—As I stated on page 20, it is now my opinion that the small Calanoid described from Nansen's Polar Expedition as *Pseudocalanus pygmæus* should more properly be regarded as the type of a separate genus, for which the name *Microcalanus* was proposed. The correctness of this view has now been still further confirmed by the discovery off the Norwegian coast of another still smaller Calanoid, which is evidently congeneric with the polar form, though apparently specifically distinct. This form is described below.

Microcalanus pusillus, G. O. Sars, n. sp.

(Suppl. Pl. II, & Pl. III, fig. 1).

Specific Characters.—Female. General form of body resembling that of *M. pygmæus*, the anterior division being rather tumid and, seen dorsally, of oval form, greatest width almost attaining half the length, both extremities abruptly contracted, the anterior one narrowly rounded at the tip. Cephalosome together with the united 1st pedigerous segment occupying $^2/_3$ of the anterior division, dorsal margin evenly curved in front. Lateral lobes of last segment of metasome somewhat appressed and rounded off at the tip. Urosome about equal in length to $^1/_3$ of the anterior division, genital segment conspicuously dilated in the middle. Caudal rami scarcely longer than they are broad, apical setæ of moderate length. Eye wholly absent. Anterior antennæ much shorter than in the typical species, scarcely reaching, when reflexed, beyond the genital segment. Natatory legs less slender than in *M. pygmæus*, terminal joint of outer ramus in 2nd to 4th pairs comparatively broader, with the apical spine remarkably dilated, cultellate in shape, and very coarsely serrate outside.

Male rather unlike the female in general appearance, the anterior division being still shorter and more tumid, whereas the urosome is much more slender than in female, fully equalling half the length of the anterior division. Anterior antennæ with the proximal part rather dilated and clothed anteriorly with large

curved sensory appendages, 7th joint very elongated and apparently formed by the coalescence of 5 articulations. Oral parts, as in the male of *Pseudocalanus*, much reduced. Last right leg scarcely $^1/_3$ as long as the left, terminal joint simple, rounded.

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

Length of adult female scarcely exceeding 0.70 mm., that of male about the same.

Remarks.—This dwarf Calanoid, perhaps the smallest of all hitherto known forms, is closely allied to the polar species, *M. pygmæus*, though differing conspicuously in the much shorter anterior antennæ, as also in the structure of the natatory legs, but more especially in the peculiar development of the apical spine of the outer ramus. It may here be remarked that the male specimen figured on Pl. XXII of my Account of the Crustacea of the Norwegian North Polar Expedition, and described as the male of *Spinocalanus longicornis*, most certainly does not belong to that form, but to *Microcalanus pygmæus*, which is proved by its great similarity to the male of the present species.

Occurrence.—Owing to its small size and inconspicuous colouring, this form had previously quite escaped my attention, though in reality it seems to be rather common, at any rate off the west coast of Norway. During a 2 months' stay last summer in that part of the country, I found this Calanoid rather abundantly in 3 different places, viz., at Christiansund, Aalesund, and in the Storfjord, farther inland than the last-mentioned town. In all these places, however, it only occurred in depths of more than 150 fathoms; and it thus appears to be a true deepwater form. The same species was also found in 2 plankton-samples kindly sent to me by Mr. Nordgaard, both taken from great depths, the one in the Herlö Fjord, the other in the Oster Fjord, near Bergen. Finally, some few more or less defective specimens of a *Microcalanus* (perhaps more properly referable to the polar species) were picked out of a plankton-sample taken during the cruise of the "Michael Sars" in the open sea between Jan Mayen and Finmark.

Page 22: Spinocalanus abyssalis, Giesbrecht.

(See Pl. XII & Suppl. Pl. III, fig. 2).

Spinocalanus abyssalis, Giesbrecht, Fauna & Fl. Golfes Neapel. Pelagische Copepoden, p. 209, Pl. 13, figs. 42–48, Pl. 36, fig. 49.

Syn: *Spinocalanus longicornis*, G. O. Sars.

(For the description of the female, see p. 22).

Description of Male. General appearance very different from that of the female. Anterior division of body oblong oval in form, both extremities,

especially the posterior one, contracting abruptly. Front unarmed, as in the female. Urosome very slender and narrow, attaining almost half the length of the anterior division, 2nd segment much the largest, anal segment very small, almost obsolete. Caudal rami mobile, and generally spread to each side. Anterior antennæ very much shorter than in female, their length scarcely exceeding that of the anterior division, and clothed in their proximal part with large curved, sensory appendages. Oral parts transformed in a manner similar to that found in the male of *Paracalanus* and *Pseudocalanus*. Natatory legs exhibiting the characteristic armature mentioned by Dr. Giesbrecht, 2nd joint of outer ramus in 2nd to 4th pairs provided on the hind face with an obliquely transverse row of extremely delicate, somewhat flattened spines. Last pair of legs comparatively small and but slightly asymmetrical, both legs biramous, with the inner ramus simple styliform and longer on right side, outer ramus of right leg biarticulate, of left 3-articulate, terminal joint in both styliform.

Colour not yet ascertained. Length of the specimen examined 1.60 mm.

Remarks.—I am now of opinion that the form recorded from Nansen's Polar Expedition as *S. longicornis*, and subsequently redescribed in the present Account under the same name, is in reality identical with Giesbrecht's species. On a closer examination, I have convinced myself that the characteristic armature of the natatory legs described and figured by Dr. Giesbrecht, is also present in both sexes of the northern form. The transverse row of flattened spines occurring on the hind face of the 2nd joint of the outer ramus is of such a delicate nature, however, that it may easily escape attention, if the opposite face of the joint be turned to the observer. The male, of which only a solitary specimen has hitherto come under my notice, is so very unlike the female, that it was only by the dissection of the specimen that I could with perfect certainty refer it to the present species. The most striking difference is unquestionably the disproportionate length of the anterior antennæ, these being scarcely longer than the anterior division of the body, whereas in the female their lenght considerably exceeds that of the whole body. An analogous sexual disproportion in these antennæ has also been shown by Dr. Giesbrecht, however, in a few other Calanoids belonging to the genera *Calanus* and *Haloptilus*.

Occurrence.—The above-described male specimen was found in a plankton-sample taken by Mr. Nordgaard in the Oster Fjord from a depth of from 400 to 600 metres, and kindly sent to me for examination. In the same sample a few female specimens also occurred.

Distribution.—Pacific Ocean, between Lat 14° N. and 4° S., at a depth of 1000—4000 metres (Giesbrecht); polar basin crossed by Nansen, at 2 different Stations.

Page 25. Ætideus armatus, Boeck.

Remarks.—I have recently had an opportunity, through the kindness of Prof. Brady, of examining 2 of the Challenger specimens, from which the original description of his *Ætideus armatus* was made, and cannot find any difference whatever between them and the northern form. For this reason I must consider Brady's and Boeck's species as identical, in spite of the widely-separated localities.

Occurrence.—I found this form last summer not unfrequently at Aalesund and in the Storfjord, in depths ranging from 30 to 150 fathoms.

Distribution.—Off the Shetland Islands (Scott), Färoe Channel (Norman's Collection), Indian Ocean, Torres Strait, Chinese Sea, South Atlantic Ocean (Brady), Gulf of Guinea (Scott).

Page 26. The following new genus is to be added:

Ætideopsis, G. O. Sars.

Generic Characters.—External appearance somewhat resembling that of *Ætideus*, the front being produced below to a strong bifurcate rostrum. Last segment of metasome, however, well defined from the preceding one, and having the lateral corners acutely produced. Urosome of moderate size, with the caudal rami comparatively short; outermost seta rudimentary, appendicular bristle very small. Anterior antennæ slender and attenuated, consisting (in female) of 24 well-defined articulations. Posterior antennæ and oral parts nearly agreeing in their structure with those in *Chiridius*, the posterior maxillipeds exhibiting a similar slender form. Legs likewise built upon the same type as in that genus.

Remarks.—This new genus is somewhat intermediate in character between *Ætideus* and *Chiridius*, agreeing with the former in the strongly developed, bifurcate rostrum, while the structure of the caudal rami and of the several appendages resembles more that of *Chiridius*. The present genus differs from both these genera in the fact that the last segment of the metasome is well defined from the preceding one. The genus comprises as yet only a single species, described below.

Ætideopsis rostrata, G. O. Sars, n. sp.

(Suppl. Pl. IV & V).

Specific Characters.—Female. Body moderately slender, with the integuments of an unusually firm consistency. Anterior division, seen dorsally, oblong oval in form, greatest width slightly exceeding $^1/_3$ of the length, anterior extremity conspicuously dilated in the oral region, and abruptly contracted in front, tip triangularly produced, posterior extremity gradually attenuated. Cephalosome separated above from the 1st pedigerous segment by a well-marked transverse groove, dorsal face only slightly vaulted, lateral edges conspicuously insinuated in the middle. Rostrum highly chitinized and pointing straight downwards, lateral spikes acutely pointed and somewhat divergent. Last segment of metasome very short, but defined in front by a well-marked curved suture, lateral corners produced to strong mucroniform processes pointing straight backwards and extending beyond the middle of the genital segment. Length of urosome scarcely exceeding $^1/_3$ that of the anterior division, genital segment not very large, and but slightly protuberant below. Caudal rami about the length of the anal segment, and somewhat flattened, tip obliquely rounded. Eye apparently well developed. Anterior antennæ, when reflexed, reaching about to the end of the 2nd caudal segment. Posterior antennæ with the outer ramus somewhat longer than the inner. Posterior maxillipeds almost exactly as in *Chiridius*, the 2nd basal joint being very narrow and elongated, whereas the terminal part is comparatively short, scarcely half as long as this joint. Apical spine of outer ramus in 2nd to 4th pairs of legs very strong, its outer edge densely aculeate in a pectinate manner.

Male unknown.

Colour not yet ascertained.

Length of adult female 4.40 mm.

Remarks.—This form, as stated above, somewhat recalls *Ætideus armatus* by the strongly-developed, bifurcate rostrum and the acutely produced lateral corners of the last segment of the metasome. It may, however, be at once distinguished by the far less vaulted cephalosome, and the sharply marked boundary between the last 2 segments of the metasome. It is also of considerably larger size.

Occurrence.—Two female specimens of this form were found in a plankton-sample taken, during the cruise of the "Michael Sars" in 1900, at Stat. 34, situated between Jan Mayen and Finmark, the depth being recorded to be from 500 to 1000 metres.

Page 28. Chiridius armatus (Boeck).

Occurrence.—A solitary male specimen, unquestionably belonging to this species, was found in a plankton-sample taken during the cruise of the "Michael Sars", at Stat. 10, east of Iceland, depth 250—400 metres.

Page 30. The following genus should be added:

Gaïdius, Giesbrecht, 1895.

Syn: *Chiridius*, G. O. Sars (part).

Generic Characters.—Body comparatively more robust than in *Chiridius*, with the urosome shorter in proportion to the anterior division. Front produced below to a very small, undivided rostral projection. Last segment of metasome wholly coalesced with the preceding one, lateral lobes obtusely rounded and each exhibiting, somewhat outside the tip, a narrow spiniform process pointing backwards. Caudal rami short, resembling in structure those in *Chiridius*. Anterior antennæ in both sexes very slender, in female 24-articulate, in male with some of the articulations coalesced. Posterior antennæ with the inner ramus somewhat longer and narrower than in *Chiridius*. Oral parts almost exactly as in that genus. Legs likewise of a very similar structure, except that in the outer ramus of 1st pair, the spine outside the 1st joint is missing.

