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AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

WITH SHORT DESCRIPTIONS AND FIGURES OF ALL THE SPECIES

BY

G. O. SARS

VOL. VIII

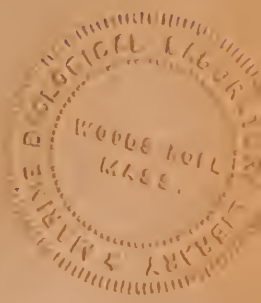
COPEPODA

MONSTRILLOIDA & NOTODELPHYOIDA

PARTS I & II

THAUMATOPSYLLIDÆ, MONSTRILLIDÆ,
NOTODELPHYIDÆ (part)

WITH 16 AUTOTYPIC PLATES



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INTRODUCTION.

In the present volume I propose to give an account of 2 anomalous groups of *Copepoda,* viz., the *Monstrilloida* and the *Notodelphyoida*, the systematic position of which has not been fully recognised by earlier authors. In the more recent classification of the Copepoda proposed by Giesbrecht, and now generally adopted by carcinologists, only the systematic rank of families is alloted to these groups, and they are both, together with several other heterogeneous families, comprised within the 2nd tribe of this suborder *Podoplea*, to which the name *Ampharthrandria* is given. I have otherwise shown, that the principles upon which Giesbrechts classification is founded do not at all hold good in every case, and this is also proved in regard to the Copepoda here in question. It may be that the name *Ampharthrandria* is applicable to the *Monstrilloida*; but this is by no means the case with the *Notodelphyoida*, this group comprising many forms with the anterior antennæ quite alike in the 2 sexes. Moreover, the genus *Thaumatopsyllus* among the Monstrilloida differs conspicuously even in the principal character by which the 2 suborders *Gymnoplea* and *Podoplea* are distinguished by Giesbrecht, viz., the mutual relation between the anterior and posterior divisions of the body. The many essential characters distinguishing the 2 groups here treated of, both from each other and from the other known Copepoda, have led me to the conclusion, that they ought to be raised to the rank of distinct divisions, to be again subdivided into real families. The relation of these divisions to other known groups of Copepoda is somewhat obscure, though in some instances a tendency towards the Cyclopoid type is unmistakable. On the other hand, by an extreme degradation of the whole body and its appendages, some forms belonging to the *Notodelphyoida* acquire an appearance, strongly recalling that of the *Lernæoida.* All the forms here in question are in some measure parasitic in habits. But the parasitisme is of a very different kind in the

2 divisions. The *Monstrilloida* are, according to the interesting observations of Malaquin, in their juvenile state true endoparasites, living as simple, sac-like bodies in the blood-vessels of some invertebrate animals (Annelids), whereas in the adult state they are freely living pelagic animals provided with powerfully developed natatory appendages. The *Notodelphyoida*, on the other hand, are for whole their life confined to their hosts (simple and compound Accidians), all stages of growth being mostly found together in the branchial cavity of these Tunicata. Yet they do not seem, as a rule, to feed on the juices of their hosts, but more properly on the nourishing particles and small organisms introduced, together with the constantly renewed water, in the branchial cavity by the breathing process. Of course they cannot at all be regarded as true parasites, but more properly as commensals or messmates. Both divisions here treated of are well represented in the Fauna of Norway, and as there is some confusion in regard to the exact definition of the genera and species, and moreover the descriptions and figures given by earlier authors in many cases are very incomplete and partly erroneous, I think that a thorough revision of these 2 interesting groups, accompanied by good figures, cannot fail to be of interest.

MONSTRILLOIDA.

Remarks. — The most prominent morphological character distinguishing this group of Copepoda, is the total absence, in the adult state, of both the posterior antennæ and of any traces of oral appendages, as also of a functional alimentary canal. Of course the fully developed animal is quite incapable to feed in the ordinary manner, but may only subsist on the nourishing matter accumulated within the body-cavity during its juvenile parasitic existence, the adult stage being exclusively devoted to the propagation. The division *Monstrilloida* comprises as yet only a rather restricted number of forms, which all formerly were referred to a single genus, viz., *Monstrilla* of Dana, with which the genus *Thaumaleus* of Krøyer was considered to be identical. In recent times, it is true, a subdivision of the genus *Monstrilla* into 2 or 3 genera has been attempted, but these genera are so closely allied, that they at all events must be comprised within the same family. Yet an interesting new genus (Thaumatopsyllus), apparently referable to the *Monstrilloida*, has recently been added by the present author, and this genus is so very different from the other Monstrilloid genera, that it cannot by any means be included in the same family with them, but must be regarded as the type not only of a separate family, but even of a distinct section, for which I have proposed the name *Monstrilloida cyclopimorpha*. Of course the division Monstrilloida appears at present cleft into 2 well defined sections, the *M. cyclopimorpha* and the *M. genuina;* but each of these sections is as yet only represented by a single family.

Section 1.

Monstrilloida cyclopimorpha

Remarks.—The type of this section is the remarkable form described by the present author in another place under the name of *Thaumatopsyllus paradoxus*. The reception of this form within the division *Monstrilloida* appears to be warranted by the above-mentioned general morphological character: the total absence of both the posterior antennæ and of any oral appendages. Otherwise this form differs considerably from the Monstrilloid type.

Fam. Thaumatopsyllidæ.

Remarks.—As this family at present only comprises a single genus, it may be sufficient to give the characters of that genus.

Gen. **Thaumatopsyllus,** G. O. Sars, 1913.

Generic Characters.—Body of adult female cyclopoid in shape, the anterior division being conspicuously dilated, the posterior slender and attenuated. Head consolidated with the 1st trunkal segment, and having the front produced below to a short and blunt rostral prominence. The 2 succeeding trunk-segments normally developed, the 2 posterior ones, however, abruptly much narrower and firmly connected with the tail, to form with it the posterior movable portion of the body. Tail proper composed in female of only 3 segments, the last extremely slender and narrow, rod-like. Caudal rami well

developed, with the normal number of setæ, Anterior antennæ composed of a limited number of well defined joints, and extended laterally. No traces of posterior antennæ and oral appendages observable, nor of any distinct oral tubule. Three pairs only of natatory legs present, the 2 posterior pairs of legs being quite rudimentary and of similar structure. Two ovisacs present in female.

Remarks.—In the above diagnosis i have attempted to give the most essential characters, by which the present genus distinguishes itself from the other known Monstrilloida. The mutual relation of the 2 chief divisions of the body is very peculiar, and does not agree either with that mentioned by Giesbrecht as characteristic to his suborder *Gymnoplea* or with that characterising the *Podoplea*, the movable articulation between the 2 divisions occuring in quite a different place, viz., at the junction between the penultimate and antipenultimate trunk-segments. This is indeed a quite unique character distinguishing this genus from any other form known to me. As anomalous characters may also here be named the presence of only 3 pairs of natatory legs, and the narrow rod-like shape of the last caudal segment. The genus comprises as yet only a single species, to be described below.

1. Thaumatopsyllus paradoxus, G. O. Sars.

(Pl. I.)

Thaumatopsyllus paradoxus, G. O. Sars, Arch. f. Mathem. og Naturvidenskab. Bd. XXXIII, No. 6, p. 5, w. plate.

Specific Characters.—Female. Body comparatively slender, with the anterior division somewhat depressed and oblong oval in outline. Cephalic segment very large and slightly contracted anteriorly, frontal part narrowly rounded. The 2 succeding segments well developed, with the lateral parts closely contiguous and rounded behind. Penultimate trunk-segment scarcely more than half as broad as the preceding one; last segment still smaller. Tail exceedingly slender, almost attaining half the length of the body; genital segment slightly constricted in the middle; 2nd segment quite short and having the posterior edge somewhat produced dorsally; 3rd segment more than twice as long as the other 2 combined, and extremely narrow, rod-like, with the slightly dilated extremity transversely truncated. Caudal rami but slightly diverging and oblong quadrangular in form, being about 4 times as long as they are broad, and a little widening distally; seta of outer edge occuring about in the middle; apical setæ of moderate size and densely ciliated, the outermost one shorter than the other 3. Antennæ not nearly attaining the length of the cephalic

segment, and each composed of 9 joints clothed with scattered simple setæ; 3rd joint much the largest, the 6 outermost joints comparatively short and equal-sized. The 3 pairs of natatory legs normally developed and of essential same structure, with both rami 3-articulate and nearly of equal size. The last 2 pairs of legs very unlike the former, and reduced to simple small 3-articulate stems, with the middle joint very small, last rounded in shape and provided with 2 unequal apical spines. Ovisacs very large, rounded oval in form.

Body in the living animal highly transparent and nearly colourless, its anterior part being filled up with a number of clear oil-bubbles of unequal size, and partly of a light orange colour. Eye replaced by a comparatively large transverse patch of a light red pigment, in which, however, no trace of refracting elements could be detected.

Length of adult female 1.65 mm.

Male unknown.

Remarks.—The above-described form is easily recognisable from any of the other known Copepoda, both as regards its outward appearance and the structure of the several appendages. I am much inclined to believe, that its life-history will turn out to be a similar one to that stated by Malaquin for the *Monstrillidæ,* and that in the juvenile state this form leads a true parasitic existence within the body of some invertebrate animals.

Occurrence.—Three specimens only of this remarkable form, all of the female sex, have as yet come under my notice. One of them was taken, many years ago, in the Christiania Fjord, at Drøbak, the other 2 in the Trondhjem Fjord, at Selven. All 3 specimens were captured, together with other pelagic animals, by the aid of a plankton-net lowered to a depth of about 60 fathoms. The living animal was seen moving through the water in a similar jumping manner to that observed in most Cyclopoida. It was, however, by no means particularly agile in its movements.

Section 2.
Monstrilloida genuina.

Remarks.—In this section are comprised the typical Monstrilloida, the general characters of which coincide with those given below for the sole family as yet representing the section.

Fam. Monstrillidæ.

General Characters.—Body more or less slender and elongated, with the anterior division only slightly dilated and not sharply marked of from the posterior. Head and 1st trunkal segment completely coalesced, forming together a very large segment of a more or less cylindrical shape, and as a rule occupying rather more than half the body, its anterior extremity obtusely truncated, without any rostral prominence; ventral face of the segment in the greater extent of its length quite smooth, exhibiting no traces of either posterior antennæ or any oral appendages, being only provided in the median line with a small tubular process, from which a short canal leads to the inner substance of the body; the latter in female specimens retracted from the walls of the segment in a most peculiar manner, so as to form a rather narrow band-like chord passing through the axis of the segment. Exposed part of trunk composed of 4 well defined segments gradually diminishing in size behind. Tail poorly developed, with the number of segments more or less reduced, and exhibiting well marked sexual differences. Caudal rami, as a rule, short, but provided with strong plumose setæ, the number of which is somewhat variable in the

different genera. Eye, when present, exhibiting 3 highly refracting lenses, one ventral and 2 lateral, imbedded in a dark pigment. Anterior antennæ, unlike what is generally the case in Copepoda, extended straight forwards, and composed of a limited number of joints clothed with rather unequal setæ pointing in different directions, some of them being much elongated and finely ciliated, some others, attached to the terminal joint, exhibiting not seldom a peculiar dichotomous ramification; same antennæ in male distinctly hinged. Natatory legs present in the usual number, and very powerfully developed, with the basal part large and muscular and both rami 3-articulate. Last pair of legs in female represented on each side by a single more or less lamellar joint carrying a restricted number of plumose setæ; in male much reduced, or wholly absent. Alimentary canal quite obliterated. Ovaria, when fully developed, very massive, filling up the greater part of the body-cavity and extending anteriorly within the frontal part of the head; the ripe ova not included in any true ovisacs, but agglutinated to 2 slender juxtaposed spines or filaments issuing from the ventral face of the genital segment, these spines being in male replaced by a thickish, somewhat clavate appendage, into which the spermatophores are received before extrusion.

Remarks.—Of this family at first only 2 species were known, derived from 2 widely remote localities, the one recorded by Dana from the Sulu Sea as *Monstrilla viridis*, the other by Krøyer from thn Norwegian coast as *Thaumaleus typicus*. These 2 species, though bearing very different names, are evidently nearly allied, and were also by most subsequent authors regarded as congeneric. In more recent times a considerable number of additional forms of the same remarkable type have been recorded from different parts of the oceans, and it appeared desiderable to group these species according to some more conspicuous diversities found between them. Thereby the first step to a subdivision of the genus *Monstrilla* was intimated. Such a subdivision was indeed carried out in the year 1892 by Giesbrecht, who referred the Monstrillidæ at that time known to 2 nearly-allied genera, chiefly characterised by the segmentation of the tail and by the number of the caudal setæ. For the one of these genera he retained the old name *Monstrilla*, for the other he applied the name *Thaumaleus* proposed by Krøyer, and this arrangement has now generally been admitted by carcinologists. I am also of opinion that these 2 genera should be supported; but I am by no means prepared to consent with Giesbrecht in his application of the name *Thaumaleus* to the one of these genera. For it is quite certain, that the form recorded by Krøyer is not referable to Giesbrecht's genus, differing as it does,

just in one of the 2 principal characters by which that genus is distinguished from *Monstrilla,* viz., in the number of caudal setæ. Both according to the description given by Krøyer in "Naturhistorisk Tidsskrift" and to the figures in the Atlas to Gaimards voyage, the caudal rami in Krøyers species are each provided with 5 well-developed setæ, as in most species of the genus Monstrilla, whereas in Giesbrecht's genus the number of setæ is much reduced, only 3 such setæ occuring on each ramus (at last in female). In any case, if it should be found advisable to support the genus *Thaumaleus* of Krøyer, it must be confined to the species recorded by that author. Fortunately we have another generic name to replace that given by Giesbrecht to his genus, viz., *Cymbasoma*, proposed as early as the year 1888 by I. C. Thompson for a species (rigidum), which evidently is referable to Giesbrecht's genus. The genus *Hæmocera* of Malaquin I regard as synonymous with that genus. In addition to the 2 genera *Monstrilla* and *Cymbasoma*, I have found it advisable to establish another genus, *Monstrillopsis,* to include the anomalous species described by Scott under the name of *Monstrilla dubia.* The family Monstrillidæ thus at present comprises 3 genera, all of which are represented in the fauna of Norway.