Remarks.—Although the differences between this genus and *Chiridius* appear to be very slight, it may perhaps be advisable to retain the genus, since there are 2 northern species that so closely agree with that first described by Dr. Giesbrecht, that the 3 species together form a natural group. The typical species is *G. pungens* Giesbr. from the Pacific Ocean; the other 2 species have been described by the present author from Nansen's Polar Expedition as *Chiridius tenuispinus* and *C. brevispinus*. Both these arctic species subsequently proved to be referable to the Norwegian fauna. The female of the first-named species has already been described in the present Account, and it only remains here to describe the hitherto unknown male of this form. The 2nd species is now for the first time added to the Norwegian fauna.

Gaïdius tenuispinus, G. O. Sars.

(See Pl. XVIII & Suppl. Pl. VI, fig. 1).

Chiridius tenuispinus, G. O. Sars, Crustacea of the Norw. North Polar Expedition, p. 67, Pl. XVIII.
(For the description of the female, see p. 30).

Description of the Male.—Anterior division of body, seen dorsally, oval in form, somewhat attenuated anteriorly, with the greatest width occurring considerably behind the middle. Lateral processes of last segment of metasome well marked, and of the same appearance as in the female. Urosome, as usual, much narrower, and composed of 5 segments, the last of which, however, is very small, almost obsolete. Anterior antennæ of about the same relative length as in female, but transformed in the usual manner, their proximal part being rather dilated, and clothed in front with large curved sensory appendages, terminal part very slender, and forming with the proximal one a somewhat angular curve. First pair of legs with the 1st joint of the outer ramus distinctly separated from the 2nd. Last pair of legs comparatively large, and somewhat resembling in structure those in the male of *Chiridius armatus*, both legs provided with a rudimentary inner ramus, that of right leg pronouncedly club-shaped, that of left much narrower; outer ramus of right leg biarticulate, with the proximal joint rather large and curved, distal joint very narrow, and forming a small rounded lobule inside, beyond the middle; that of left leg 3-articulate, last joint spiniform.

Length of the specimen examined about 2 mm.

Remarks.—It will be seen from the above short description, that the sexual differences in the present form do not materially differ from those found in the genus *Chiridius*, and the last pair of legs in the male even bears a very close resemblance to those in the male of *Chiridius armatus*.

Occurrence.—The above-described specimen was found in the same sample (Stat. 34) in which *Ætideopsis armata* occurred, and could at once be recognized as the male of the present species by the slender spiniform processes issuing from the last segment of the metasome.

Gaïdius brevispinus, G. O. Sars.

(Suppl. Pl. VI, fig. 2).

Chiridius brevispinus, G. O. Sars, Crustacea of the Norw. North Polar Expedition, p. 68, Pl. XIX.

Specific Characters.—Female. Body comparatively robust, with the anterior division rather massive and, seen dorsally, oblong oval in form; anterior extremity somewhat contracted near the tip, which appears obtusely truncated, posterior

extremity only slightly attenuated. Rostral prominence exactly as in *G. tenuispinus*, forming a very small conical projection. Lateral lobes of last segment of metasome broadly rounded, spiniform process outside the tip extremely small. Urosome scarcely attaining $^1/_3$ of the length of the anterior division; caudal rami comparatively very short and somewhat divergent. Anterior antennæ slender and elongated, reaching, when reflexed, as far as the tip of the caudal rami. Posterior antennæ and oral parts almost exactly as in *G. tenuispinus*. First pair of legs with the 1st joint of the outer ramus well defined, though, as in *G. tenuispinus*, without any trace of a spine outside; inner ramus of 2nd pair distinctly biarticulate.

Male unknown.

Colour not yet ascertained.

Length of adult female 4.80 mm.

Remarks.—This form is undoubtedly very closely allied to *G. tenuispinus*, though easily distinguishable by its much larger size and somewhat more robust form of body, the more elongated anterior antennæ, and the small size of the spiniform processes issuing from the last segment of the metasome.

Occurrence.—A solitary but well-preserved female specimen of this Arctic form was found in the same sample (Stat. 34), in which the male of *G. tenuispinus* occurred.

Distribution.—Polar basin crossed by Nansen, at 6 different Stations (the present author); Färoe Channel (Norman's Collection).

Page 32. Undinopsis Bradyi, G. O. Sars.

Remarks.—During the past summer I have found this form very plentiful in one place near Aalesund, just at the bottom of a steep incline, on a sandy bottom. Male specimens were by no means rare, and on a renewed examination of the latter, I found that the right last leg is generally wholly absent. In some few specimens from the same locality, otherwise indistinguishable from the others, these legs, however, exhibited exactly the appearance figured on Pl. XIX, a distinct rudiment of the right leg being present.

Page 39. Euchæta norvegica, Boeck.

Distribution.—Scottish coast (Scott).

Page 42. Euchæta barbata, Brady.

Distribution.—Gulf of Guinea (Scott).

Page 47. Xanthocalanus borealis, G. O. Sars.

Distribution.—East of the Shetland Islands (Scott).

Page 53. Amallophora brevicornis, G. O. Sars.

Remarks.—The hitherto unknown male of this species has recently been described by Th. Scott, and the correctness of my opinion in considering this form to be a true *Amallophora*, is fully confirmed by the structure of the last pair of legs, which are built upon the very same type as in *A. magna* Scott.

Distribution.—East of the Shetland Islands (Scott).

Page 66. Parastephos pallidus, G. O. Sars.

Distribution.—I have recently received from Th. Scott an adult male specimen and an immature female of this form, taken by him off the Scottish coast.

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LIST OF PLATES.

The Plates have been marked as far as possible in accordance with those belonging to the 3 previous Volumes (Amphipoda, Isopoda, Cumacea).

The following are the chief signs, with their significance:

♀ female; ♂ male; *C.* cephalosome: *R.* rostrum; *Urs.* urosome with the caudal rami; *gen. S.* genital segment of female; *O.* eye; $a.^1$ anterior antenna; $a.^2$ posterior antenna; *or. area* oral area; *L.* anterior lip; *M.* mandible: *m.* maxilla; $mp.^1$ anterior maxilliped; $mp.^2$ posterior maxilliped; $p.^1$—$p.^5$ legs of 1st to 5th pairs.

Pl. XXII.
Bryaxis brevicornis, Boeck: female.

Pl. XXIII.
Bryaxis brevicornis; female (continued).

Pl. XXIV.
Euchæta norvegica, Boeck: female.

Pl. XXV.
Euchæta norvegica; female (continued).

Pl. XXVI.
Euchæta norvegica, Boeck; adult male.

Pl. XXVII.
Euchæta glacialis, Hansen; female & male.

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Euchæta barbata, Brady; female & male.

Pl. XXIX.
Pseudophaënna typica, G. O. Sars: female & male.

Pl. XXX.
Pseudophaënna typica; female (continued).

Pl. XXXI.
Xanthocalanus borealis, G. O. Sars; female & male.

Pl. XXXII.
Xanthocalanus borealis; female (continued).

Pl. XXXIII.
Xanthocalanus propinqvus, G. O. Sars: female & male.

Pl. XXXIV.
Amallophora magna, Scott; female & male.

Pl. XXXV.
Amallophora magna; female (continued).

Pl. XXXVI.
Amallophora brevicornis, G. O. Sars; female.

Pl. XXXVII.
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Pl. XXXVIII.
Scolecithricella minor; female (continued).

Pl. XXXIX.
Diaixis hibernica (Scott); female & male.

Pl. XL.
Diaixis hibernica; female (continued).

Pl. XLI.
Stephos lamellatus, G. O. Sars: female & male.

Pl. XLII.
Stephos lamellatus; female (continued).

Pl. XLIII.
Stephos Scotti, G. O. Sars; female & male.

Pl. XLIV.
Parastephos pallidus, G. O. Sars: male.

Pl. XLV.
Tharybis macrophthalma, G. O. Sars: female & male.

Pl. XLVI.
Tharybis macrophthalma; female (continued).

Pl. XLVII.
Pseudocyclopia stephoides, Thompson: female & male.

Pl. XLVIII.
Pseudocyclopia stephoides; female (continued).

Pl. XLIX.
Centropages typicus, Kröyer; female.

Pl. L.
Centropages typicus; female (continued).

Pl. LI.
Centropages typicus, Kröyer: adult male.

Pl. LII.
Centropages hamatus (Lilljeborg); female & male.

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Isias clavipes, Boeck: female & male.

Pl. LIV.
Isias clavipes; female (continued).

Pl. LV.
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Pl. LVI.
Limnocalanus macrurus; female (continued).

Pl. LVII.
Diaptomus castor (Jurine); female & male.

Pl. LVIII.
Diaptomus castor; female & male (continued).

Pl. LIX.
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Pl. LX.
Diaptomus bacillifer, Koelbel; female & male.

Pl. LXI.
Diaptomus laticeps, G. O. Sars; female & male.

Pl. LXII.
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Pl. LXIII.
Diaptomus gracilis, G. O. Sars; female & male.

Pl. LXIV.
Diaptomus graciloides, Lilljeborg; female & male.

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Pl. LXVI.
Temora longicornis; female (continued).

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Pl. LXXVI.
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Pl. LXXVIII.
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1. Haloptilus longicornis; female (continued).
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Anomalocera Patersoni, Templt.; adult male.

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Parapontella brevicornis; female & male (continued).

Pl. XCIX.

Acartia longiremis (Lilljeborg); female.

Pl. C.

Acartia longiremis; male & female (continued).

Pl. CI.

Acartia Clausi, Giesbrecht; female & male.

Pl. CII.

Acartia discaudata, Giesbrecht; female & male.

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Pseudocalanus gracilis, G. O. Sars; female & male.

Suppl. Pl. II.

Microcalanus pusillus, G. O. Sars; female.

Suppl. Pl. III.

1. Microcalanus pusillus; male.
2. Spinocalanus abyssalis, Giesbrecht; adult male.

Suppl. Pl. IV.

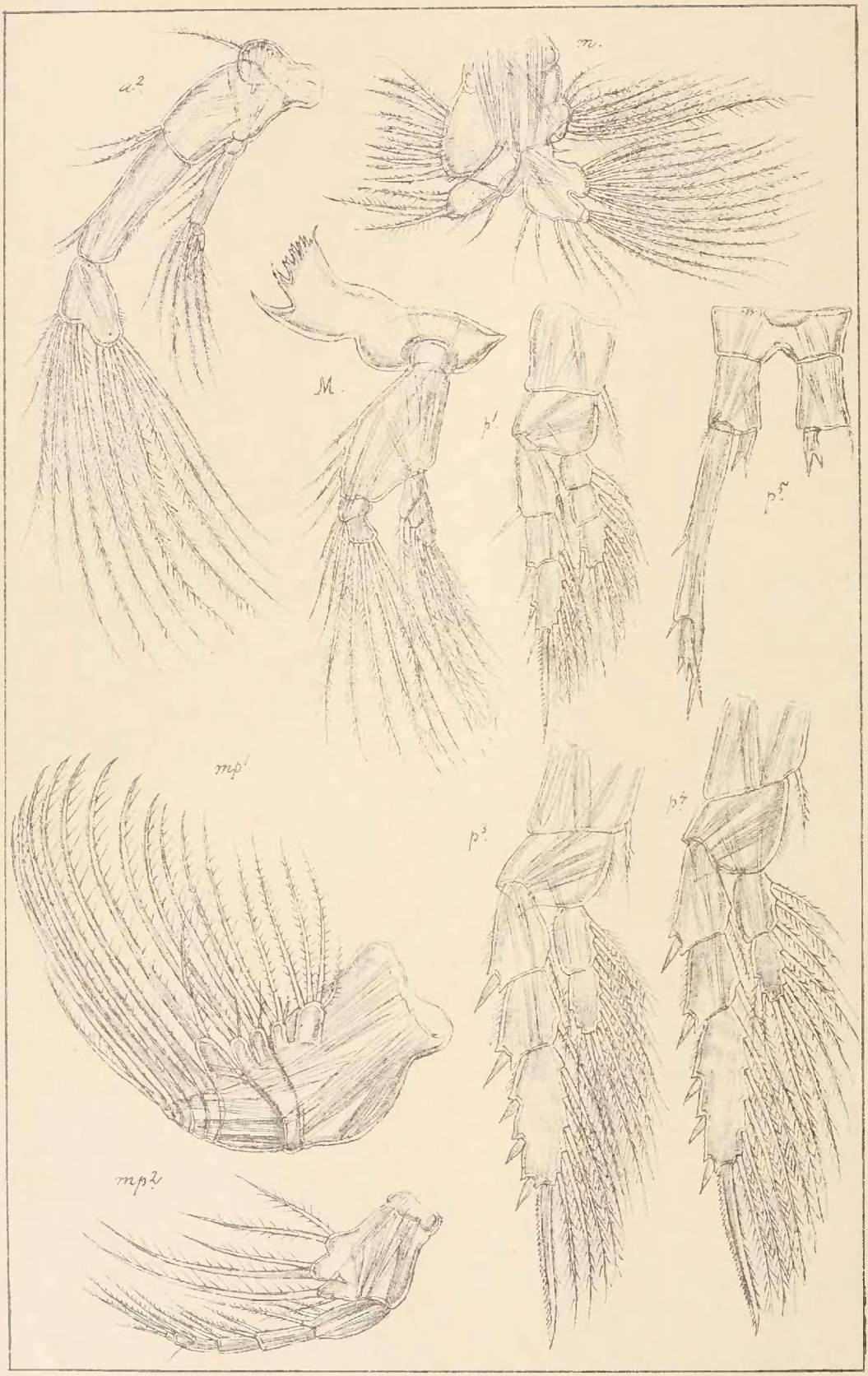
Ætideopsis rostrata, G. O. Sars; female.

Suppl. Pl. V.

Ætideopsis rostrata; female (continued).

Suppl. Pl. VI.

1. Gaïdius tenuispinus, G. O. Sars; adult male.
1. Gaïdius brevispinus, G. O. Sars; female.



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Anomalocera Pattersoni, Templt.
(continued)

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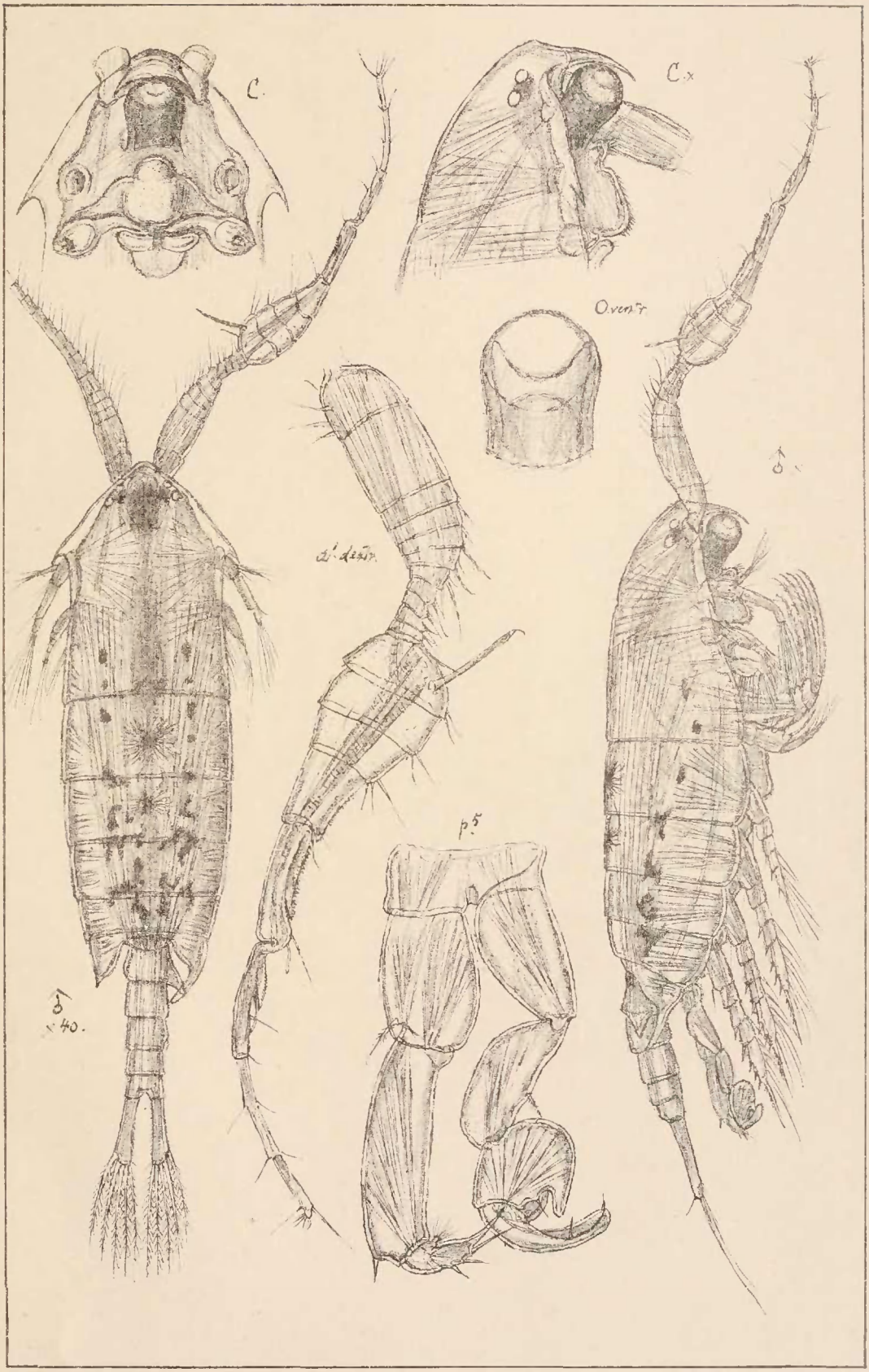
Calanoida.



G. O. Sars autogr.

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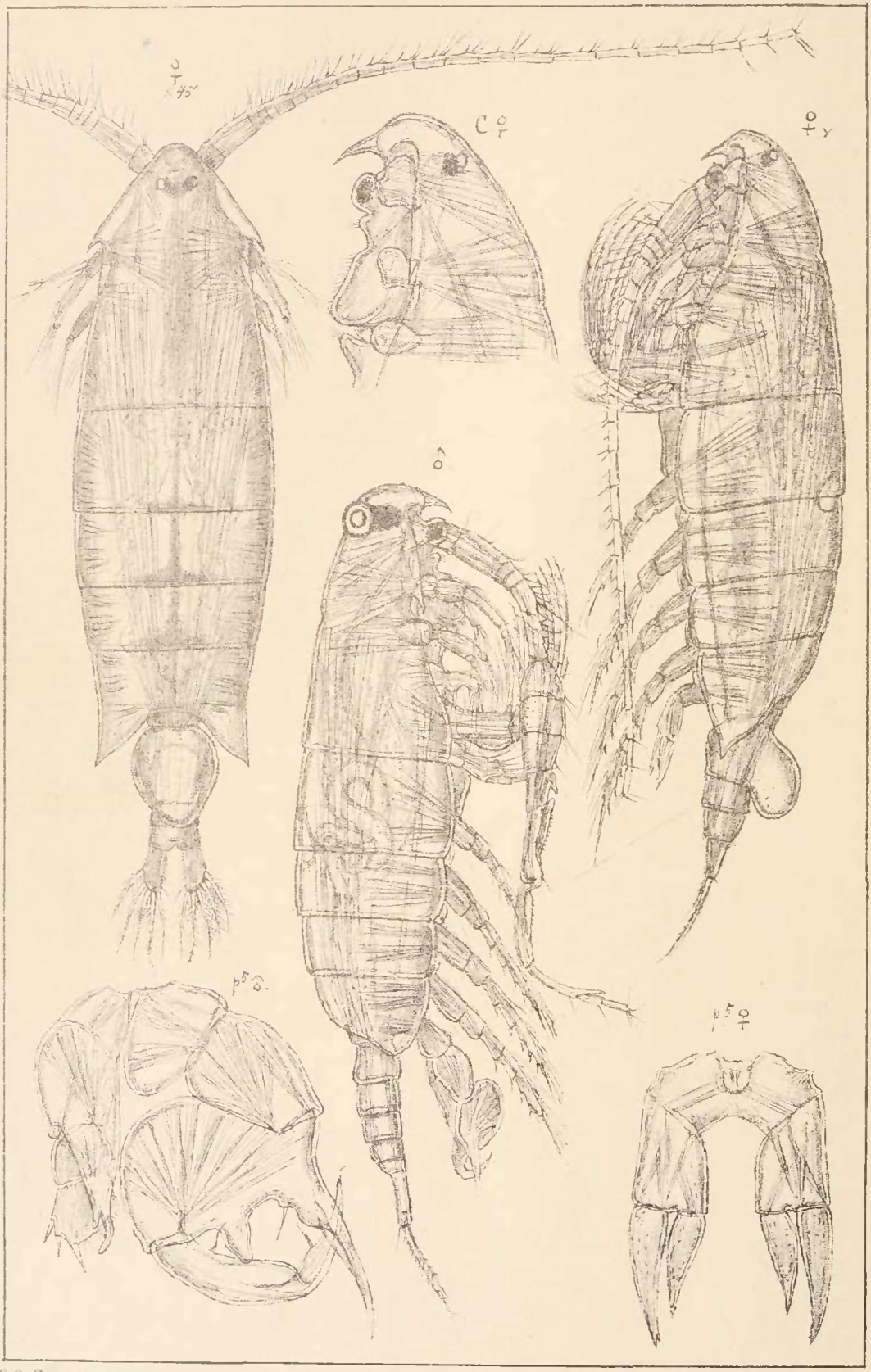
Anomalocera Pattersoni, Templt.
(male)