Though I have not myself as yet had any opportunity to study the peculiar life-history of the Monstrillidæ, I think that a short resumé of the interesting investigations made in this respect by the French naturalist Malaquin[1]) may here be given. According to that distinguished author, the young live the eggs as small Nauplii, without mouth or alimentary canal, but provided in front with the usual 2 pairs of limbs (anterior and posterior antennæ) and behind them on each side with a hook-like appendage (mandibles). The Nauplii soon attach themselves to some polychæte Annelid and penetrate through the body-wall of the same, then entering the vascular system. By this process they lose completely all their appendages, and become converted to simple ovoid bodies merely consisting of an assemblage of indifferent embryonic cells surrounded by a thin cuticle. From the one end of these bodies 2 soft horn-like processes grow out, gradually increasing in length, and at last assuming the form of slender thread-like appendages. It is supposed that through these appendages the absorbtion of the blood-serum of the host is performed, and according to their position they may answer to the posterior antennæ. During the rapid growth of these endo-parasitic larvæ a remarkable differentiation take place in their interior, resulting in the formation of the characteristic and rather

[1]). See: Arch. Zool. Exp. (3), Vol. 9, 1901.

complicated body of a true Monstrillid. In the last larval stage the enclosed Monstrillid is very distinctly traced through the thin outer cuticle of the larva, filling up nearly the whole inner cavity, and exhibiting all the definitive appendages, as also distinct traces of the generative organs, at least the female ones. At this time the larva is ready to force its way out of the body of the host, and this is apparently accomplished by a burrowing action of the hind acutely produced extremity, which is surrounded with several rows of small hooklike spinules. After the escape of the larva its thin outer cuticle soon burst, and the enclosed Monstrillid is thus allowed to emerge, unfolding its several appendages Its movements are at first rather slow, but very soon, by a single moult, it aquires its full development, moving quickly about, to commence its free pelagic existence.

Gen. 2. **Monstrilla,** Dana, 1848.

Syn: ? *Thaumaleus,* Kröyer (not Giesbrecht).

Generic Characters.—Body as a rule very slender and elongated, especially in female, with the cephalic segment in most cases occupying rather more than half its length and more or less cylindrical in shape; exposed part of trunk gradually narrowed behind, with the lateral parts of the segments rounded off. Tail composed in female of 3, in male of 4 well defined segments, the last one rather small and obtusely truncated behind.[a] Caudal rami sublamellar, each provided in female with 5 or 6 setæ, one of which is generally shorter than the others and attached more dorsally; those in male of same appearance as in female, but lacking one of the setæ. Eye in most of the species imperfectly developed. Oral tubule generally far remote from the frontal part of the head. Antennæ more or less elongated, with the joints generally imperfectly defined in female. Natatory legs with the basal part very massiv, rami comparatively short, buth clothed inside and at the end with long plumose setæ; outer ramus somewhat longer than the inner and only provided with 2 small spines outside, the one attached to the 1st joint, the other to the end of the last joint. Last pair of legs in female sublamellar and somewhat extended laterally, inner edge more or less expanded, extremity slightly exserted and provided with 3 (in some cases only 2) plumose setæ; those in male much reduced in size, knob-like, and tipped with one or two slender setæ.

Remarks.—The present genus was established as early as in the year 1848 by Dana, and may be regarded as the type not only of the family Monstrillidæ, but also of the whole division here treated of. It is chiefly distin-

guished from the other 2 genera comprised within the present family by the more complete segmentation of the tail and the increased number of caudal setæ. Another character by which the species of this genus may be readily recognised, is the position of the oral tubule, wich is more or less far remote from the frontal part of the head, whereas in the other 2 genera it generally occurs in close approximation to that part.

Seven Norwegian species referable to this genus will be described in the sequel, one of them being, however, somewath doubtful and only observed in the male sex.

2. Monstrilla longicornis, Thompson.

(Pl. II & III).

Monstrilla longicornis, I. C. Thompson, Trans. Biol. Soc. Liverpool, Vol IV, p. 119, Pl. IV, figs. 1, 2, 4 (♂).

Syn: *Monstrilla intermedia*, Aurivillius.

Specific Characters.—Female. Body moderately slender, with rather coarse integuments, which exhibit everywhere a finely granular or dotted surface. Cephalic segment occupying about half the length of the body, and almost of equal width throughout, though, seen dorsally, exhibiting somewhat behind the middle a slight but easily observable dilatation, frontal part bluntly truncated. Tail about equalling half the length of the exposed part of the trunk; genital segment comparatively large, being fully as long as the remaining part of the tail, and oblong quadrangular in shape, with a well marked transverse suture in the middle of the dorsal face; ovigerous spines about twice the length of the tail. Caudal rami about equalling in length the last 2 segments combined, and only slightly divergent, each provided with 5 strong plumose setæ of nearly equal size, the outermost one attached to a well-marked ledge of the outer edge, the others to the somewhat obliquelly rounded apex. Eye imperfectly developed, without any trace of refracting elements, and only replaced by a diffuse yellowish pigment. Antennæ rather slender and elongated, though scarcely exceeding in length the cephalic segment, and each apparently composed of 5 joints, of which, however, only the 1st is distinctly defined, the others being confluent and only indicated by slight constrictions of the antenna; most of the setæ attached around the middle of the fusiform terminal joint reachly ramified. Oral tubule well marked and occurring somewhat behind the middle of the cephalic segment. Natatory legs all of the very same structure and also of about equal size; 2nd basal segment not very sharply defined from the 1st, and armed inside with 2 small juxtaposed denticles; terminal joint of outer

ramus rather produced, being fully twice as long as the middle one, and having the outer edge divided into 4 very distinctly marked crenulations. Last pair of legs rather broad at the base, but having the outer part abruptly narrowed and provided at the obtusely rounded extremity with 3 ciliated setæ, the innermost of which is much smaller than the other 2; inner expansion almost rectangular and carrying a single, but well developed seta.

Male considerably smaller than female and of somewhat shorter and stouter form of the body, but exhibiting a very similar shape of the cephalic segment. Tail comparatively more slender than in female, and composed of 4 well defined segments of nearly equal length, the 1st, as usual, produced below to a club-like copulative appendage terminating in 2 short diverging rami, each armed at the end with a short spine. Caudal rami of a similar shape to that in female, but with one of the apical setæ absent. Antennæ more strongly built than in female and having the joints more distinctly defined, being moreover conspicuously hinged, the hinge occurring between the last 2 joints. Natatory legs of exactly same structure as i female. Last pair of legs, however, much reduced in size, forming 2 small knob-like prominences issuing from a common base, each prominence tipped by 2 (in some cases only 1) slender setæ.

Body in both sexes of a yellowish grey colour, and on the whole less transparent than in most other species.

Length of adult female 3.50 mm., of male 2.30 mm.

Remarks.—This species was established in the year 1890 by J. C. Thompson, and was only based on a solitary male specimen taken by him off the Puffin Islands. Subsequently, however, Th. Scott recorded this form from many other localities, and has given in the report of the Fishery Board for Scotland (1904) good descriptions and figures of both sexes. He is of opinion that Giesbrecht's species, *M. longiremis*, is identical with that observed by him; but this is certainly not the case, as will be shown further on. The present species may be easily distinguished from its nearest allies by the somewhat robust body and the rather coarse and distinctly granular integuments. Two other characters, both derived from the structure of the natatory legs, may also here be named, viz., the presence inside the 2nd basal segment of 2 well defined denticles, and the very conspicuous crenulation of the outer edge on the terminal joint of the outer ramus. These characters are pretty constant and found quite alike in both sexes. The form recorded by Aurivillius under the name of *M. intermedia* is identical with the present species.

Occurrence.—I have met with this form occasionally in several places, both on the south and west coast of Norway, among other pelagic animals

taken by the aid of the tow-net near the surface of the sea. The movements of the animal are very rapid, and are performed in abrupt bounds, whereby the body is kept in a more or less erect position. Male specimens seem to occur in nearly same number as the females.

Distribution. British Isles (Thompson, Scott), Skagerak (Aurivillius).

3. Monstrilla longiremis, Giesbrecht.

(Pl. IV & V)

Monstrilla longiremis, Giesbrecht, Pelagische Copepoden des Golfes von Neapel, p. 589, Pl. 46, figs. 10, 14, 22, 37, 41.

Specific Characters.— Female. Body considerably more slender than in the preceding species, with thinner and scarcely at all granular integuments. Cephalic segment occupying rather more than half the length of the body, and slightly narrowed in its anterior part, with no distinct dilatation in the middle. Tail agreeing with that in *M. longicornis*, as regards its relativ size and its segmentation, but having the ovigerous spines considerably more elongate. Caudal rami comparatively narrower than in that species and remarkably divergent; number of marginal setæ, as in *M. longicornis*, 5 on each ramus, the innermost but one conspicuously shorter than the others. Eye inconspicuous. Antennæ exceedingly slender and elongated, considerably exceeding in length the cephalic segment, and, as in the preceding species, having all the joints, except the 1st, confluent. Oral tubule rather small, and occurring about in the middle of the cephalic segment. Natatory legs resembling in structure those in *M. longicornis*, but differing in the presence of only a single denticle inside the 2nd basal segment, and in the total absence of any crenulations on the outer edge of the terminal joint of the outer ramus. Last pair of legs comparatively narrower, with the inner expansion less prominent and evenly rounded off; number of marginal setæ as in *M. longicornis*. Ova attached to the genital spines very numerous, and in some cases accumulated to form an oblong oval mass extending far beyond the limits of the body.

Male of rather small size, as compared with the female, but exhibiting a much similar slender and narrow form of the body. Cephalic segment nearly perfectly cylindrical in shape and exceeding somewhat in length the remaining part of the body. Tail, as in the male of *M. longicornis*, distinctly 4-articulate, with the copulative appendage of a very similar structure. Caudal rami agreeing in shape with those in female and spread out in the same remarkable manner, each of them, however, only provided with 4 setæ. Antennæ much more slender than in the male of *M. longicornis*, with the 2nd joint of

unusual length, otherwise built in a much similar manner. Natatory legs exactly as in female. Last pair of legs, however, very small, knob-like, each only tipped with a single slender seta.

Body in both sexes rather pellucid with only a very slight yellow tinge, and provided in some places with a few small pigmentary patches of a darker colour.

Length of adult female generally about 3 mm., though in some instances reaching 3.70 mm.; that of male scarcely attaining 2 mm.

Remarks.—The above-described form is unquestionally the same as that recorded by Giesbrecht from the Mediterranean, the identity of both being at once seen by a comparison of the figures here given with those in Giesbrecht's work. It is true that the present form in several respects shows a near relationship to *M. longicornis;* but I think that the above given descriptions of these 2 forms will prove them to be in reality specifically distinct.

Occurrence.—Several specimens of this form have been taken by me at different times and in different places on the Norwegian coast, from the Christiania Fjord and northwards to Kvalø. Only a single male has, however, as yet come under my notice, all the other specimens were of the female sex.

Distribution.—Mediterranean (Giesbrecht).

4. Monstrilla clavata, G. O. Sars, n. sp.

(Pl. VI)

Specific Characters.—Female. Body rather stout and clumsy, being considerably dilated in its anterior part and viewed laterally, of a pronouncedly clavate shape. Cephalic segment very large, occupying rather more than half the length of the body, and having its greatest width about in the middle, dorsal face remarkably vaulted in front. Tail about half the length of the exposed part of the trunk, and on the whole resembling in structure that in the 2 preceding species; ovigerous spines rather produced, being fully 3 times as long as the tail. Caudal rami exceeding somewhat in length the last 2 segments combined, and only slightly divergent, each, as in the 2 preceding species, provided with 5 setæ, the innermost but one being, however, considerably shorter than the others. Eye inconspicuous. Antennæ not nearly attaining the length of the cephalic segment, otherwise built in much the same manner as in the 2 preceding species. Oral tubule rather prominent and occurring somewhat behind the middle of the cephalic segment. Natatory legs, as in *M. longiremis*, armed inside the 2nd basal segment with a single well-marked denticle, terminal joint of outer ramus with a slight indication of a crenulation

of the outer edge. Last pair of legs very similar in shape to those in *M. longicornis*, the inner expansion being rather prominent.

Body in the living animal whitish pellucid, and ornamented with irregular patches of a light reddish brown or chestnut-coloured pigment.

Length of adult female 4.50 mm.

Male unknown.

Remarks.—This is much the largest of the species observed by me, and I therefore at first believed it to be the *M. grandis* of Giesbrecht. On a closer examination I have, however, found it to differ in some respects very essentially from that species, being in reality much more nearly related to the 2 preceding species, though easily distinguishable from them by the rather different shape of the body.

Occurrence.—A solitary female specimen of this form was taken, many years ago, at Hvalør, outside the Christiania Fjord.

5. **Monstrilla leucopis**, G. O. Sars, n. sp.

(Pl. VII)

Specific Characters.—Female. Body exceedingly slender and elongated, resembling somewhat in shape that of *M. longiremis*. Cephalic segment considerably exceeding half the length of the body, and of a narrow cylindrical form. Tail comparatively short, scarcely attaining half the length of the exposed part of the trunk; genital segment rather dilated at the base, and without any trace of a dorsal suture; ovigerous spines of moderate length. Caudal rami rather large, exceeding in length the last 2 segments combined, and only slightly divergent, inner edge perfectly straight, outer considerably protuberant in front of the middle; each ramus provided with 5 setæ, 3 of which issue from the narrowly rounded apex, the other 2 from the outer edge, the latter of very unequal size, the proximal one being normally developed, whereas the distal one is greatly reduced, and only slightly exceeds in length the corresponding ramus. Eye inconspicuous, and replaced by an opaque whitish substance apparently answering to the ocular pigment. Antennæ rather slender, though not nearly attaining the length of the cephalic segment, and having their 5 joints more distinctly defined than in the preceding species, none of the setæ attached to the terminal joint ramified. Oral tubule rather small, and occurring somewhat in front of the middle of the cephalic segment. Natatory legs without any denticle inside the 2nd basal segment, outer ramus rather produced and having the outer edge of the terminal joint perfectly

smooth. Last pair of legs gradually narrowed distally, and only provided with 2 apical setæ, inner edge scarcely expanded.

Male much smaller than female, but exhibiting a very similar slender form of the body. Tail, as usual, composed of 4 well defined segments, the 1st of which is the largest, and is produced below to a rather large and prominent copulative appendage of an oblong oval form and armed on each side with a straight rod-like spine. Caudal rami of the very same shape as in the female, and having the outermost but one of the setæ reduced in a similar manner, differing, however, as in the males of the preceding species, in the absence of one of the apical setæ. Anterior antennæ hinged in the usual manner. Last pair of legs reduced to 2 very small knob-like prominences, each tipped with a single slender seta.

Body (in female) highly transparent and ornamented in some places with pigmentary patches of a light reddish colour. Length of adult female reaching to 3.30 mm.; that of male scarcely exceeding 1.60 mm.