Copepoda

Pontellidæ — Calanoida — PI XCV



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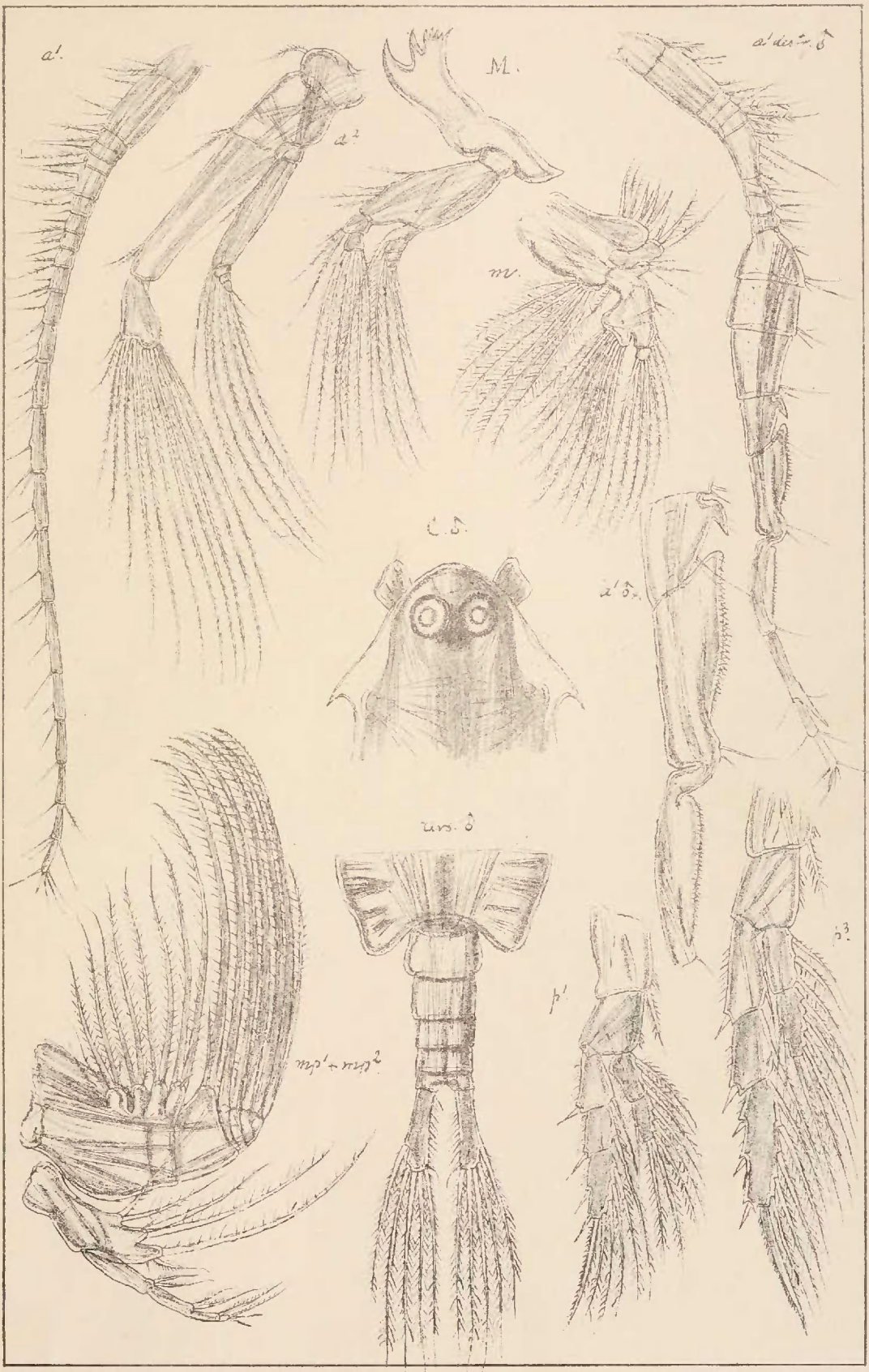
Labidocera Wollastoni (Lubbock)



G.O. Sars autogr

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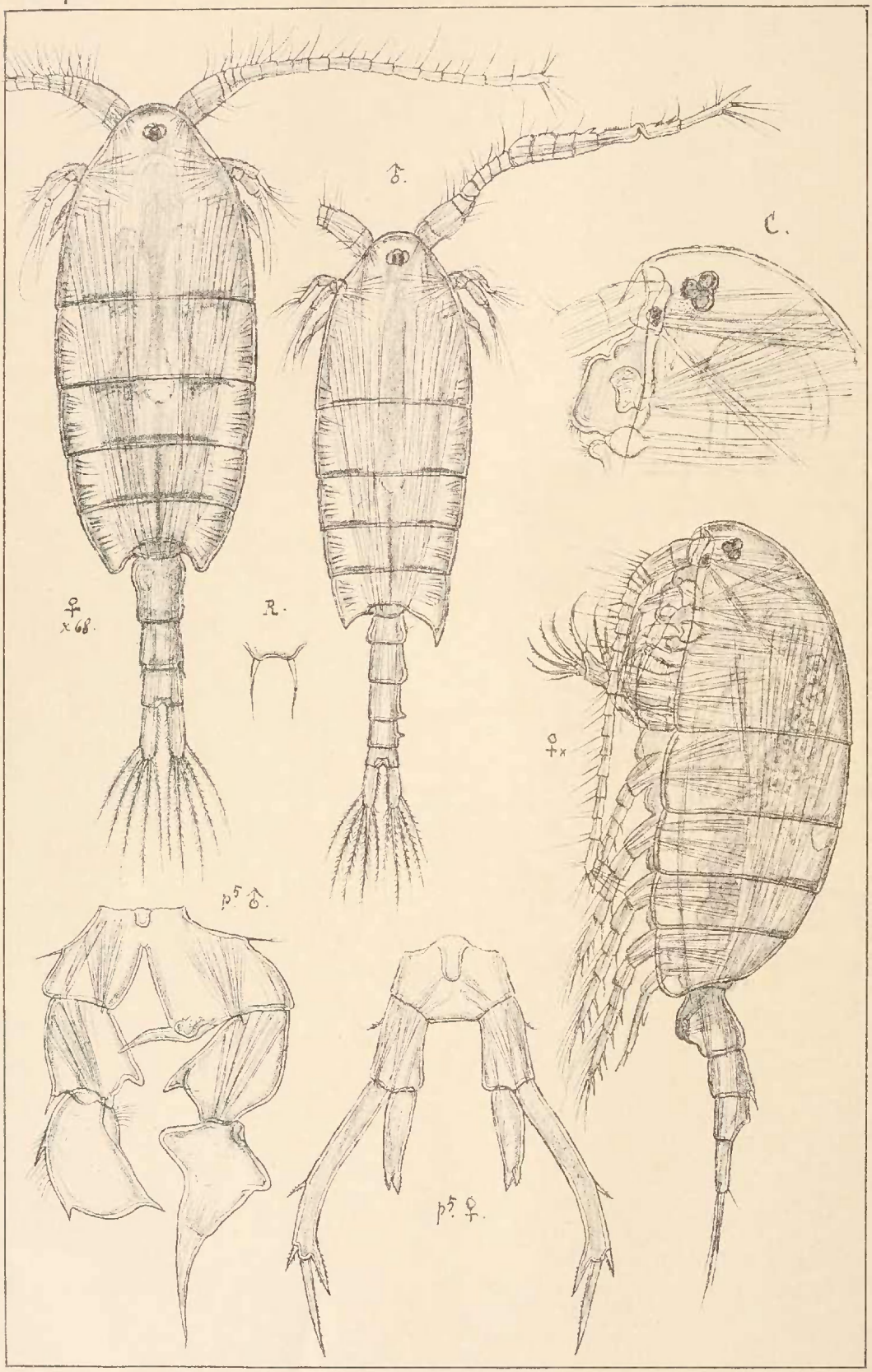
Labidocera Wollastoni (Lubbock)
(continued)

Copepoda



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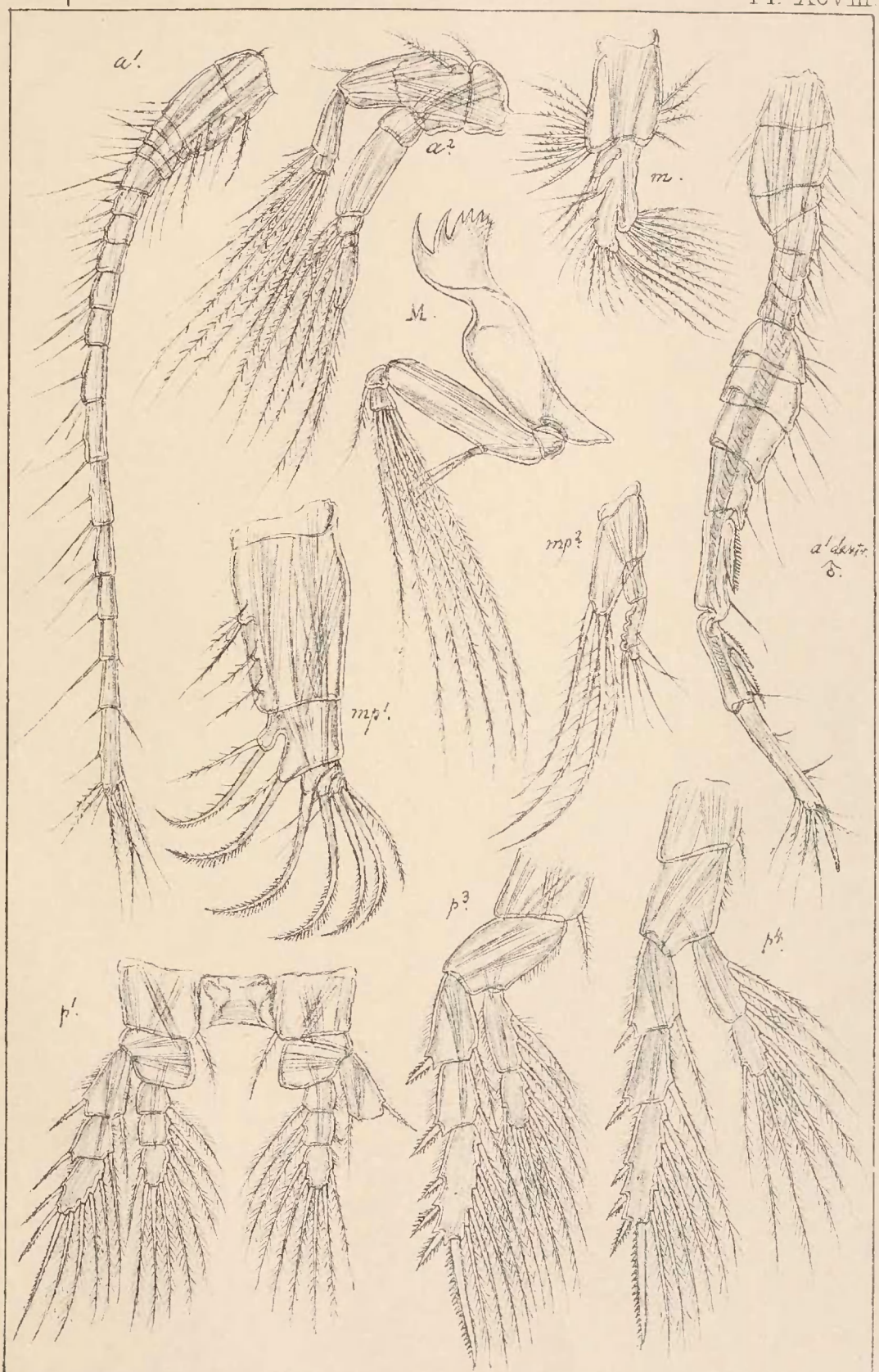
Parapontella brevicornis (Lubbock)

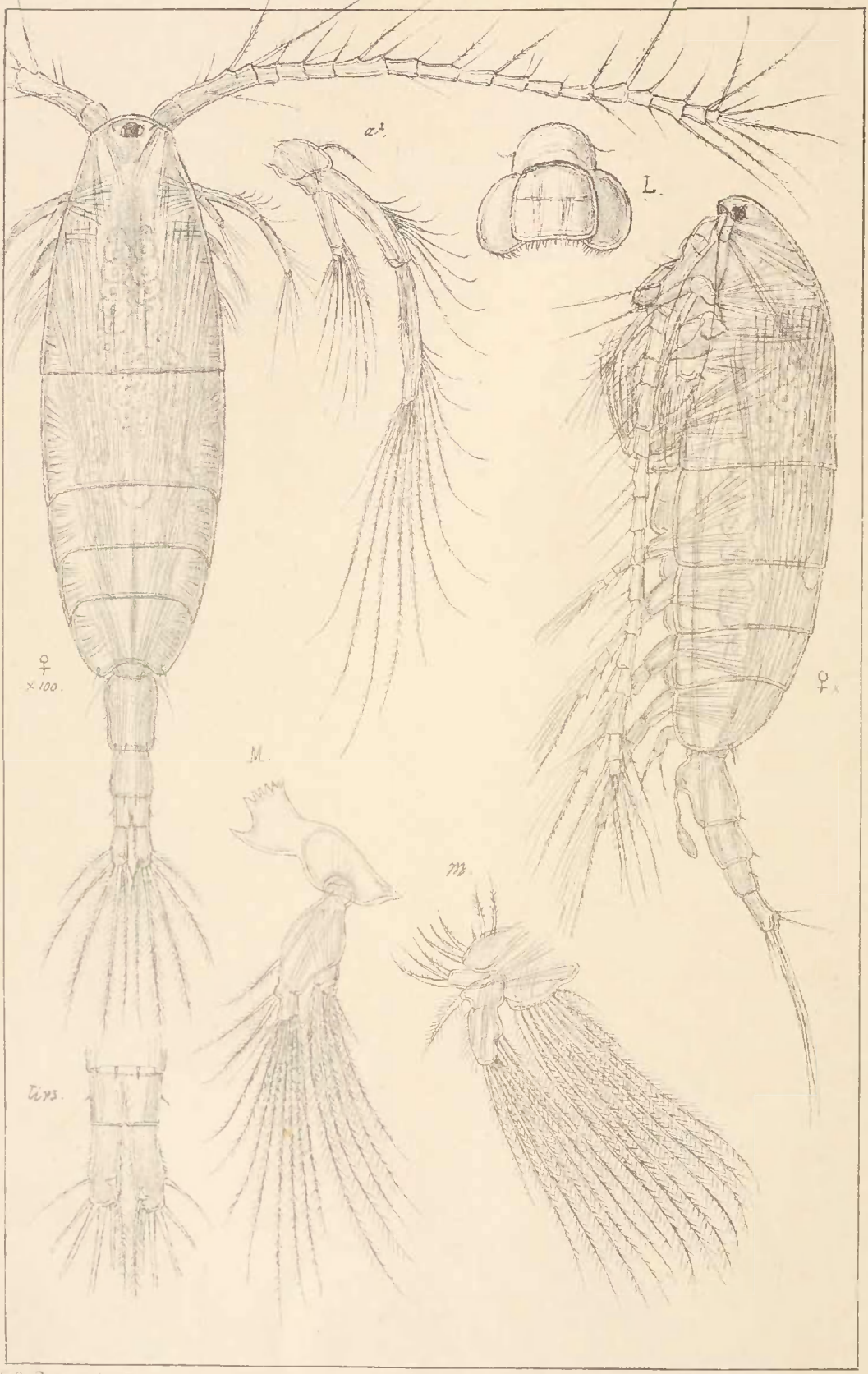


G. O. Sars autogr. Trykt i den private Opmaaling Cara

Parapontella brevicornis (Lubbock)
(continued)

Copepoda

Acartiidæ — Calanoida — Pl. XCIX



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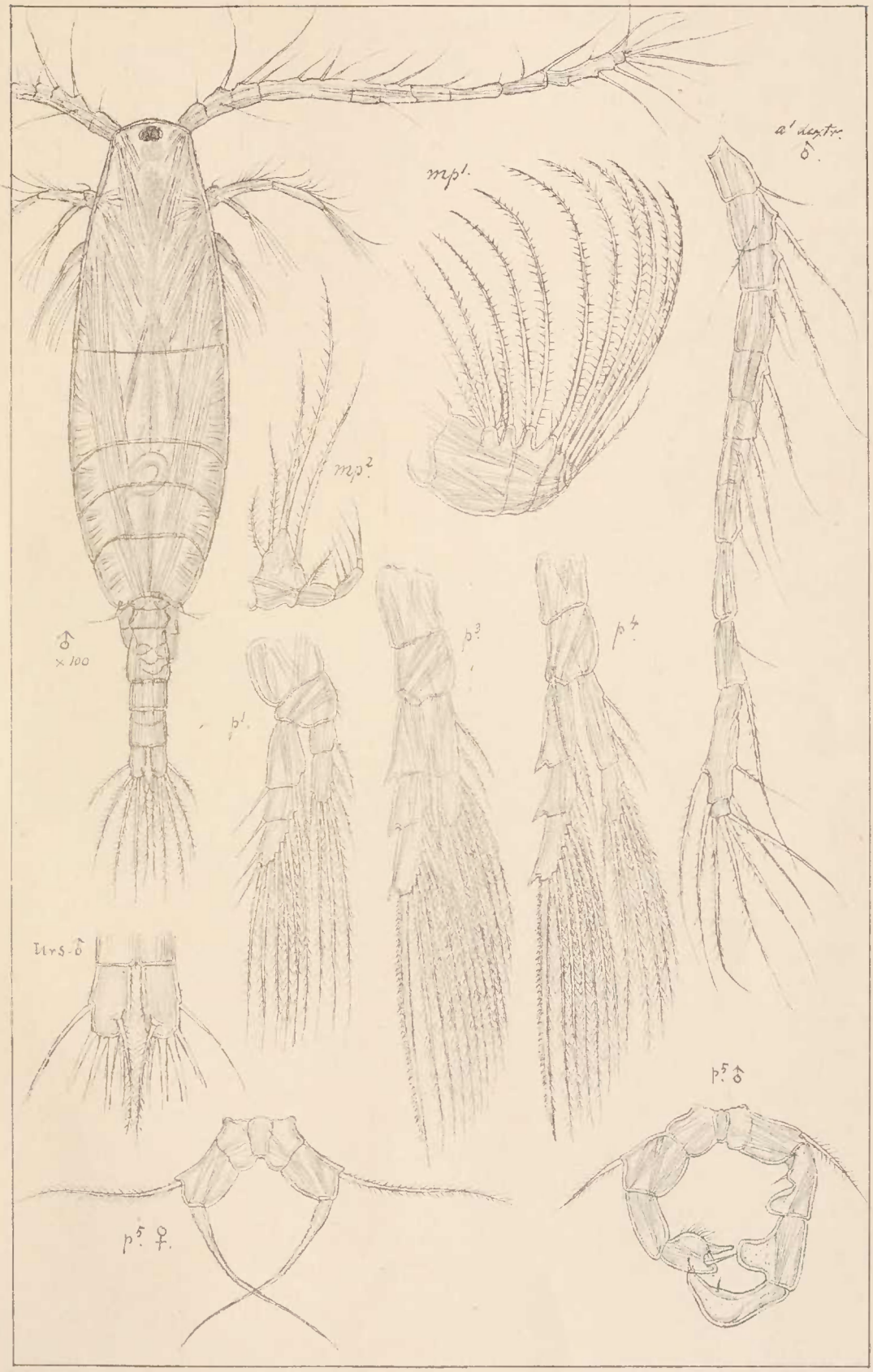
Acartia longiremis (Lilljeborg)



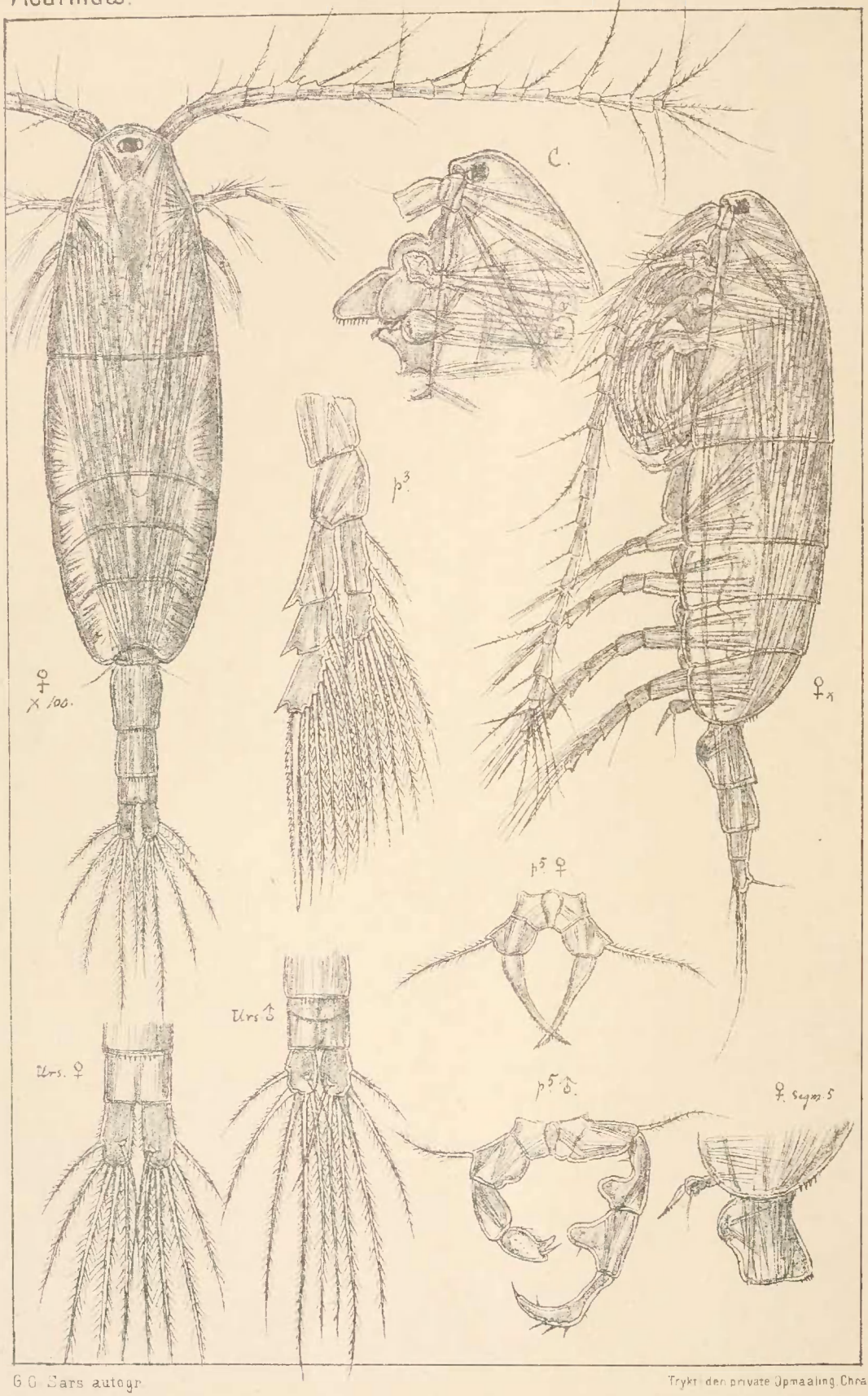
G. O. Sars autogr. Trykt i den private Opmaaling. Chra.