Remarks.—I have been in some doubt, if not the above-described form should be the same as that recorded by Scott under the name of *M. anglica* Lubbock. Indeed, in the structure of the last pair of legs and the peculiar reduction of the outermost but one of the caudal setæ, both these forms seem to agree pretty well. On the other hand, is the general shape of the body, to judge from the figure given by Scott, rather unlike, and another very essential difference is found as regards the number of the caudal setæ, which, both according to the description and the figure given by Scott, is stated to be 6 on each ramus in the form observed by him. In any case the specific name *anglica* cannot be applied either to the present form, or to that observed by Scott, as it seems evident that Lubbock's species is different from both of them. I have retained for the species here treated of the name assigned to it long ago in my notes.

Occurrence.—Some few specimens of this form, among them a single male, were collected, many years ago, at Kvalø on the Nordland coast.

6. Monstrilla gracilicauda, Giesbrecht.

(Pl. VIII)

Monstrilla gracilicauda, Giesbrecht. Pelagische Copepoden des Golfes von Neapel, p. 587, Pl. 46, figs. 9, 16, 18, 29, 32, 43.

Specific Characters.—Female. Body moderately slender, with the anterior division slightly dilated in the middle. Cephalic segment about occupying half

the length of the body, and, viewed dorsally, exhibiting a very slight dilatation in front of the middle, frontal edge somewhat produced between the insertion of the antennæ. Tail exceeding half the length of the exposed part of the trunk; genital segment rather large, being considerably longer than the remaining part of the tail, and gradually narrowed behind, dorsal face with a very slight transverse suture in the middle; ovigerous spines unusually short. Caudal rami comparatively small and somewhat divergent, each provided with 6 setæ, one of which, however, is very short and attached somewhat dorsally. Eye easily observable in the living animal, though of a somewhat incomplete structure, lateral lenses small and rather remote from each other, being connected by a narrow stripe of dark pigment, ventral lens apparently imperfectly developed. Antennæ rather shorter than in the species described in the preceding pages, not even attaining half the length of the cephalic segment, and only composed of 4 joints, the last of which is about as long as the other 3 combined and somewhat fusiform in shape, with none of the setæ ramified. Oral tubule occurring unusually far in front, at about the end of the first 1/3 of the cephalic segment. Natatory legs without any denticle inside the 2nd basal segment, outer ramus considerably longer than the inner and having the terminal joint well developed, with the outer edge perfectly smooth. Last pair of legs somewhat clavate in outline, the inner edge forming a rounded expansion immediately inside the extremity, apical setæ 3 in number and of nearly equal size.

Body in the living animal rather transparent and in some places tinged with a light yellow pigment.

Length of adult female reaching to 3.55 mm.

Male unknown.

Remarks.—The present species is easily distinguished from those described in the preceding pages by the comparatively shorter antennæ, the position of the oral tubule, and the shape of the last pair of legs. The tail, moreover, appears more elongate and the genital segment of larger size than in those species.

Occurrence.—Some few specimens of this form, all of the female sex, were collected, many years ago, in 2 different places on the Nordland coast, viz., Valdersund and Kvalø.

Distribution.—Mediterranean (Giesbrecht) Scottish coast (Scott).

7. Monstrilla helgolandica, Claus.

(Pl. IX)

Monstrilla helgolandica, Claus. Die freilebenden Copepoden, p. 165, Pl. 12, fig. 9.

Specific Characters.—Female. Body comparatively short and stout, and somewhat dilated in its anterior part. Cephalic segment about occupying half the length of the body and, viewed dorsally, exhibiting a somewhat fusiform shape, with the greatest width a little in front of the middle and almost attaining half the length. Tail of a similar shape to that in *M. gracilicauda*, the genital segment being rather large and gradually narrowed behind; ovigerous spines of moderate length. Caudal rami considerably divergent, and narrow oblong in shape, each provided with 6 setæ of somewhat unequal length, one of them, attached somewhat dorsally, being very small, that next to it on the outer side somewhat shorter than the 4 remaining ones, all the setæ issuing from the outermost rounded part of the ramus. Eye easily observable, and having all 3 lenses distinctly developed. Antennæ scarcely attaining half the length of the cephalic segment, and, as in *M. gracilicauda*, only composed of 4 joints. Oral tubule well marked, and occurring about in the middle of the cephalic segment. Natatory legs without any denticle inside the 2nd basal segment, outer ramus less elongate than in the other species, with the terminal joint of smaller size. Last pair of legs rather unlike those in the other known species, each forming a narrow cylindrical stem, angularly bent in the middle and tipped with 2 subequal setæ.

Body very transparent in its anterior part, but behind tinged with a dark brownish pigment.

Length of adult female scarcely exceeding 1.40 mm.

Male unknown.

Remarks.—This is a very small-sized species, and may moreover be easily recognised by the unusual short and stout form of the body, as also by the structure of the caudal rami and that of the last pair of legs. The form recorded by Bourne as *M. helgolandica* is quite certainly not that species, but more properly referable to *M. longiremis* Giesbrecht.

Occurrence.—Two female specimens only of this form have as yet come under my notice. They were taken, many years ago, at Christiansund, west coast of Norway.

Distribution.—Helgoland (Claus), Skagerak (Timm).

8. **Monstrilla serricornis**, G. O. Sars, n. sp.

(Pl. X, fig. 1).

Specific Characters.—Male. Body comparatively short and stout, and, seen laterally exhibiting a somewhat clavate shape. Cephalic segment shorter than usual, only slightly exceeding in length the exposed part of the trunk and, seen dorsally, nearly of equal width throughout, its ventral face forming anteriorly a rather prominent gibbous convexity, but without any distinctly marked oral tubule. Tail rather narrow, and composed of 4 well defined segments, the 1st of which is produced below to a sub-clavate copulative appendage provided at the end on each side with a short auriculiform lobe. Caudal rami comparatively small and somewhat divergent, each having the form of a rounded oval lamella edged with 5 subequal setæ. Eye inconspicuous. Antennæ about equalling in length $^2/_3$ of the cephalic segment, and rather strongly built, being composed of 5 well defined joints, the last of which is, as usual, very movably articulated to the preceding one, and somewhat knife-shaped, with the inner sharpened edge divived at the extremity into 5 small recurved denticles. Natatory legs of the usual structure. 5th pair of legs wholly absent.

Colour not yet ascertained. Length of the body 1.75 mm.

Female unknown

Remarks.—It is only provisionally that I refer the above-described remarkable form to the genus *Monstrilla*, from which it in some respects seems to differ rather conspicuously. As, however, only the one sex as yet has been observed, its true relationship cannot at present be fully made out. The peculiar armature of the antennæ may suffice to distinguish at once this form from any of the hitherto known Monstrillidæ.

Occurrence.—Two specimens only of the present form have as yet come under my notice, both of the male sex and exactly agreeing with each other. The one was taken at Bukken, outside the Stavanger Fjord, the other at Kvalø, on the Nordland coast.

Gen. 3. **Cymbasoma**, Thompson, 1888.

Syn: *Thamaleus*, Giesbrecht (not Kröyer).
„ *Hæmocera*, Malaquin.

Generic Characters.—General form of the body resembling that in *Monstrilla*. Tail however having the number of segments reduced in both sexes, only 2 segments being present in female and 3 in male. Caudal rami com-

paratively short and more or less pronouncedly club-shaped, each ramus provided in female with only 3 distinctly developed setæ, whereas in male, contrary to what is the case in *Monstrilla*, their number is generally increased by one additional seta. Eye as a rule well developed. Antennæ rather short in female and only composed of 4 joints, in male much more elongate, and distinctly 5-articulate, with a well-marked hinge between the last 2 joints. Oral tubule generally occurring far in front, in close approximation to the frontal part of the head. Natatory legs built in the usual manner. Last pair of legs in female comparatively short, but provided inside with a well defined lobe; in male wholly absent.

Remarks.—This genus was proposed in the year 1888 by J. C. Thompson, to include a peculiar Copepod *(C. rigidum)*, of which at first only a single female specimen was found. As, on a closer examination of several other specimens taken by the same author partly in the Mediterranean, partly on the British coast, the near relationship of this form to the species at that time referred to the genus *Monstrilla* of Dana was recognised, the generic name *Cymbasoma* was subsequently withdrawn in favour of that of *Monstrilla*. By the subdivision of the latter genus into 2 nearly-allied genera carried out by Giesbrecht, it was, however, of course required to decide to which of these 2 genera the species of Thompson should be referred, and in this regard no doubt can arise. It is quite certainly a true member of the genus to which Giesbrecht had applied the name *Thaumaleus*. Since, however, as stated above, the application of this name to the present genus is quite inadmissibel, I have felt justified to restore the generic name proposed by Thompson.

The genus here treated of is chiefly distinguished from *Monstrilla* by the reduced number of segments in the tail, and, by the likewise reduced number of caudal setæ. Moreover the position of the oral tubule and the total absence in the male of the 5th pair of legs may be named as characters distinguishing the present genus. Three well defined species with be described in the succeeding pages.

9. Cymbasoma rigidum, Thompson.

(Pl. X, fig. 2, Pl. XI).

Cymbasoma rigida, J. C. Thompson, Linn. Soc. Journ. Zool., Vol., XX, p. 154, Pl. XIII, figs. 1—4.

Syn: *Monstrilla rigida*, Bourne.
„ *Thaumaleus rigidus*, Scott.
„ *Thaumaleus Claparèdi*, Giesbrecht.
„ *Thaumaleus germanicus*, Timm.
„ *Hæmocera Danæ*, Malaquin.

Specific Characters.—Female. Body moderately slender, and generally extended in a manner to give it a somewhat rigid appearance. Cephalic segment fully as long as the remaining part of the body and, viewed dorsally, somewhat dilated in the middle, ventral face evenly convex throughout. Tail scarcely exceeding half the length of the exposed part of the trunk; genital segment of moderate size and evenly narrowed behind, ovigerous spines nearly 3 times as long as the tail; distal segment somewhat flattened and gradually widening behind, exhibiting in front of the middle, on each side, a slight notch, as an attempt to a subdivision, the notch not being, however, continued in any difining suture. Caudal rami only slightly longer than they are broad, and not much divergent, with the inner edge somewhat concaved, the outer gibbously produced, each ramus provided with 3 strong subequal setæ, the outermost of which is attached to a rather prominent ledge; a very small appendicular bristle is moreover generally found attached near the inner corner to the ventral face. Eye well developed, with all 3 lenses distinct. Antennæ rather short, scarcely attaining $^1/_3$ of the length of the cephalic segment, terminal joint somewhat shorter than the other 3 combined, with none of the setæ ramified. Oral tubule rather small, and occurring at about the end of the first $^1/_4$ of the cephalic segment. Natatory legs with the outher ramus only slightly longer than the inner, its terminal joint not much produced. Last pair of legs with 3 apical setæ, the innermost of which is much smaller than the other 2, inner edge produced to a narrow linguiform lobe curving outwards along the terminal part of the leg, and in most cases extending as far as the latter. Ova attached to the genital filaments very numerous and in some cases accumulated to form an elongate almost cylindrical mass extending far beyond the limits of the body.

Male, as usual, smaller than female and of a shorter and more robust form of the body, with the cephalic segment somewhat clavate in outline. Tail rather narrow and composed of 3 segments, the last exhibiting on each

side a quite similar notch to that observed in female; copulative appendage divided at the end into 2 comparatively large diverging lobes of a somewhat sausage-shaped form. Caudal rami more pronouncedly clavate than in female, each provided with 4 slender subequal setæ attached to the obtusely truncated and distinctly thickened extremity, one of them apparently answering to the small appendicular bristle found in the female. Antennæ much more elongate than in female and distinctly 5-articulate, last joint very movably articulated to the preceding one, and terminating in a slender, slightly curved spine. Natatory legs of exactly same structure as in female. Of a 5th pair of legs not the slightest trace is to be detected.

Body of female, as usual, very transparent in its anterior part, but otherwise exhibiting a light yellowish-grey colour, and tinged in some places with a darker brownish pigment.

Length of adult female reaching to 2.50 mm., of male to 1.75 mm.

Remarks.—That the present form is identical with that recorded by I. C. Thompson under the name of *Cymbasoma rigidum* and subsequently more fully described by Scott as *Thaumaleus rigidus*, appears to me to be beyond any doubt, and I am also of opinion, that several other forms, described under different names, should be referred to that species. Indeed, I have been unable to find any reliable character to distinguish the several forms enumerated above as synonymes, and I am thus led to the conclusion, that they all should be combined into the very same species, for which of course the earliest name ought to be retained.

Occurrence.—Several specimens of this form have been taken by me at different times and in different places, both on the south and west coast of Norway. Most of the specimens collected were of the female sex; but I have also come across a few male specimens, one of which has been subjected to a closer examination and is figured on Pl. X.

Distribution.—Atlantic Ocean off Teneriffe (Thompson). Mediterranean (Giesbrecht), coast of Normandie (Claparéde), British Isles (Thompson, Scott), Eastern part of North Sea (Timm).

10. Cymbasoma Thompsoni, (Giesbrecht).

(Pl. XII)

Thaumaleus Thompsoni, Giesbrecht, Pelagische Copepoden des Golfes von Neapel, p. 584, Pl. 46, figs. 7, 27, 31, 36, 40.

Syn. Monstrilla Danæ, Moebius (non Claparède)

Specific Characters.—Female. Body comparatively more slender than in the preceding species, with the cephalic segment narrower and considerably exceeding in length the remaining part. Tail very short, scarcely longer than the last 2 trunkal segments combined; genital segment unusually tumid, seen dorsally almost circular in outline, ventral face strongly protuberant, ovigerous spines of moderate length; distal segment without any traces of lateral notches. Caudal rami rather small, each provided with 3 subequal setæ; no appedicular bristle present. Eye apparently well developed. Antennæ scarcely attaining $^1/_3$ of the length of the cephalic segment, and of a structure very similar to that in the preceding species. Oral tubule somewhat more approximate to the frontal part of the head. Natatory legs with the outer ramus considerably longer than the inner, and the terminal joint more produced than in the preceding species. Last pair of legs resembling in structure those in *C. rigidum,* though having the innermost of the apical setæ rather smaller and the lobe of the inner edge less prominent.

Male comparatively more slender than that of the preceding species, and having the cephalic segment shorter and less pronouncedly clavate in shape. Tail composed of 3 well defined segments, the last of which, as in female, does not exhibit any traces of lateral notches. Caudal rami of the very same structure as in the female, each ramus being only provided with 3 setæ. Antennæ very strongly built, with the joints rather expanded, the last one very mobile and somewhat thickened at the extremity, which is armed with 2 small denticles. No traces of a 5th pair of legs present. Copulative appendage comparatively smaller than in the preceding species, with the terminal lobes less produced.