Acartia longiremis (Lilljeborg)
(continued)

Copepoda

Calanoida

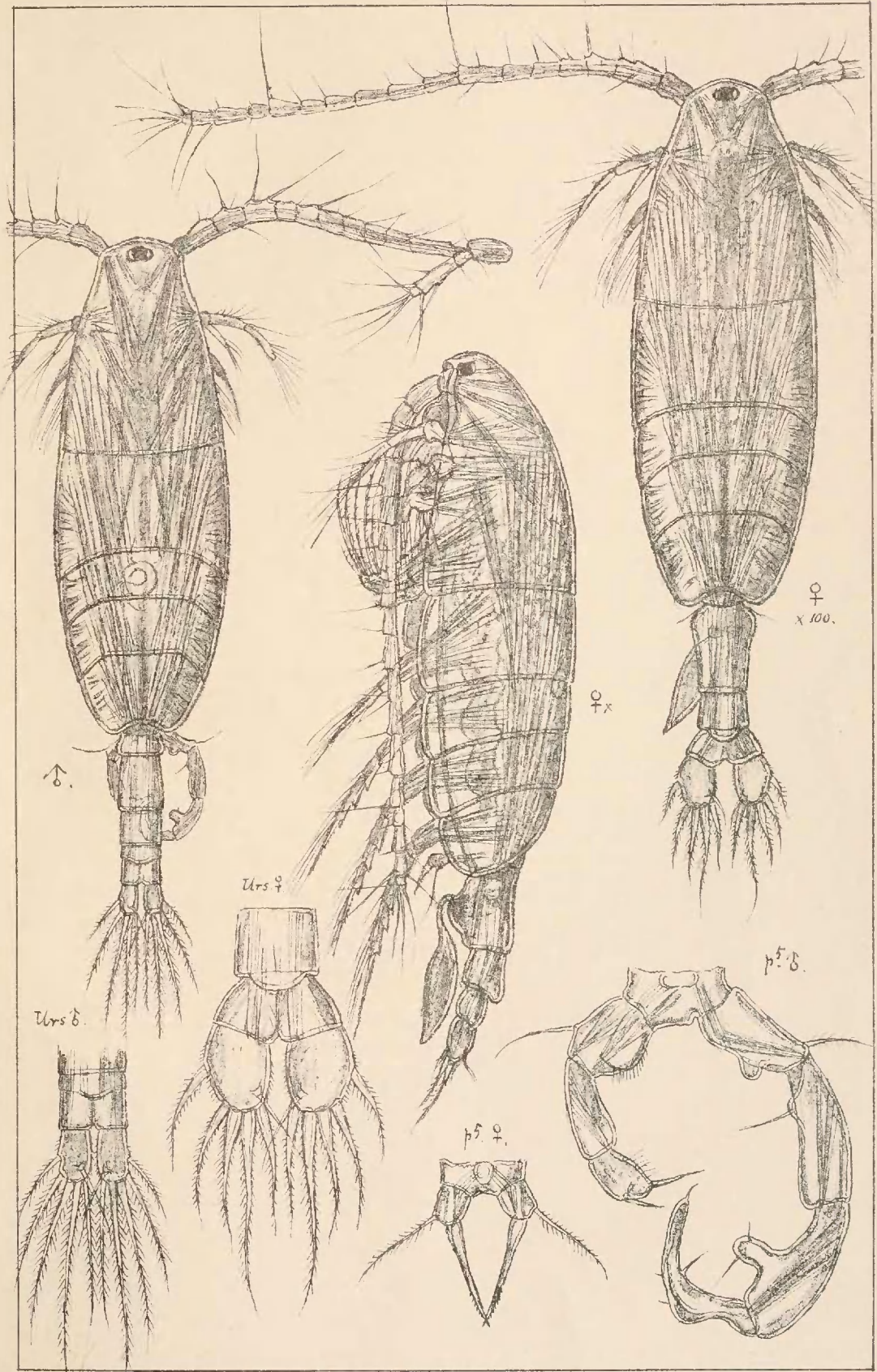
Acartiidæ. PI CI



G O Sars autogr.

Trykt i den private Opmaaling. Chra

Acartia Clausi, Giesbrecht



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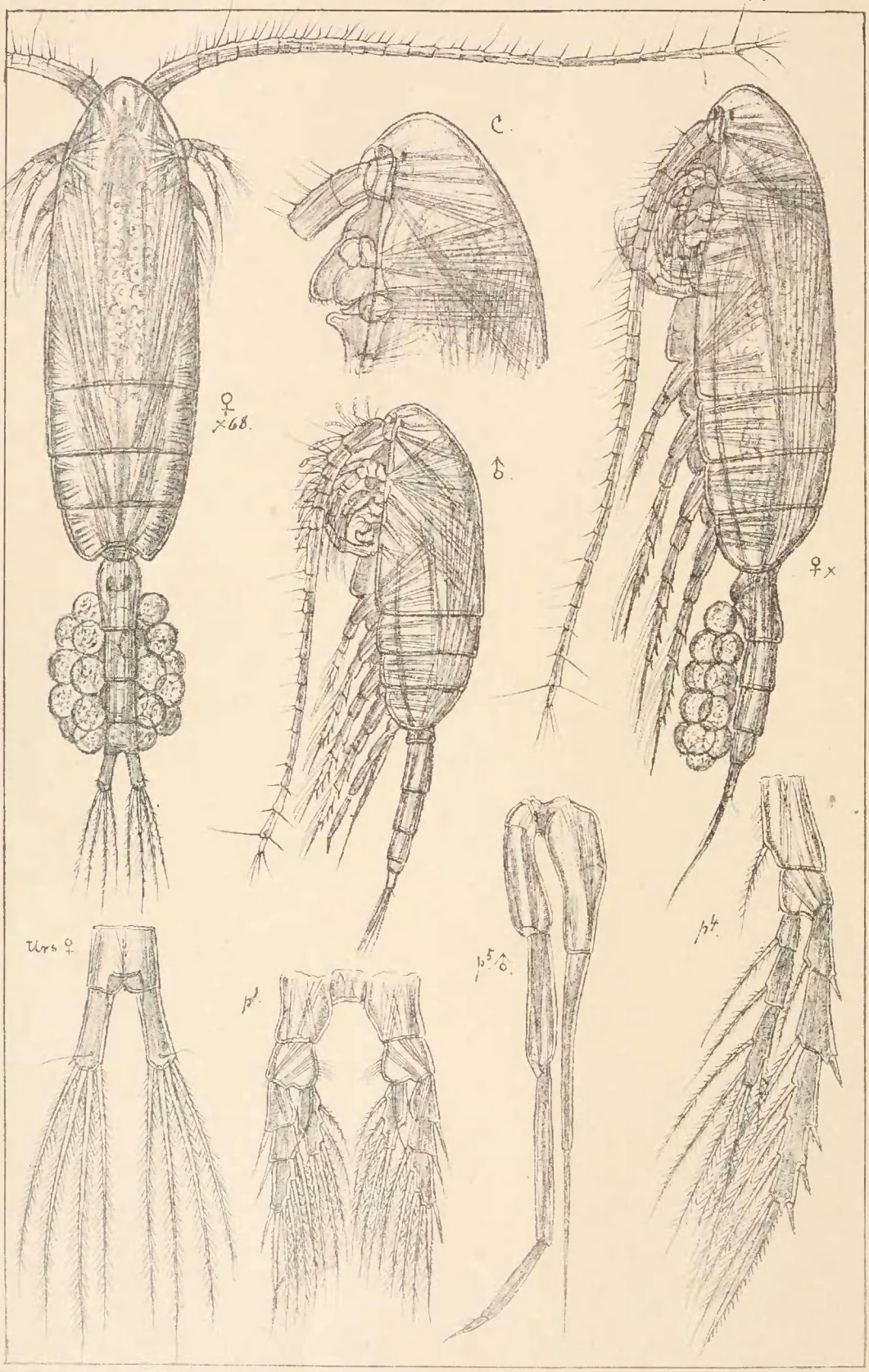
G O Sars autogr

Acartia discaudata Giesbrecht.

Copepoda

Pseudocalanidæ. Calanoida Suppl. PI. I



G.O. Sars autogr.

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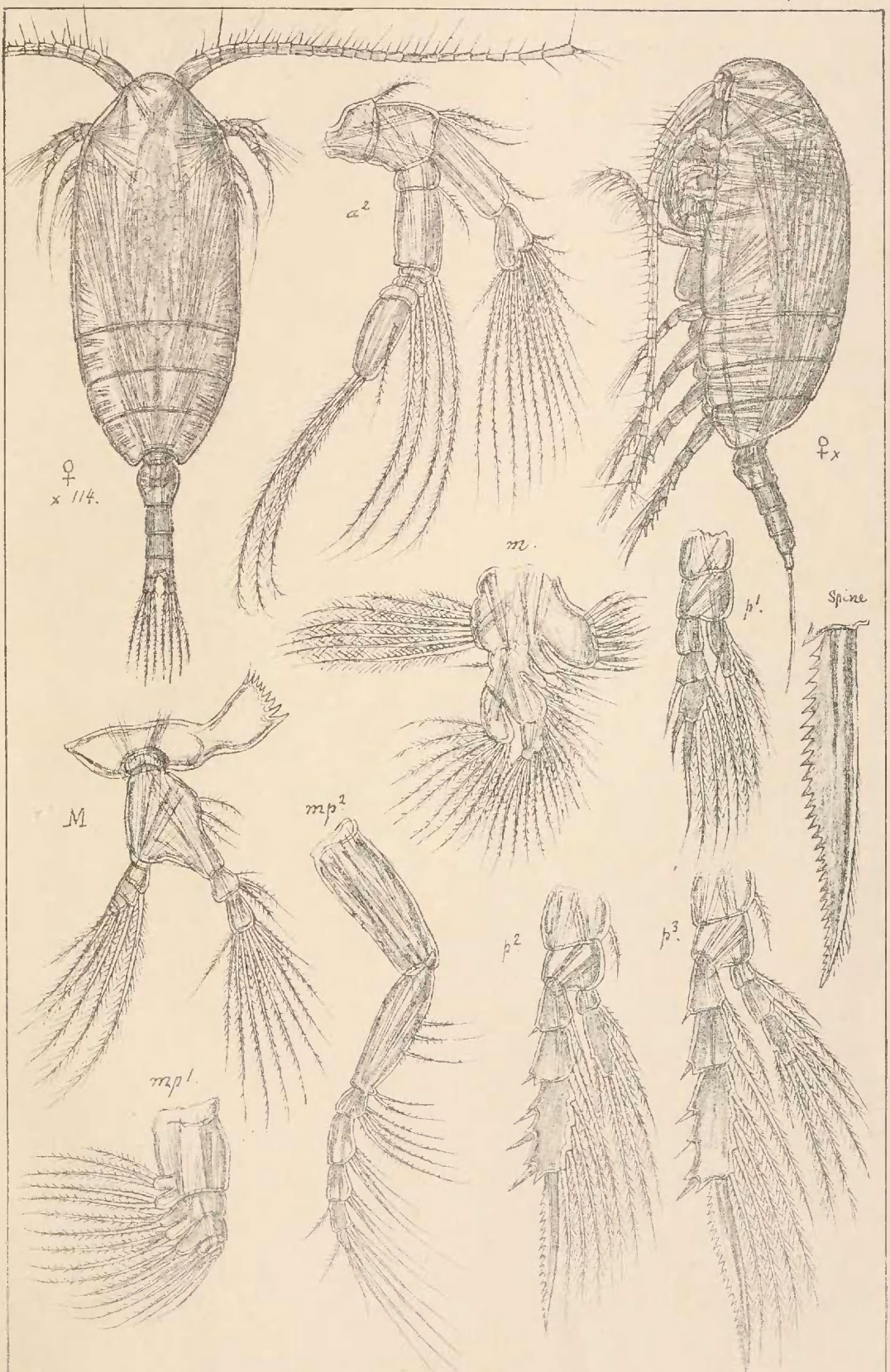
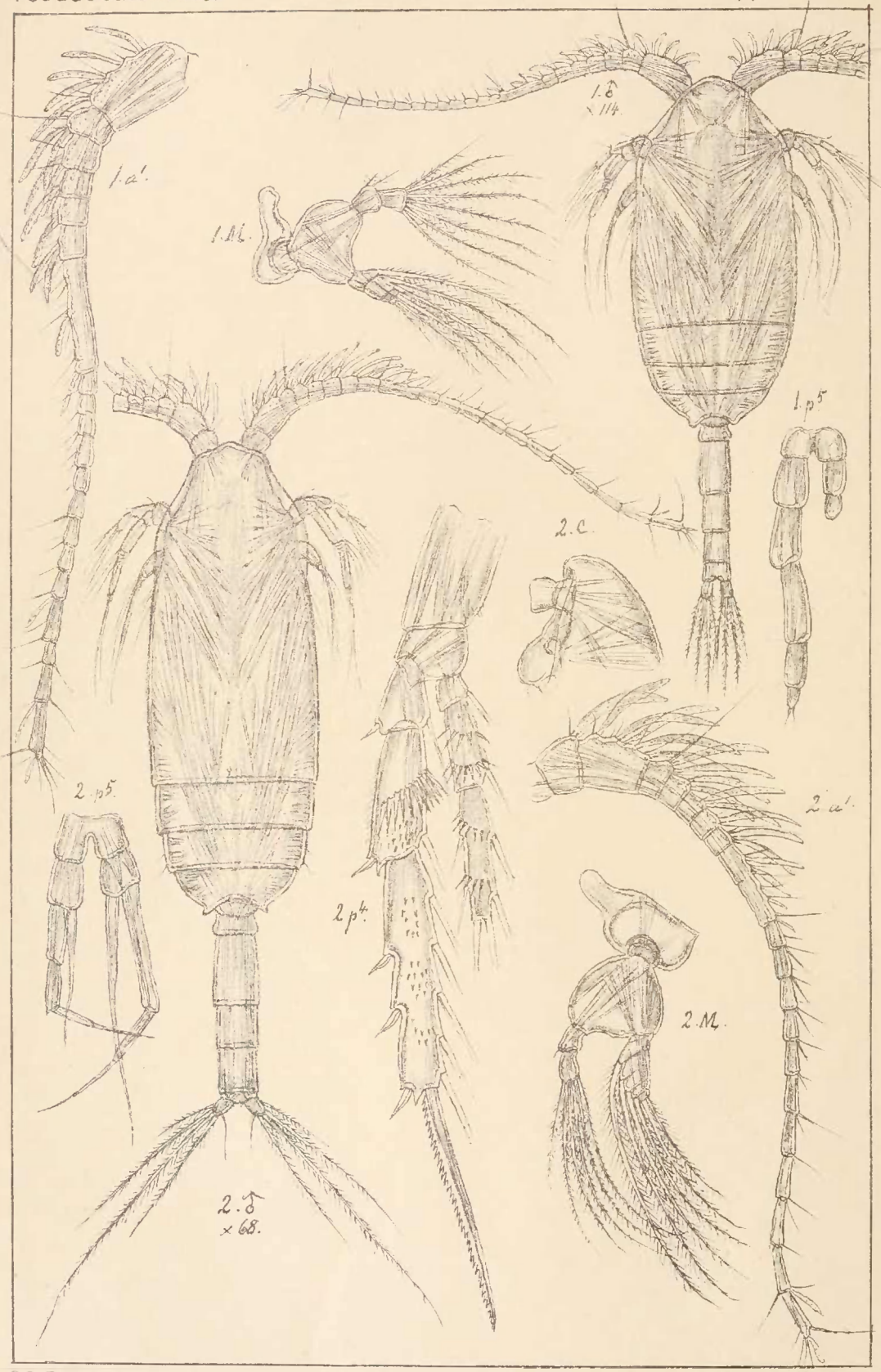
Pseudocalanus gracilis, G.O. Sars.