Colour of the living animal not yet assertained.

Length of adult female 1.20 mm., of male 0.80 mm.

Remarks.—The precent species was described by Giesbrecht from some specimens taken in the Baltic, east of Langeland, and sent to him from Moebius, who had previously recorded this form under the name of *Monstrilla Danæ*, Claparède. It may easily be distinguished from the preceding species by its much inferior size, and more particularly by the rather different shape

of the tail. The form described by Scott as *Thaumaleus Thompsoni* is quite certainly different from Giesbrecht's species.

Occurrence.—Three specimens only of this species, 2 females and 1 male, have as yet come under my notice. They were taken in as many different localities, viz., Christiansund, Skutesnæs and Risør.

Distribution.—Western part of the Baltic (Moebius).

11. Cymbasoma longispinosum (Bourne).

(Pl. XIII)

Monstrilla longispinosa, Bourne, Quart. Journ. Micr. Science, (2), Vol. 30, p. 575, Pl. 37, figs. 1—4, 10.

Syn.: Thaumaleus longispinosus, Giesbrecht.

Specific Characters.—Female. Body rather slender, with the cephalic segment only very slightly dilated in the middle, and considerably exceeding half the length of the body. Tail very short, not even attaining the length of the 2 preceding segments combined; genital segment about the size of the last trunkal segment and, seen from above, of a very similar subquadrate form its ventral face considerably protuberant; ovigerous spines of quite an extraordinary length, attaining in some instances nearly the double length of the body, and confluent at the base for some distance; distal segment much narrower than the proximal one, being conspicuously constricted at the base, and without any trace of a subdivision. Caudal rami very small, scarcely longer than they are broad, and each only provided with 3 thickish setæ of equal length. Eye well developed, at least in female. Antennæ comparatively short and stout, scarcely exceeding in length $^1/_4$ of the cephalic segment and, as in the other species of the present genus, only composed of 4 joints, the last of which is about the length of the other 3 combined and gradually narrowed distally, some of its setæ distinctly ramified. Oral tubule occurring far in front, at only at short distance from the frontal part of the head. Natatory legs with the terminal joint of the outer ramus unusually short, scarcely longer than the middle one, and of a rounded form. Last pair of legs provided at the obtusely truncated extremity with 3 plumose setæ, the innermost of which is a little shorter than the other 2; inner lobe well defined, triangular, and extending at right angle to the axis of the leg.

Male somewhat smaller than female and less slender of form, with the cephalic segment comparatively shorter and nearly of equal width throughout. Tail exceeding somewhat half the length of the exposed part of the trunk, and composed of 3 well defined segments, the middle of which is the smallest;

copulative appendage divided at the end into 2 comparatively short diverging lobes. Caudal rami of a similar shape to those in the female, but each provided with 4, instead of 3, setæ of nearly equal length. Antennæ comparatively much larger than in female, and each composed of 5 well defined joints, the 3 middle ones lamellarly expanded inside and armed with several short spines in addition to the setæ, last joint comparatively small, but very movably articulated to the preceding one. Natatory legs agreeing exactly in structure with those in female. 5th pair of legs wholly absent.

Body, as usual, much more transparent in female than in male, being in the latter, according to Giesbrecht, everywhere of a dark fuscous colour.

Length of adult female 2.60—3.16 mm., of male 2.30 mm.

Remarks.—The present form is chiefly characterised by the extraordinary length of the ovigerous spines in the female and their peculiar coalescence at the base. In its general appearance it bears a very close resemblance to the form recorded by Claparède under the name of *Monstrilla dancæ*, and, were it not that no mention has been made by that author on the above-named distinguishing character, I should indeed have been much inclined to regard these 2 forms as identical.

Occurrence.—The present species, it is true, has not yet been observed off the Norwegian coast; but I regard it as very probable that on further investigations it will be found to occur in some place or other on the south and west coast. As I have had an opportunity of examining this form, I find it advisable to give here a detailed description of it, for comparison with the other 2 species. The figures given on Pl. XIII have been drawn from specimens collected during one of the Monaco-Expeditions in the Mediterranean off Sardinia.

Distribution.—British Channel (Bourne), Mediterranean at Naples (Giesbrecht).

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

Generic Characters.—Body of very different appearance in the 2 sexes, being exceedingly slender in female, much shorter and stouter in male. Tail composed in female of 3 well defined segments, the middle of which is the smallest, in male distinctly 4-articulate. Caudal rami in both sexes of the very same structure, being unusually produced, and each provided with 4 well

developed setæ, 2 apical and 2 lateral. Eye very fully developed, especially in male. Antennæ in female 4-articulate, in male much larger and distinctly 5-articulate, with the usual hinge between the last 2 joints. Oral tubule occurring far in front. Natatory legs built in the usual manner. Last pair of legs, however, in female of rather a peculiar structure, being somewhat fusiform in shape, and each produced into 2 smooth conical lappets, the outer of which is the more prominent; setæ of these legs not, as usual, attached to the terminal edge of the leg, but arranged in a line crossing the base of the outer lappet. Male without any trace of these legs, but having the copulative appendage normally developed.

Remarks.—This new genus is established to include the anomalous form recorded by Scott under the name of *Monstrilla dubia*. Indeed, I have found it impossible to place this species either in the genus *Monstrilla* or in that of *Cymbasoma*, as it in some respects seems to combine characters of both these genera, in other respects to differ conspicuously from either of them.

12. Monstrillopsis dubia, (Scott).

Pl. XIV.

Monstrilla dubia, T. Scott, Twenty-second Ann Rap. of the Fishery Board for Scotland, Part III, p. 247, Pl. XIII, fig. 14, Pl. XIV, figs. 16—18

Specific Characters.—Female. Body exceedingly slender and narrow, with the anterior division not at all dilated. Cephalic segment exceeding the remaining part of the body by $^1/_3$ of its length, and narrow cylindrical in form, being almost of equal width throughout. Tail about equalling half the length of the exposed part of the trunk; genital segment a little longer than the other 2 segments combined and slightly dilated at the base, with the ventral face somewhat protuberant; ovigerous spines of moderate length; anal segment somewhat flattened and sharply defined from the rather small middle segment. Caudal rami rather produced, exceeding somewhat in length the 2 preceding segments combined, and slightly divergent, each ramus provided with 4 setæ, one about in the middle of the outer edge, 2 at the apex, and one inside at some distance from the end. Eye very conspicuous in the living animal, with dark pigment and all 3 lenses well developed. Antennæ exceeding somewhat in length $^1/_3$ of the cephalic segment, and composed of 4 well defined joints, the last of which is fully as long as the other 3 combined; none of the setæ ramified. Oral tubule well marked, and occurring near the frontal part of the head. Natatory legs with the outer ramus con-

siderably longer than the inner, and having the terminal joint well developed. Last pair of legs rather narrow at the base, but considerably widening towards the end, which is produced to a conical lappet, across the base of which 3 slender setæ are attached; inner edge of the leg produced to a similar lappet, which, however, is quite smooth.

Male very unlike the female and of much smaller size, with the body much shorter and stouter. Cephalic segment somewhat club-shaped, and scarcely exceeding half the length of the body. Tail very narrow and composed of 4 well defined segments, the 1st of which is produced below to a rather large copulative appendage divided at the end into 2 diverging subcylindrical rami. Caudal rami of much the same appearance as in female, with the same number of setæ. Eye still more largely developed than in female, with the ventral lens rather prominent and highly refractive. Antennæ considerably exceeding half the length of the cephalic segment and distinctly 5-articulate, with the last very mobile joint abruptly attenuated distally.

Body in the living animal rather pellucid, with a pale yellow hue, and in some places dotted with a chestnut-coloured pigment.

Length of adult female 3.80 mm., of male 2.10 mm.

Remarks.—This form was described in the year 1904 by Scott from some female specimens taken in 2 different places of the Scottish coast. The resemblance of this form to *Monstrilla Danæ* Claparède, vindicated by Scott in a note to his description, I find to be a very slight one. In fact the present form is easily distinguishable both from this and from any other of the Monstrillidæ.

Occurrence.—Two specimens only of this remarkable form, a female and a male, have as yet come under my notice. They were captured, many years ago, at Bejan, outside the Trondhjem Fjord, and coloured drawings of both, when still alive, were immediately executed.

Distribution.—Scottish coast (Scott).

NOTODELPHYOIDA.

Remarks.—This division comprises a number of Copepoda, which partly differ considerably from each other and according to their organisation, represent several distinct types. Yet, all these forms agree as to habits, in so far that they live as parasites, or more properly as commensales, within Ascidians of different kinds. They were all by earlier authors comprised within a single family, the *Ascidicolidæ*, and this family was by Giesbrecht, together with the *Monstrillidæ* and several other heterogeneous groups, included in the 2nd tribe of his suborder *Podoplea*, for which the name *Ampharthrandria* was proposed. I have already mentioned, that the latter name is quite inapplikable for the present group of Copepoda, which comprises both forms with the anterior antennæ in the male transformed to prehensile organs, and such in which these antennæ are quite alike in the 2 sexes. According to the classification proposed by Giesbrecht, these latter forms should of course be transferred to his 1st tribe, the *Isokerandria;* but such a transfer appears quite unreasonable, since there are forms, otherwise closely related and even referred to one and the same genus, in which the above-named difference, as to the structure of the anterior antennæ, is found. Thus in the male of *Doropygus longicauda* Aurivillius, as will be shown farther on, these antennæ are very distinctly hinged, whereas in the other species referred to that genus they are quite alike in the 2 sexes. It is thereby clearly proved that the above-named character, upon which Giesbrecht laid so much stress, is of far inferior systematic value than opined by that author, and that it in reality must be considered unserviseable as the basis for a more general classification of the Copepoda. There are many other much more important diversities to be found on a comparison of the several forms comprised within the present group, and these diversities are in fact of such an essential quality as to make it inadmissible to include all these forms within a single family. This was also recognised by Thorell, who referred the forms observed by him to 3 different families, viz., *Notodelphyidæ, Ascidicolidæ* and *Buproridæ*. The 1st of these families has subsequently been subdivided by Prof. Brady into 2 nearly-allied

families: *Notodelphyidæ* (proper) and *Doropygidæ*, and 2 other very distinct families, *Botryllophilidæ* and *Enterocolidæ*, are here added. The present division thus comprises at least 6 families, and I regard it as very probable, that their number will still be augmented, on a closer investigation of the many peculiar forms found by Hesse within compound Accidians, but rather imperfectly described by that author.

Fam. 1. Notodelphyidæ.

General Characters.—Body in both sexes cyclopoid in shape and more or less straight, with the anterior division somewhat depressed, the posterior much narrower and cylindric in form. Exposed part of trunk composed in male of the usual number of segments, whereas in female the last 2 segments are confluent, forming together a large median piece somewhat broader in front than behind in young specimens, but in the adult female greatly expanded behind, to form dorsally a very voluminous, somewhat flattened bag or incubatory pouch, into which the ripe ova are received. Tail composed in both sexes of 5 segments not very different in size. Caudal rami well developed and provided at the end with strong ciliated setæ present in the usual number. Eye of the structure generally met with in the Copepoda. Anterior antennæ of moderate size, and extended laterally, being composed of numerous short joints densely clothed with setæ; those in male distinctly hinged. Posterior antennæ much smaller than the anterior, but distinctly prehensile, each terminating in a strong mobile claw. Oral parts, as a rule, well developed, and built on a somewhat similar type to that in the family *Cyclopinidæ*. The 4 anterior pairs of legs likewise cyclopoid in structure, and adapted for swimming; 5th pair of legs extremely small and rudimentary, biarticulate.

Remarks.—This family is here taken in a much more restricted sense than done by Thorell, who included into it also his 2 genera *Doropygus* and *Botachus*. In the restriction here adopted, the family only comprises 2 genera, viz., *Notodelphys* Allman and *Agnathaner* Canu.

Gen. 1. **Notodelphys,** Allman, 1847.

Generic Characters.—Body more or less elongated, and in female conspicuously dilated in the middle on account of the greatly expanded matrical part; integuments rather soft and flexible. Cephalic segment not very large, and produced in front to an obtuse deflexed rostral prominence. The 2 succeeding segments in both sexes well defined and separated by deep lateral incisions. Incubatory pouch in female broad, flattened, more or less advancing over the base of the tail. The latter perfectly cylindrical in form, with the 1st segment in female scarcely larger than the succeeding ones, in male somewhat swollen and generally containing 2 oval spermatophores. Caudal rami, as a rule, finely ciliated on both edges, and each carrying at the tip 4 well developed and somewhat diverging plumose setæ, being moreover provided with 2 small bristles, the one attached to the outer edge, the other to the dorsal face, near the inner corner. Eye comparatively small, but easily observable in the living animal, being provided with 2 lateral lenses imbedded in a bright red pigment. Anterior antennæ in female gradually tapered distally, and generally composed of 15 joints clothed with comparatively short, but distinctly ciliated setæ; those in male having the number of joints somewhat reduced, and exhibiting between the penultimate and antipenultimate joints a well marked hinge. Posterior antennæ only composed of 3 distinctly defined joints, the first 2, representing the basal part, somewhat compressed and separated by an oblique suture, at the end of which outside 2 juxtaposed plumose setæ are attached; terminal joint very movably articulated to the basal part, and linear in form; apical claw accompanied by a number of short curved setæ. Anterior lip projecting at the end into 2 triangular lappets. Mandibles with the masticatory part lamellarly expanded and divided at the end into several unequal teath; palp well developed, biramous. Maxillæ with all their constituent parts distinctly defined. Anterior maxillipeds with the 1st basal joint very large and massive, exhibiting inside 3 or 4 short setiferous lobes; 2nd basal joint much narrower, and armed at the end inside with a strong claw-like spine accompanied by a slender seta; terminal part thin, 3-articulate. Posterior maxillipeds much smaller than the anterior ones, and 3-articulate, 1st joint much the largest and provided inside with several short plumose setæ arranged in 2 groups, each of the other 2 joints armed with a slender incurved spine, that of the terminal joint accompanied by 2 small setæ. Natatory legs with the basal part broad and flattened, rami in all the pairs

distinctly 3-articulate and armed in the usual manner, those of 1st pair somewhat unequal, in the other pairs of about equal size. Last pair of legs extremely small, and in female quite concealed beneath the dilated matrical part of the body; proximal joint short and broad, and produced outside to a digitiform process tipped with a small bristle; distal joint more or less scale-like, with a small apical bristle and a short spine inside.

Remarks.—This genus was established as early as in the yeart 1847 by Allman, and may be regarded as the type, not only of the present family, but of the whole division *Notodelphyoida*. It comprises the most perfectly organised forms of that division, and exhibits some unmistakable relations to certain gnathostomous Cyclopoida, in particular the *Cyclopinidæ*. Indeed, the forms included in the present genus may be regarded as Cyclopoids, which by a close adaptation to the particular conditions of life as commensales of Ascidians, have acquired some extraneous characters apparently distinguishing them very essentially from their original ancestors. The genus was in the year 1859 subjected by Thorell to a careful investigation, and its general characters were made out by him in a very satisfactory manner. Thorell distinguished within the genus no less than 7 different species, all of which I have had an opportunity of examining from material collected off the Norwegian coast. These species are very closely related to each others, and as the distinctive characters given by Thorell in the short diagnoses in Latin, preceding the description of each species, appeared to be of a rather trifling kind, the validity of most of them has been questioned by recent authors. On a careful examination I have, however, come to the conclusion, that they all ought to be supported, though their distinction indeed is attended with no small difficulties, at least in the case of preserved specimens. I hope that the descriptions given below, in connection with the figures on the accompaying plates, may render the species more easily recognisable than this has been possible by consulting the work of Thorell.

1. Notodelphys Allmani, Thorell.

(Pl. XV & XVI)

Notodelphys Allmanni, Thorell. Bidrag til kännedomen om Krustaceer som lefva i Arter af slägtet Ascidia, p. 31, Pl. I, Pl. II, 1.

Syn: Notodelphys mediterranea, Buchholtz.

Specific Characters.—Female. Body moderately slender, with the anterior division pronouncedly depressed, and nearly twice as long as the posterior. Cephalic segment scarcely longer than the 2 succeeding segments combined,

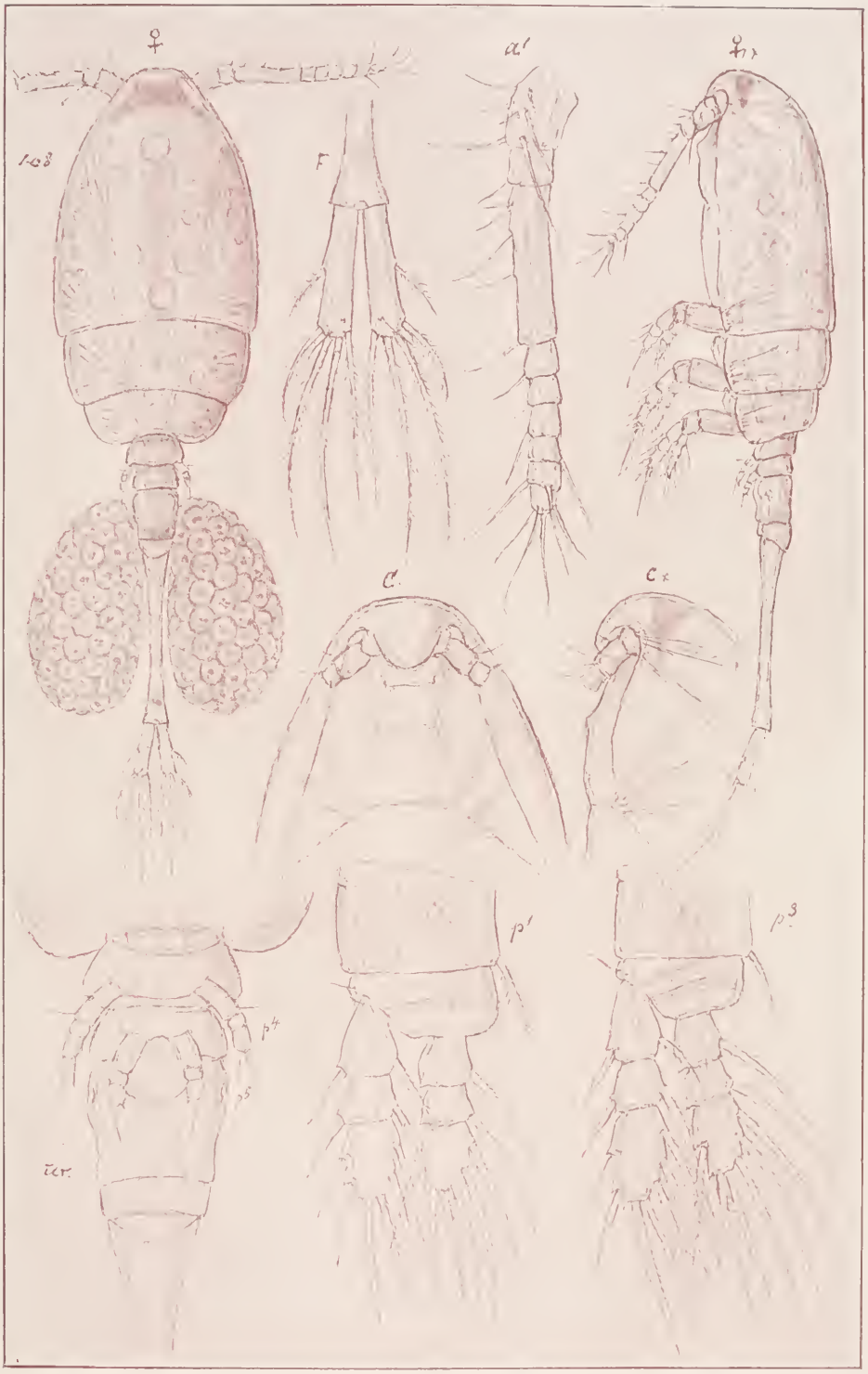
and gradually narrowed anteriorly, terminating in an obtuse point. Incubatory pouch, when fully developed, very broad, rounded quadrate in outline, with the posterior edge slightly concave in the middle. Caudal rami rather slender, sublinear in form, and more or less divergent, attaining nearly twice the length of the anal segment, and more than 4 times as long as they are broad, both edges distinctly ciliated; apical setæ of moderate length and rather divergent; bristle of outer edge occurring at a distance from the end equalling about 1/3 of the length of the ramus. Anterior antennæ nearly as long as the cephalic segment and rather thick at the base, but rapidly tapered distally, 3rd joint the largest, the 3 succeeding joints gradually diminishing in size, remaining joints very small; setæ attached to the anterior face of these antennæ rather coarse and very distinctly ciliated. Posterior antennæ moderately slender, with the terminal joint about the length of the other 2 combined. 1st pair of legs, as in the other species, differing from the succeeding ones by the presence, at the inner corner of the 2nd basal segment, of a short deflexed spine; rami moreover rather unequal, the outer one being considerably shorter than the inner and bent outwards in a peculiar manner, its 1st joint comparatively large and having the outer edge finely denticulate. Last pair of legs with the proximal joint rather broad and finely denticulate at the inner rounded corner, digitiform process considerably produced; distal joint small, scale-like and conspicuously contracted at the base, spine of inner edge accompanied proximally with a few small denticles.

Male of much smaller size than female, with the body gradually attenuated behind. Cephalic segment comparatively larger, exceeding in length the 3 succeeding segments combined. Last trunkal segment scarcely broader than the genital segment. Anterior antennæ of coarser structure than in female and only composed of 11 joints very unlike in size, the outer 2 rather elongate and forming together a very mobile piece, which admits to be impinged against the preceding part of the antenna. Posterior antennæ, oral parts, and legs of same structure as in female. Genital lobes contiguous at the base inside, and subtriangular in form, their extremity somewhat truncated and provided at the outer corner with a small bristle, at the inner with 2 unequal juxtaposed spines.

Body in the living animal semipellucid, with a light yellowish gray hue; ovarial tubes in female pale greenish, the ripe ova included within the incubatory pouch being of a somewhat darker green colour.

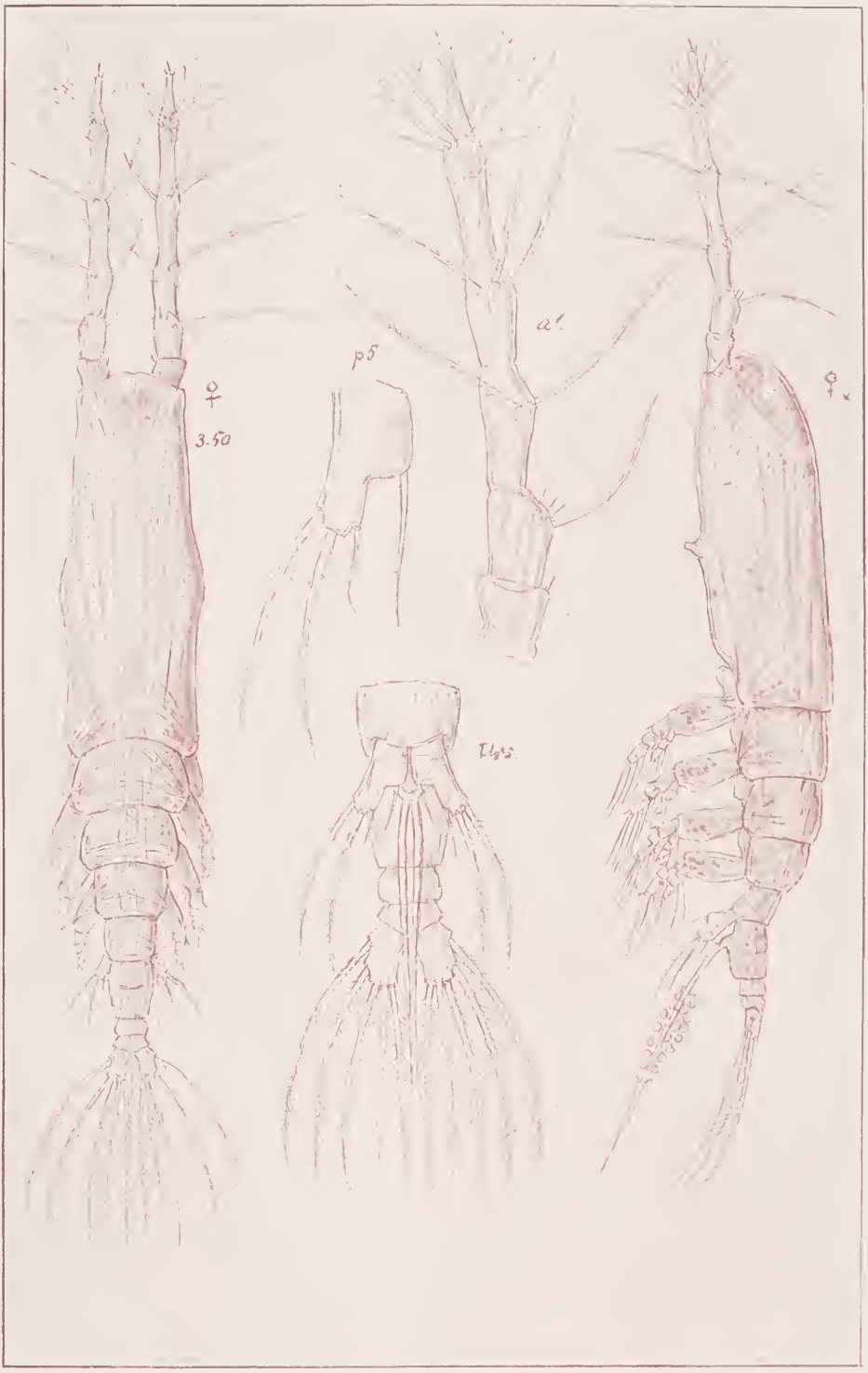
Length of adult female attaining 4.50 mm; of male 1.90 mm.

Remarks.—This is the largest and also the most common of the species,



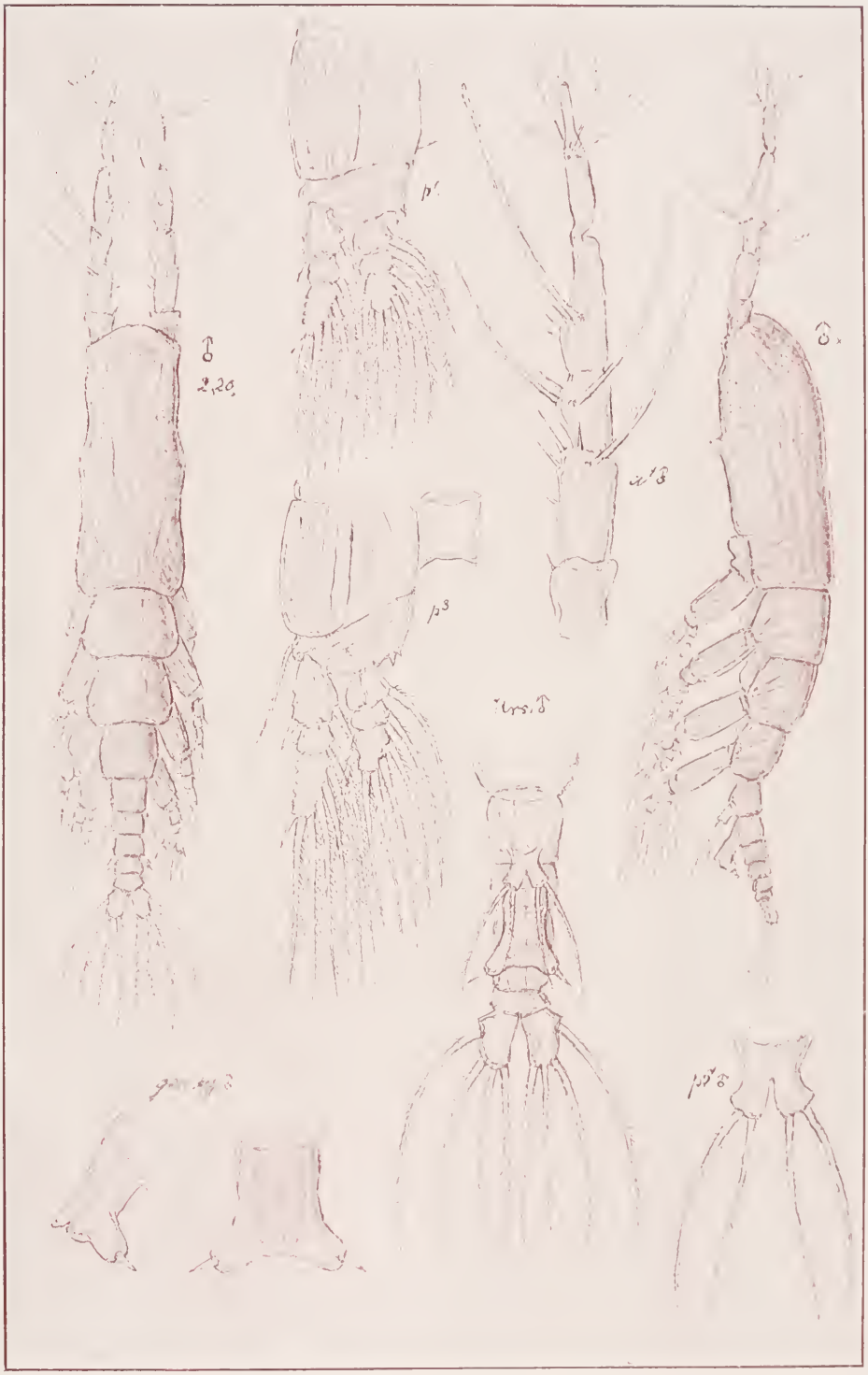
G. O. Sars del.