Microcalanus pusillus, G.O. Sars.

Copepoda

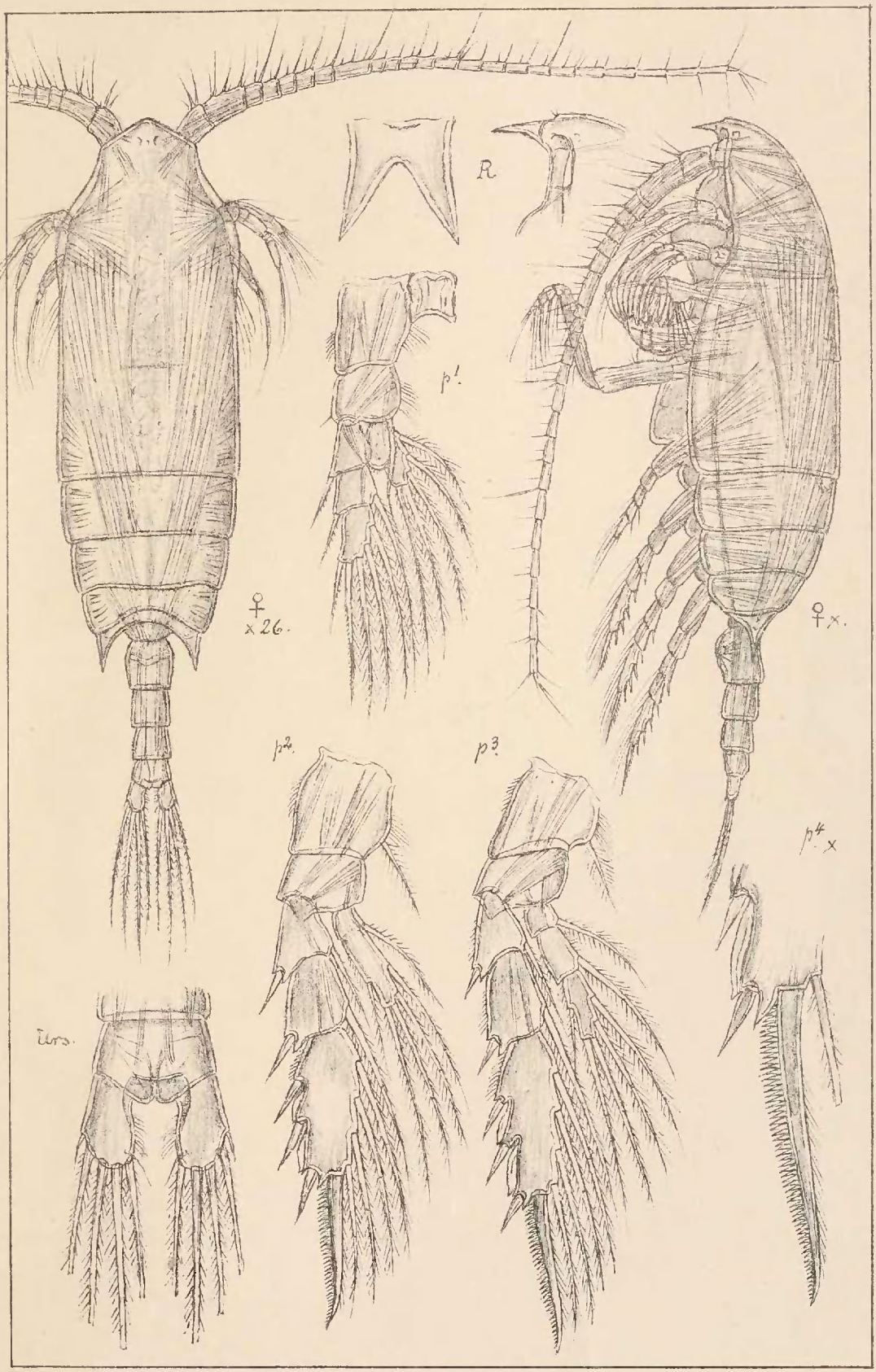
Calanoida



G.O. Sars autogr

1. Microcalanus pusillus, G.O. Sars.
(continued)
2. Spinocalanus abyssalis, Giesbrecht
(male)

Trykt i den private Opmaaling Chra



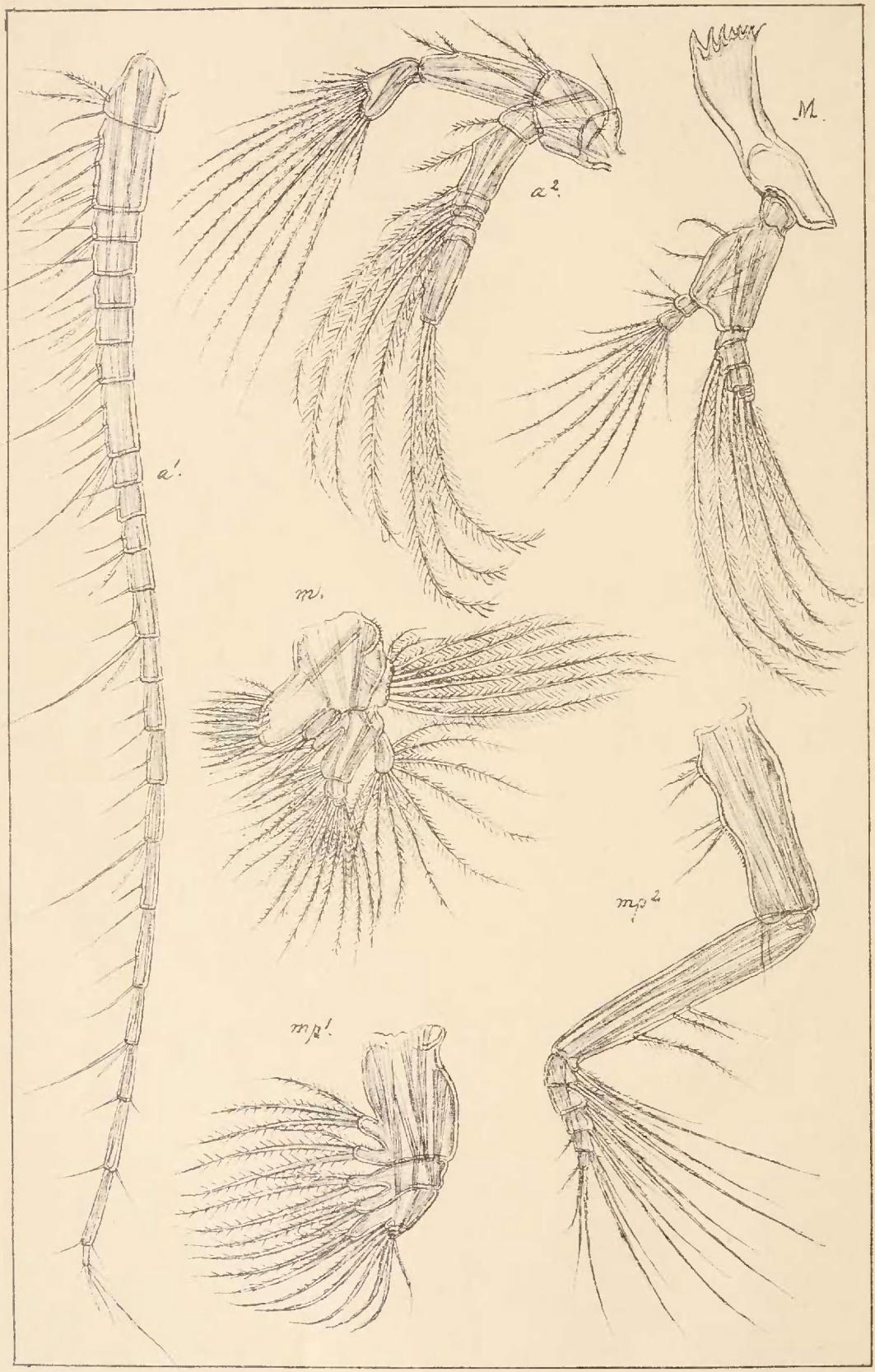
G. O. Sars autogr

Trykt i den private Opmaaling Chra

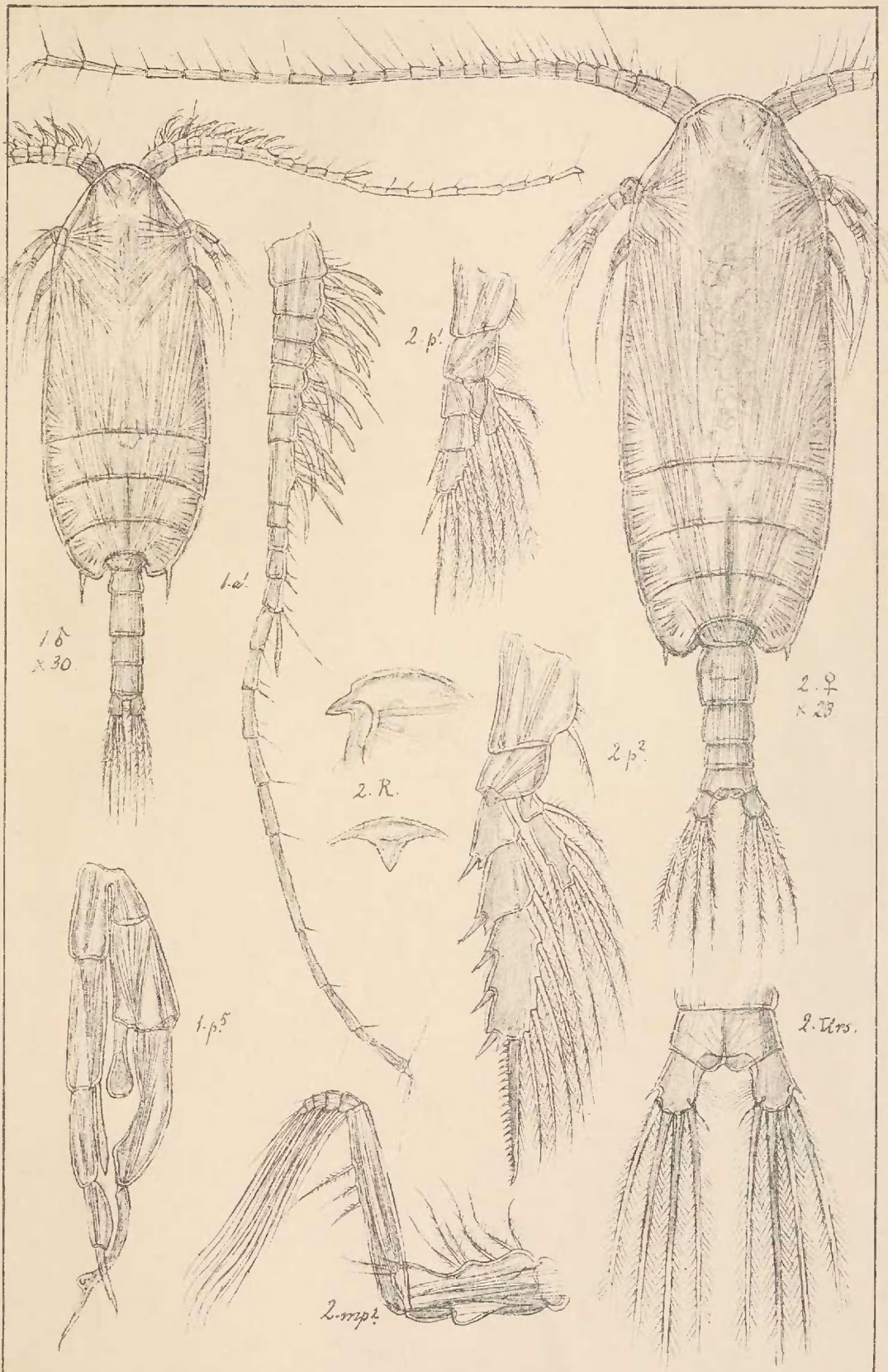
Ætideopsis rostrata, G. O. Sars.

Copepoda

Calanoida



Ætideopsis rostrata, G. O. Sars.
(continued)



G O Sars autogr

Trykt i den private Opmaaling Chra

1. Gaidius tenuispinus, G.O.Sars.
(male)
2. Gaidius brevispinus, G.O.Sars.

AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

BERGEN. JOHN GRIEG.

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SYSTEMATIC LIST

OF THE SPECIES DESCRIBED IN THE PRESENT VOLUME.

Amphascandria.

Calanidæ.

Calanus, Leach.
finmarchicus, Gunner.
helgolandicus, Claus.
hyperboreus, Kröyer.

Eucalanidæ.

Rhincalanus, Dana.
nasutus, Giesbrecht.

Paracalanidæ.

Paracalanus, Boeck.
parvus, Claus.

Pseudocalanidæ.

Pseudocalanus, Boeck.
elongatus, Boeck.
gracilis, G. O. Sars.
Microcalanus, G. O. Sars.
pusillus, G. O. Sars.
Spinocalanus, Giesbrecht.
abyssalis, Giesbrecht.

Ætideidæ.

Ætideus, Brady.
armatus, Boeck.
Ætideopsis, G. O. Sars.
rostrata, G. O. Sars.
Chiridius, Giesbrecht.
armatus, Boeck.
obtusifrons, G. O. Sars.
Gaïdius, Giesbrecht.
tenuispinus, G. O. Sars.
brevispinus, G. O. Sars.
Undinopsis, G. O. Sars.
Bradyi, G. O. Sars.
similis, G. O. Sars.
Bryaxis, Boeck.
brevicornis, Boeck.

Euchætidæ.

Euchæta, Philippi.
norvegica, Boeck.
glacialis, Hansen.
barbata, Brady.

Phaënnidæ.

Pseudophaënna, G. O. Sars.
typica, G. O. Sars.
Xanthocalanus, Giesbrecht.
borealis, G. O. Sars.
propinquus, G. O. Sars.

Scolecithricidæ.

Amallophora, Scott.
magna, Scott.
brevicornis, G. O. Sars.
Scolecithricella, G. O. Sars.
minor, Brady.

Isokerandria.

Diaixidæ.

Diaixis, G. O. Sars.
hibernica, Scott.

Stephidæ.

Stephos, Scott.
lamellatus, G. O. Sars.
Scotti, G. O. Sars.
Parastephos, G. O. Sars.
pallidus, G. O. Sars.

Tharybidæ.

Tharybis, G. O. Sars.
macrophthalma, G. O. Sars.

Pseudocyclopiidæ.

Pseudocyclopia, Scott.
stephoides, Thompson.

Heterarthrandria.

Centropagidæ.

Centropages, Kröyer.
typicus, Kröyer.
hamatus, Lilljeborg.
Isias, Boeck.
clavipes, Boeck.
Limnocalanus, G. O. Sars.
macrurus, G. O. Sars.

Diaptomidæ.

Diaptomus, Westwood.
castor, Jurine.
denticornis, Wierzejsky.
bacillifer, Koelbel.
laticeps, G. O. Sars.
laciniatus, Lilljeborg.
gracilis, G. O. Sars.
graciloides, Lilljeborg.

Temoridæ.

Temora, Baird.
longicornis, Müller.
Eurytemora, Giesbrecht.
velox, Lilljeborg.
hirundoides, Nordqvist.
lacustris, Poppe.
Heterocope, G. O. Sars.
saliens, Lilljeborg.
borealis, Fischer.
appendiculata, G. O. Sars.

Metridiidæ.

Metridia, Boeck.
longa, Lubbock.
lucens, Boeck.
Pleuromamma, Giesbrecht.
robusta, Dahl.

Heterorhabdidæ.

Heterorhabdus, Giesbrecht.
norvegicus, Boeck.
Haloptilus, Giesbrecht.
longicornis, Claus.
acutifrons, Giesbrecht.

Arietellidæ.

Scottula, G. O. Sars.
margicornis, G. O. Sars.
Paramisophria, Scott.
Cluthæ, Scott.

Pseudocyclopidæ.

Pseudocyclops, Brady.
obtusatus, Brady.

Candaciidæ.

Candacia, Dana.
norvegica, Boeck.
armata, Boeck.

Pontellidæ.

Anomalocera, Templeton.
Patersoni, Templeton.

Labidocera, Lubbock.
Wollastoni, Lubbock.

Parapontellidæ.

Parapontella, Brady.
brevicornis, Lubbock.

Acartiidæ.

Acartia, Dana.
longiremis, Lilljeborg.
Clausi, Giesbrecht.
discaudata, Giesbrecht.

PREFACE.

The present Volume deals with one of the great divisions of the extensive order, *Copepoda*, viz., that of the *Calanoida*, which of late has attracted the special interest of biologists, on account of the enormous numbers in which some of the species are sometimes found to appear, forming, as they do, a very essential part of the so-called *Zoö-plankton*. As not only the amount of the plankton, but also its quality is of great significance in determining the nutritive value of the water both in the sea and in lakes, a thorough knowledge of the organisms composing it may be said to be quite indispensable. It is now generally admitted that Copepoda of the Calanoid group form an essential part of the nourishment of several of our common food-fishes, either in the adult state, or at any rate in the earlier periods of their life; and the investigation of these little creatures must therefore be regarded as intimately connected with that of the fisheries, whether in the sea or in lakes.

The present Volume, which gives full diagnoses and figures of all Norwegian Calanoids, both marine and fresh-water, known at present, may thus, I hope, be of essential use to those who are studying our fisheries and the biological conditions connected therewith.

In order to make the determination of the species as easy as possible, I have given, besides anatomical analyses, carefully drawn habitus-figures of all, in most cases both a dorsal and a lateral view, and as a rule of both sexes. The detail figures, unlike those in Dr. Giesbrecht's work, are always arranged in such a manner, that they can at once be referred to their respective species.

An objection may perhaps be urged against the practical arrangement of the present Volume, as also of the 3 preceding Volumes, viz., that no analytical tables are given. In my opinion, however, the practical value of such tables, especially when they comprise a great number of different forms requiring a more or less complicated arrangement, has been much overestimated. I think that the

student, instead of labouring through such a complicated table, will in most cases prefer the much more simple and direct method of determination by comparing his specimen with the figures, and, if still in doubt, consulting the short diagnoses given of the respective families, genera and species.

In the elaboration of this Volume, I have been assisted by several distinguished naturalists both in my own country and abroad; and I desire here to tender them my best thanks. Among foreign naturalists, my thanks are due to Canon A. M. Norman, Mr. Th. Scott, Prof. Brady and Prof. Cleve, for sending me interesting specimens. I am also greatly indebted to the Zoological Station at Naples for a very interesting series of plankton-samples, which have been of great use to me in comparing the Mediterranean species with those of the northern seas. The Norwegian naturalists to whom I wish to offer my hearty thanks are Mr. O. Nordgaard, director of the Biological Station in Bergen, and Dr. J. Hjort, director of the Norwegian marine fisheries. To the latter gentleman I am especially indebted for the opportunity he gave me of examining the numerous plankton-samples taken during the cruise of the "Michael Sars" in different parts of the Norwegian Sea. A most important addition to the Calanoid fauna of Norway has thereby been gained, as will be shown in the course of the account here given. Finally, I beg to thank the direction of the Bergen Museum for the readiness with which it has undertaken the continued publication of the present extensive work.

G. O. Sars.

ERRATUM.

Page 114, line 10: *for* „It was subsequently recorded," *read* „It had been previously recorded."