Thaumatopsyllus paradoxus, G. O. Sars



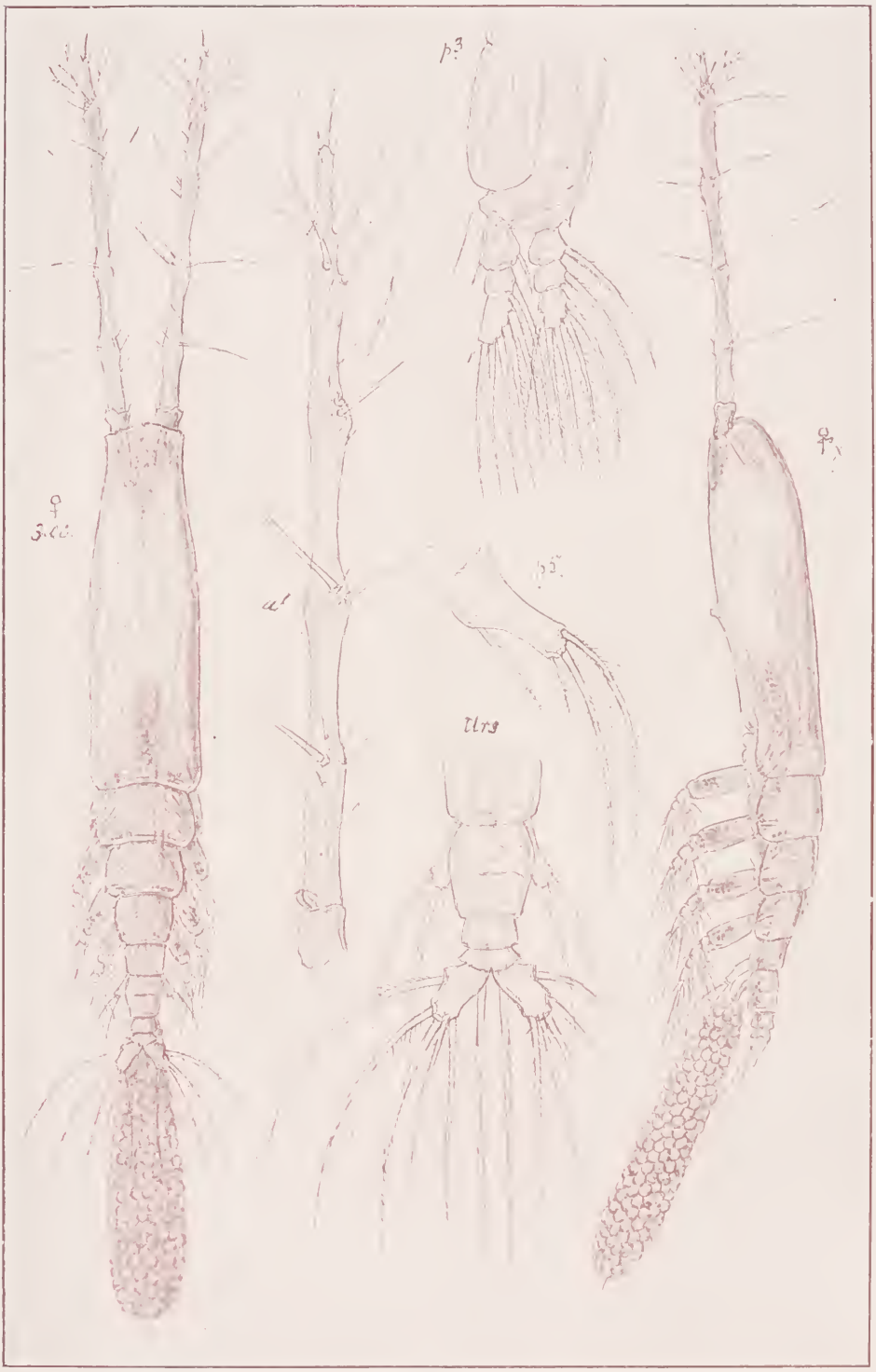
G. O. Sars del.

Monstrilla longicornis, Thomps.



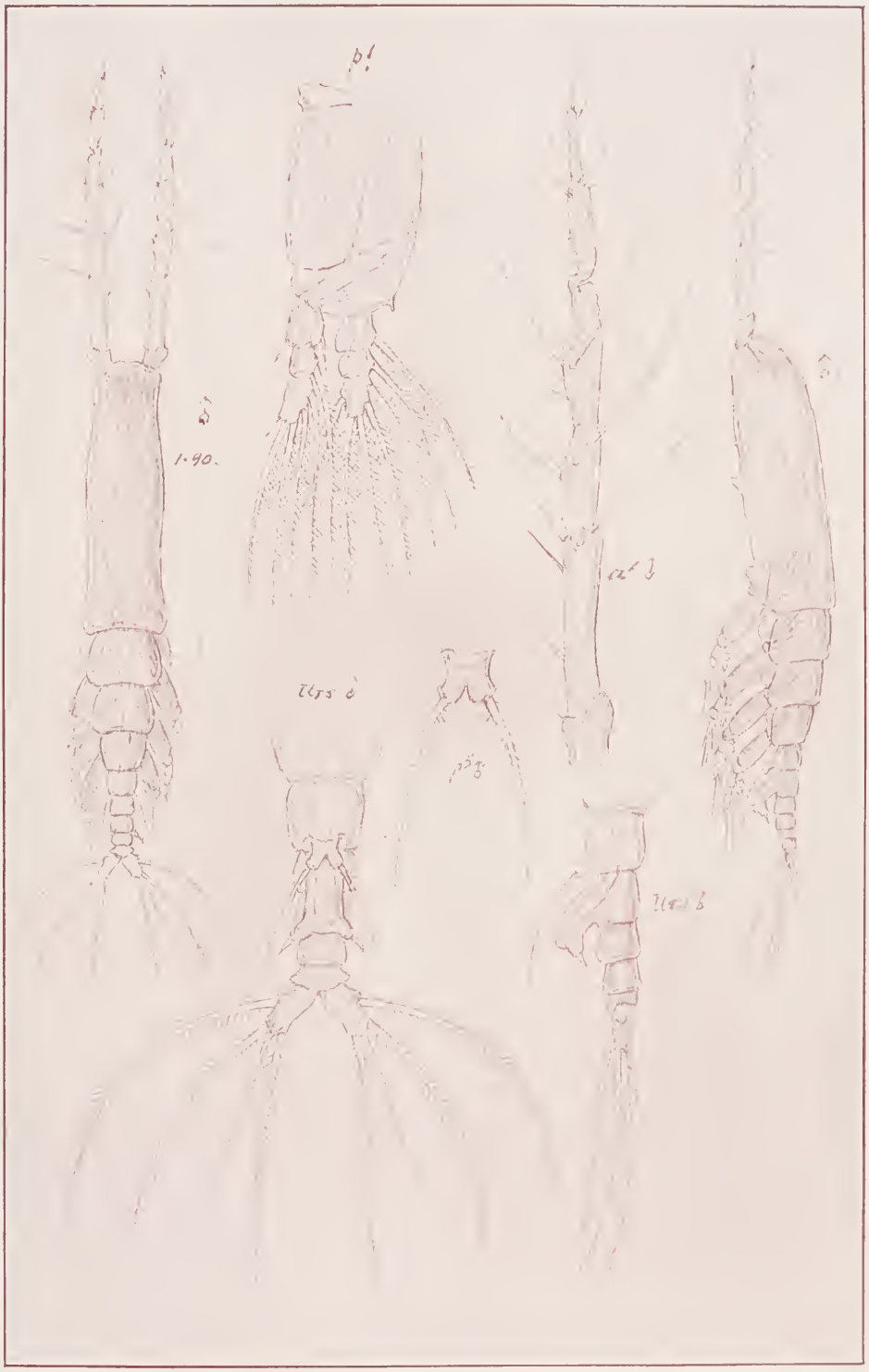
G. O. Sars del.

Monstrilla longicornis, Thomps.
(continued)



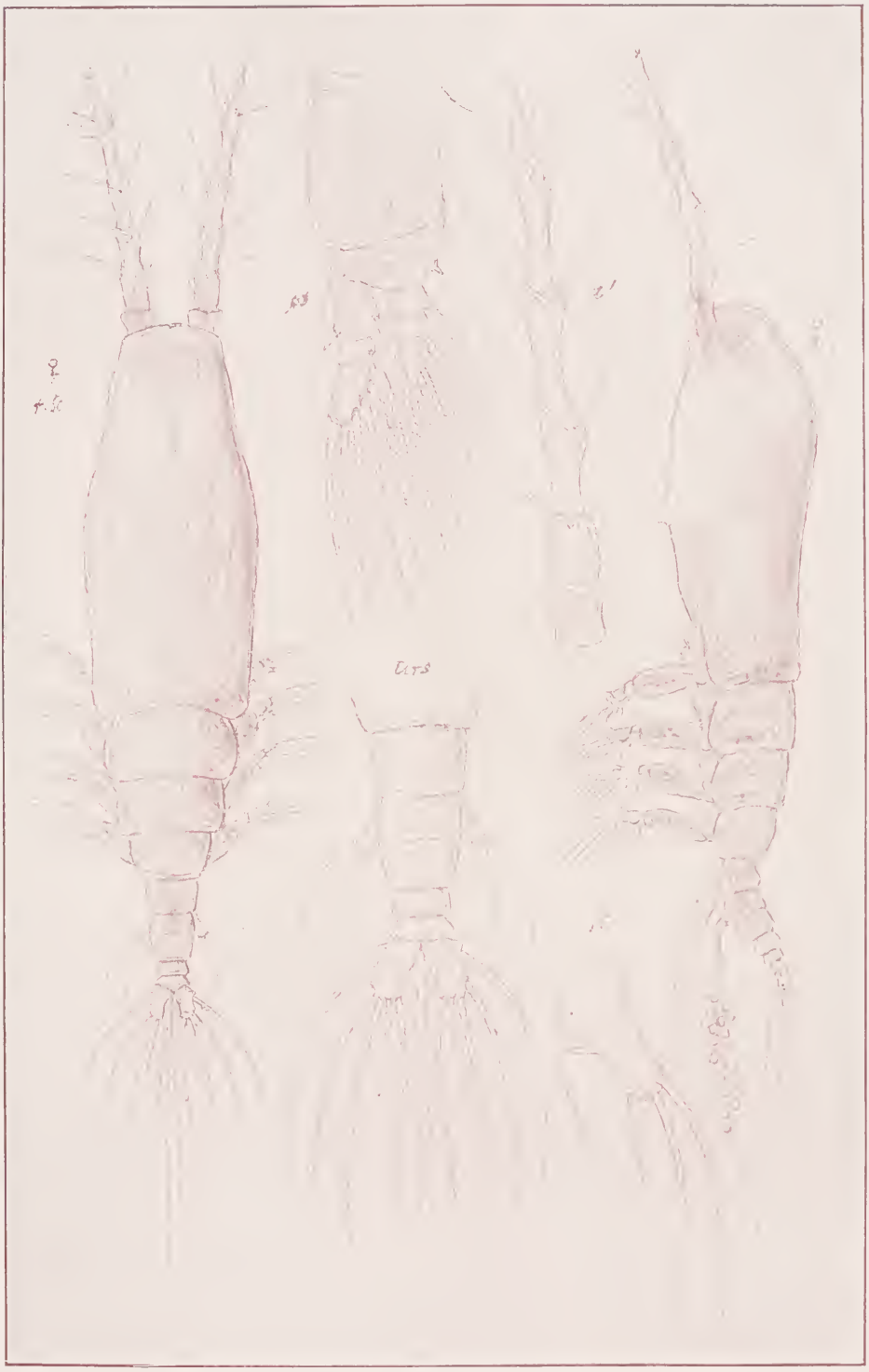
G. O. Sars del.

Monstrilla longiremis, Giesbr.



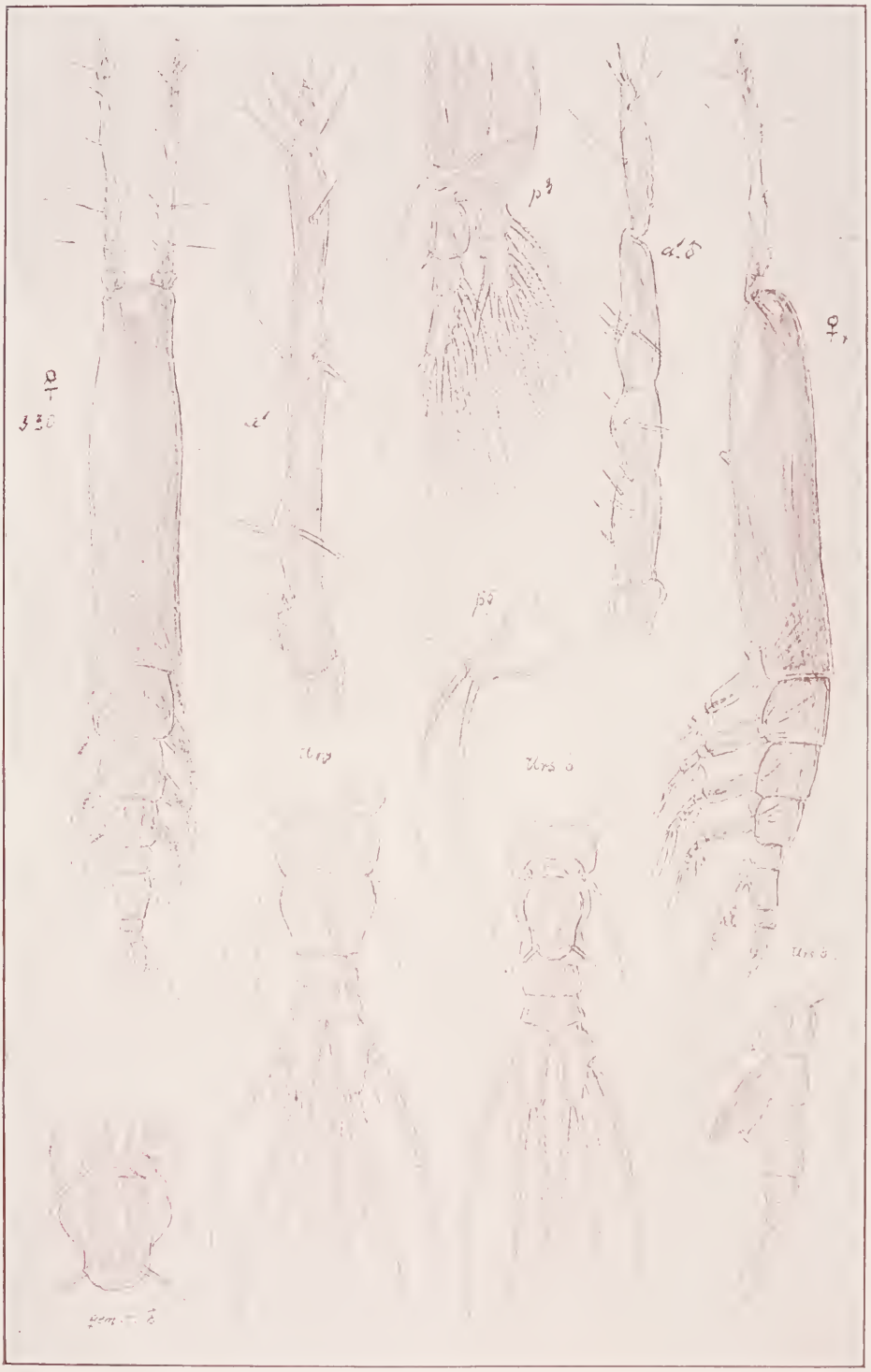
G. O. Sars del.

Monstrilla longiremis, Giesbr.
(male)



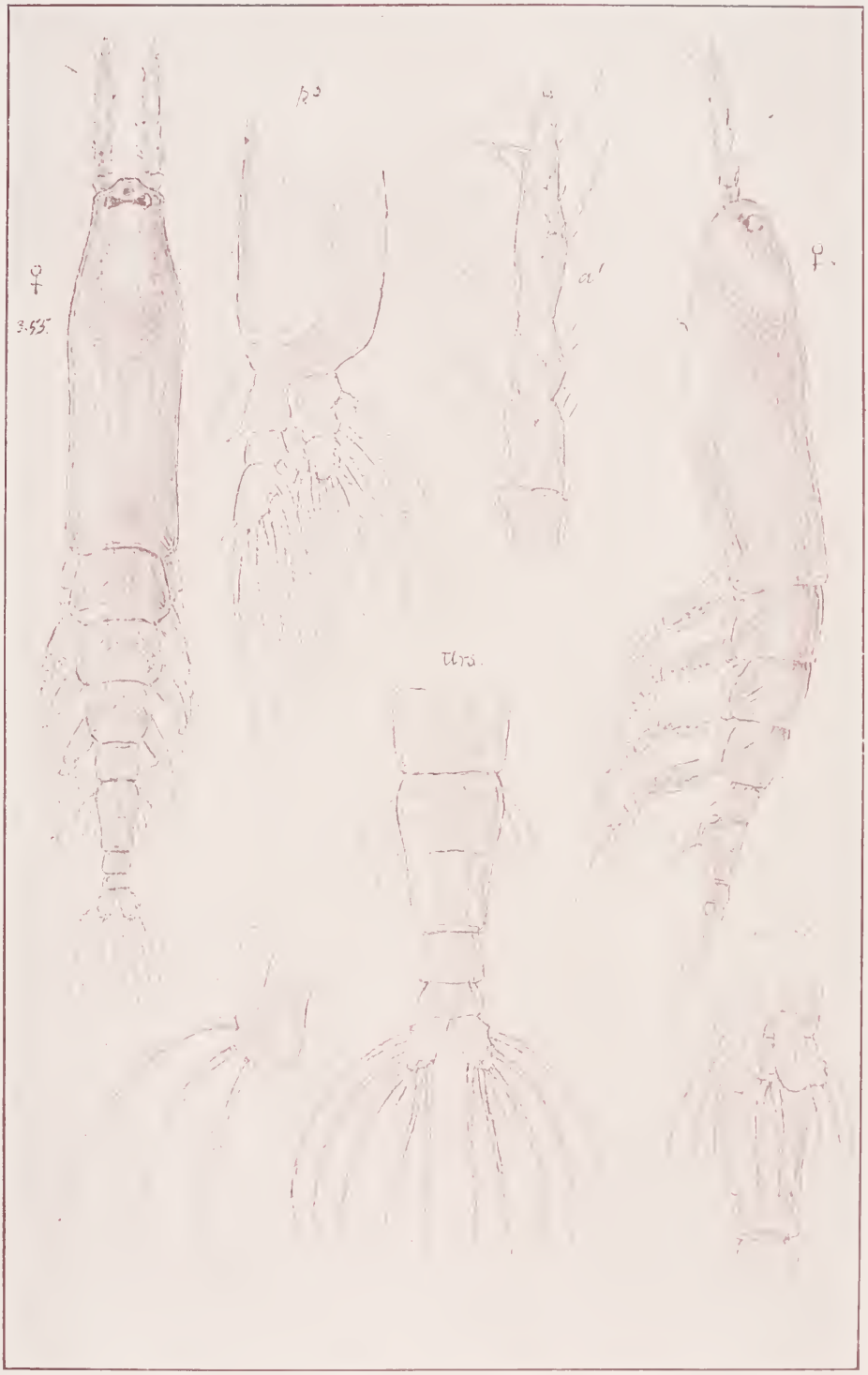
G. O. Sars del.

Monstrilla clavata, G. O. Sars



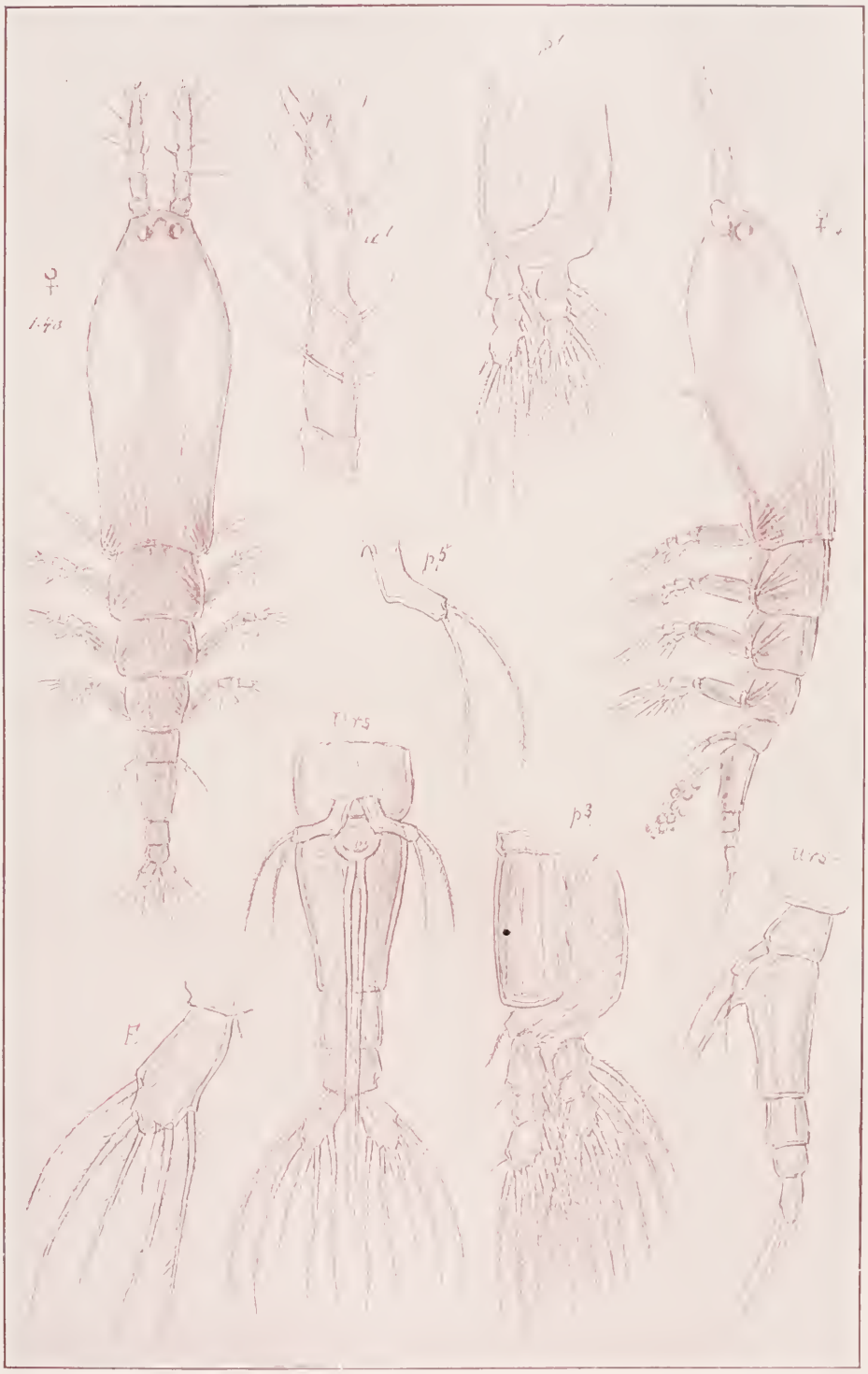
G. O. Sars del.

Monstrilla leucopis, G. O. Sars



G. O. Sars del.

Monstrilla gracilicauda, Giesbr.



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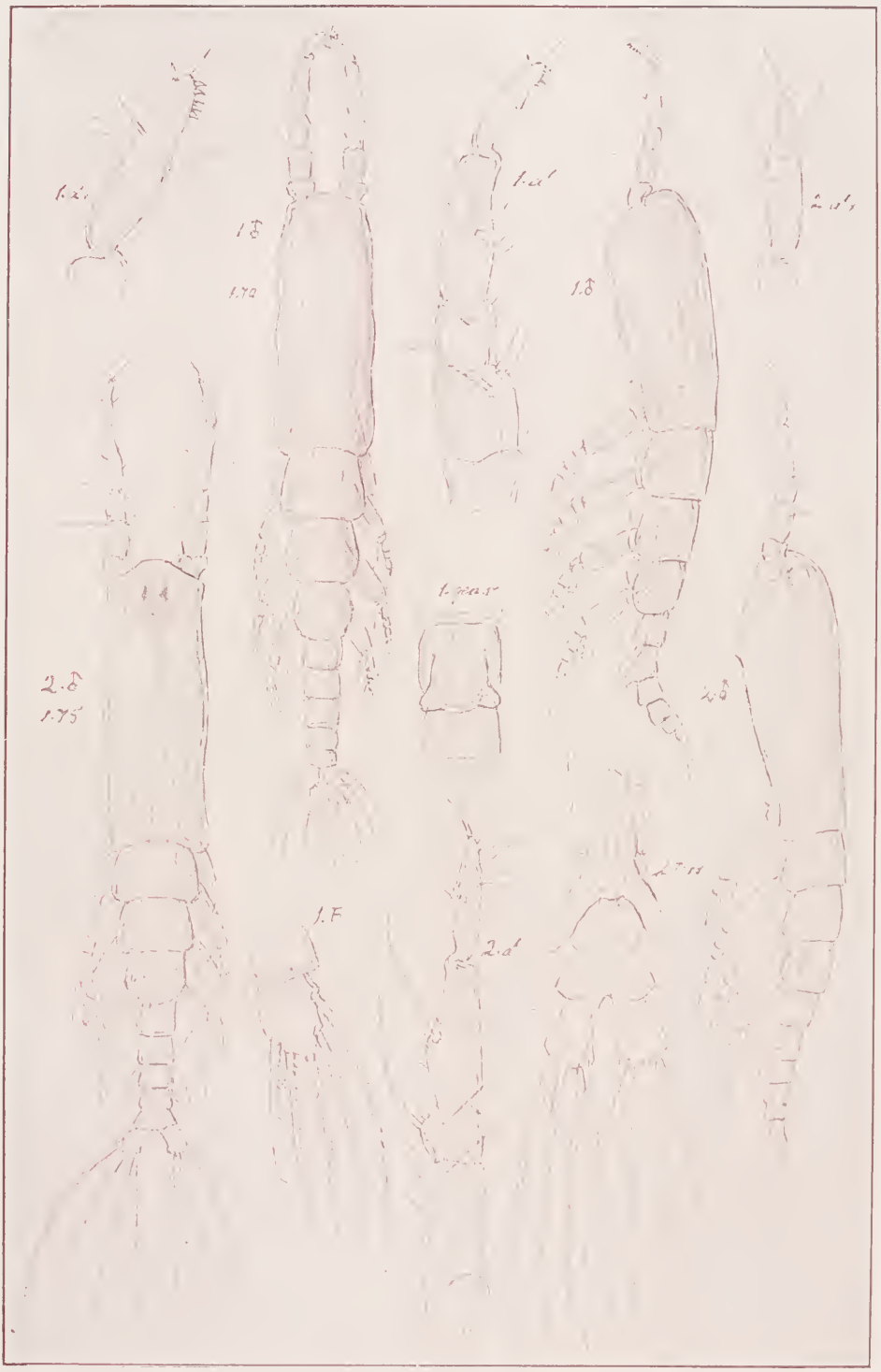
Monstrilla helgolandica, Claus

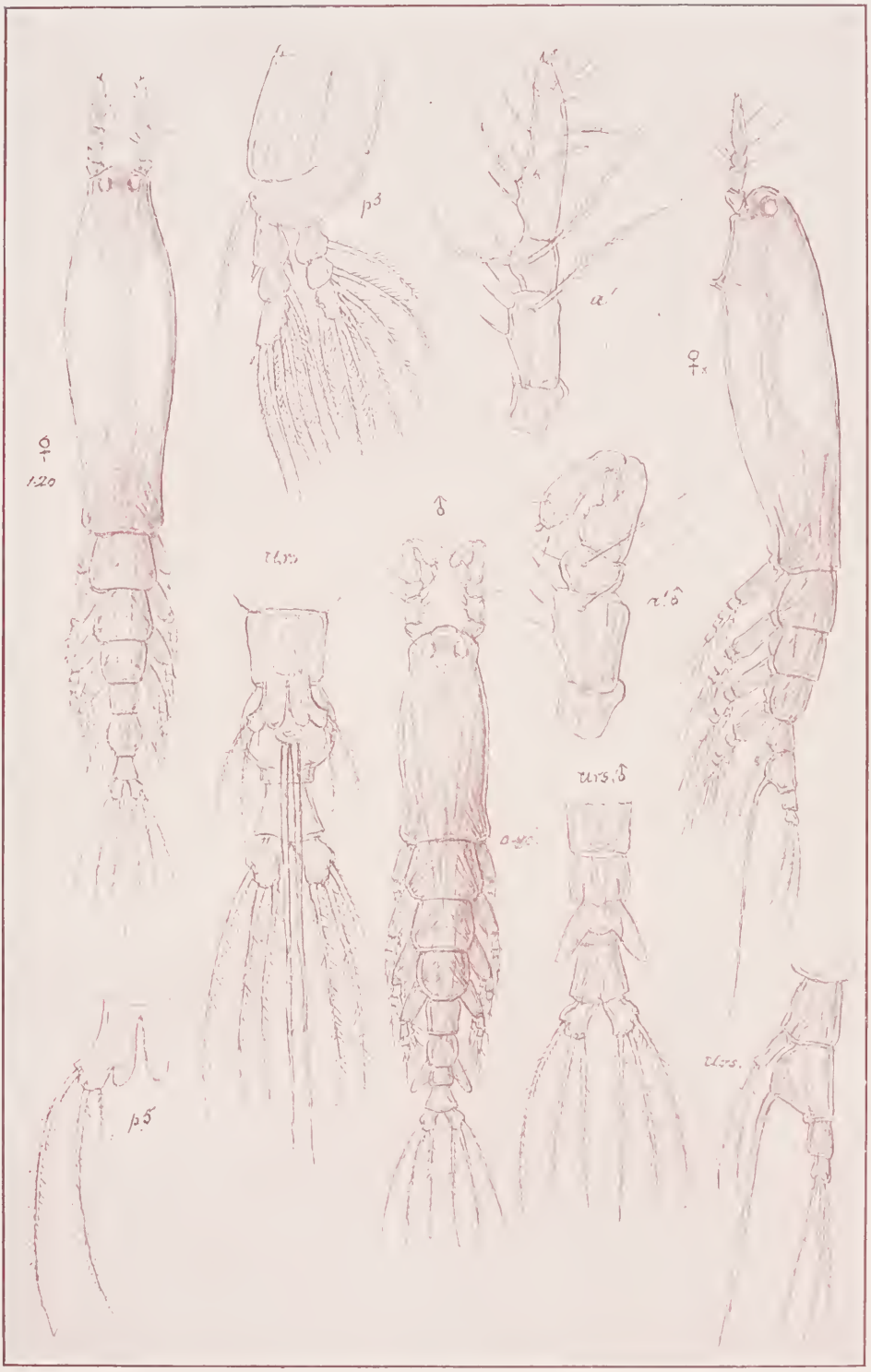


G. O. Sars del.

1. Monstrilla serricornis, G. O. Sars. ♂
2. Cymbasoma rigidum, Thomps. ♂

G. O. Sars del.

Cymbasoma rigidum, Thomps.



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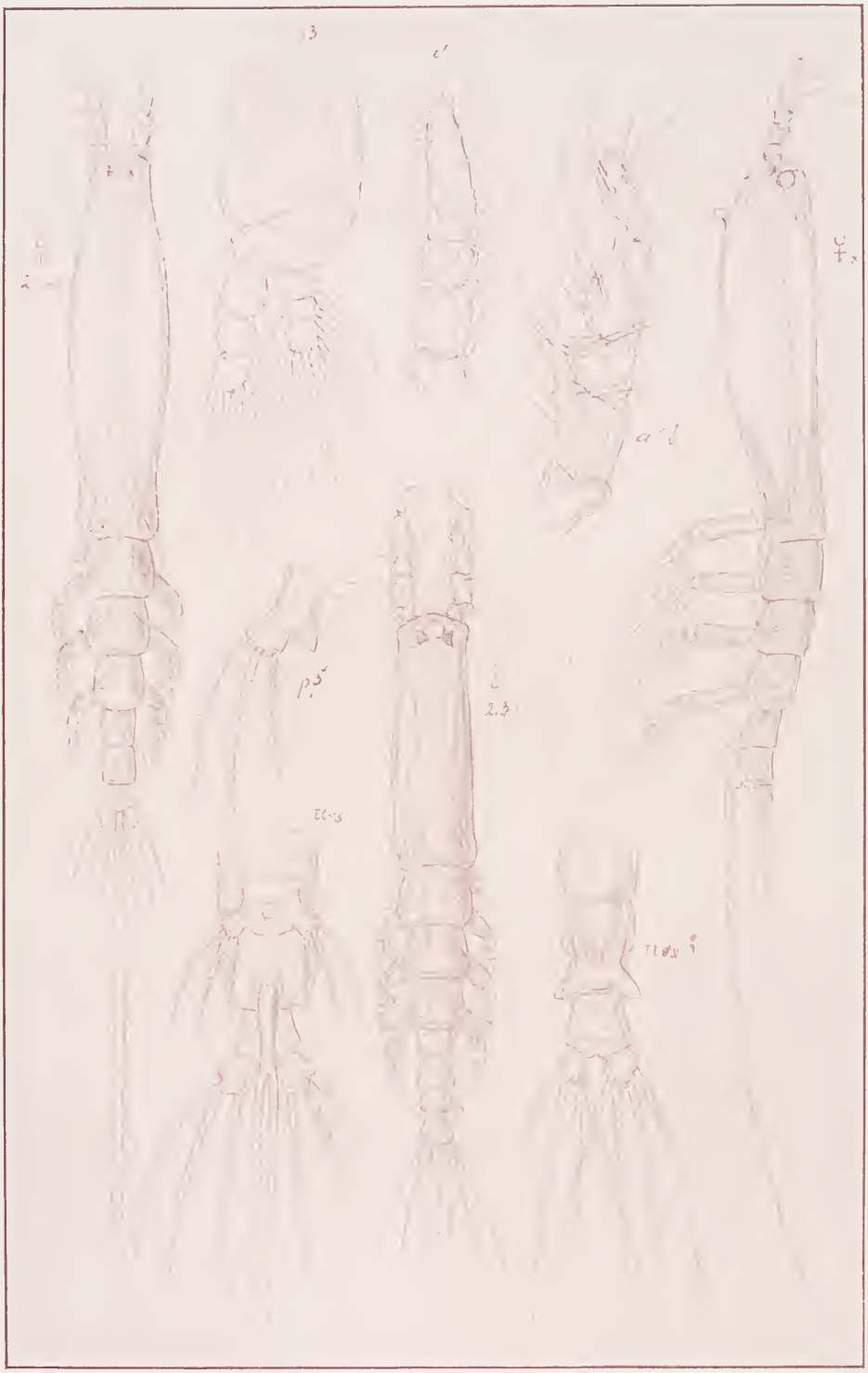
Cymbasoma Thompsoni, (Giesbrecht)



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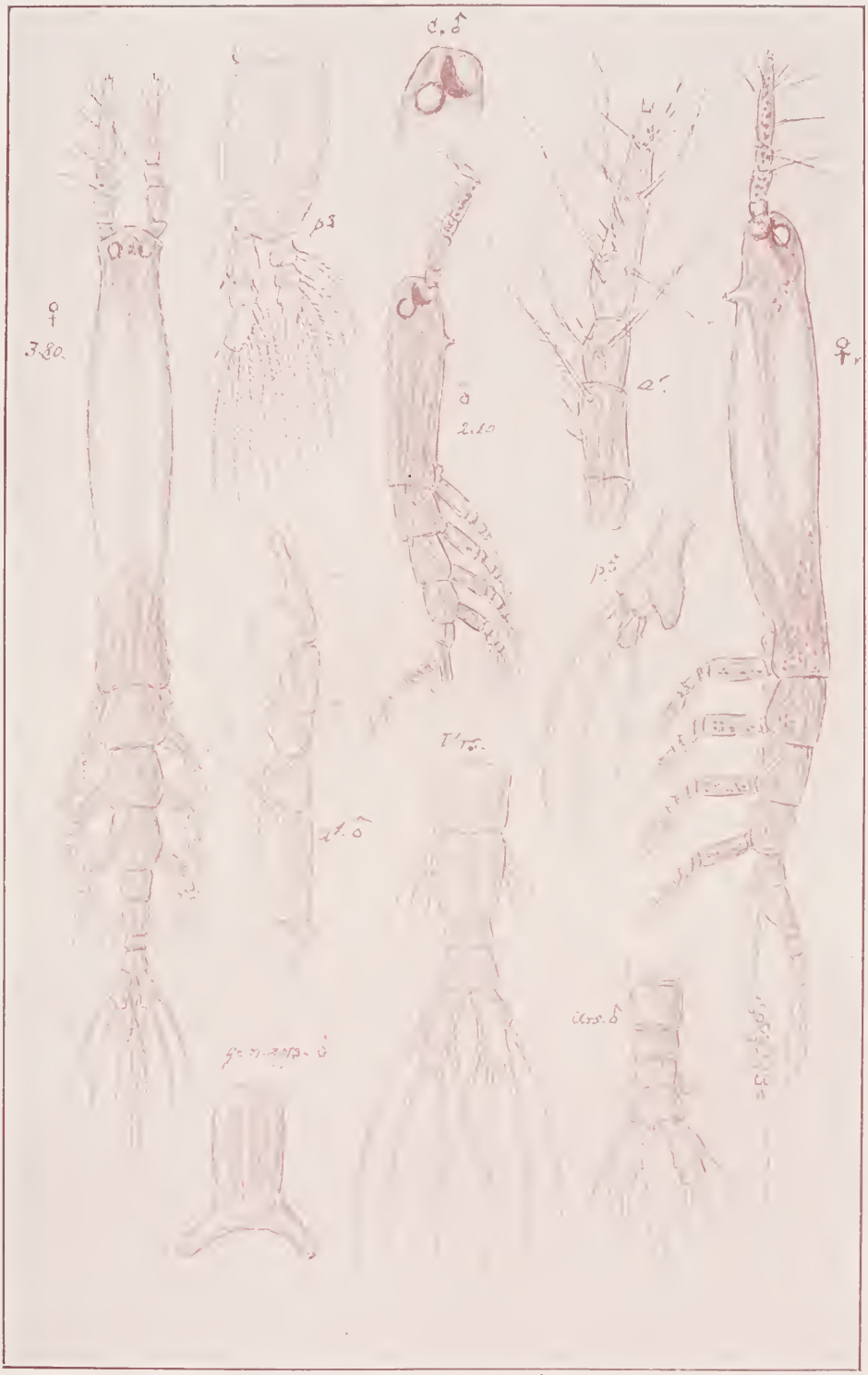
Cymbasoma longispinosum, (Bourne)

Copepoda



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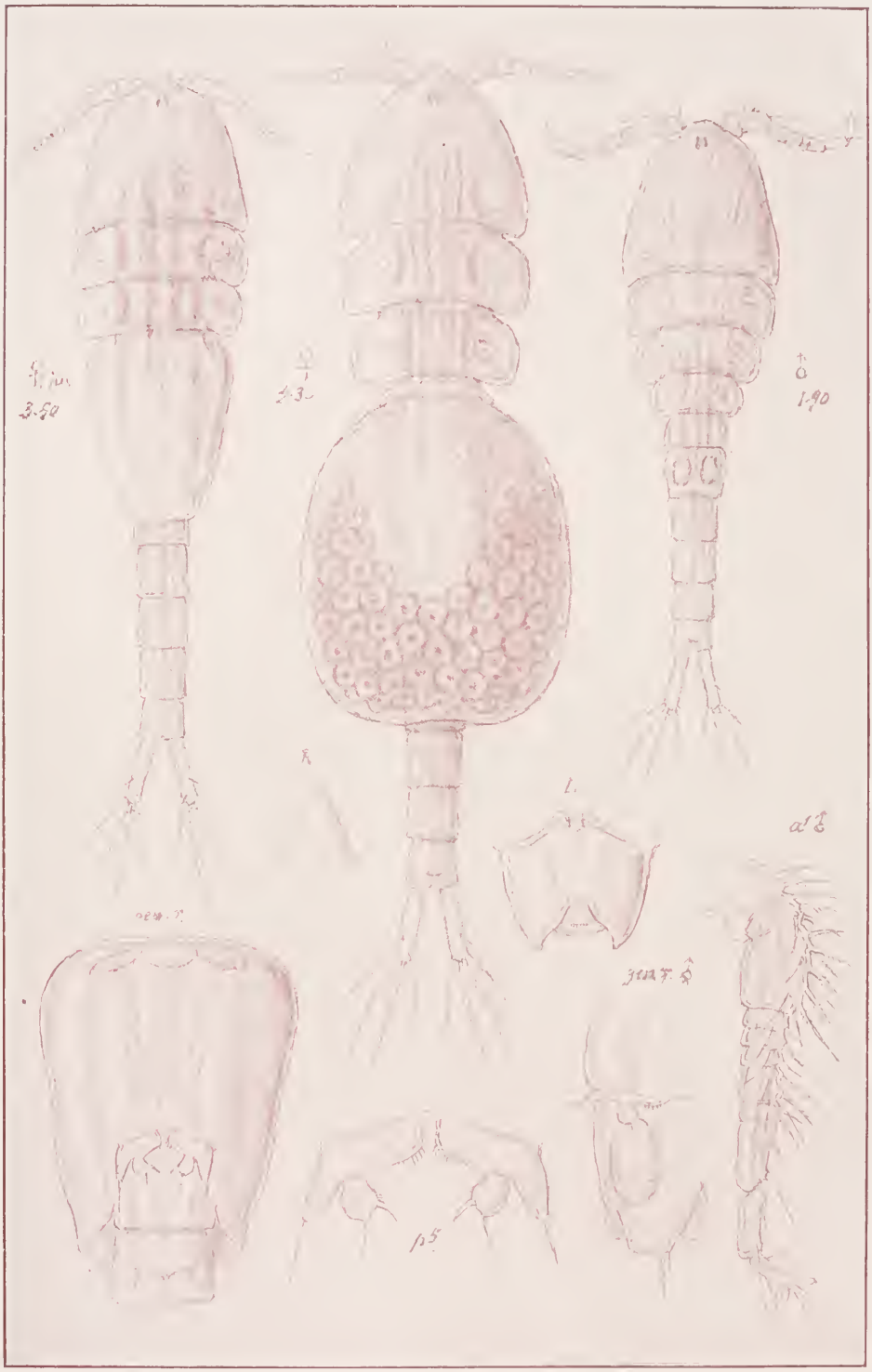
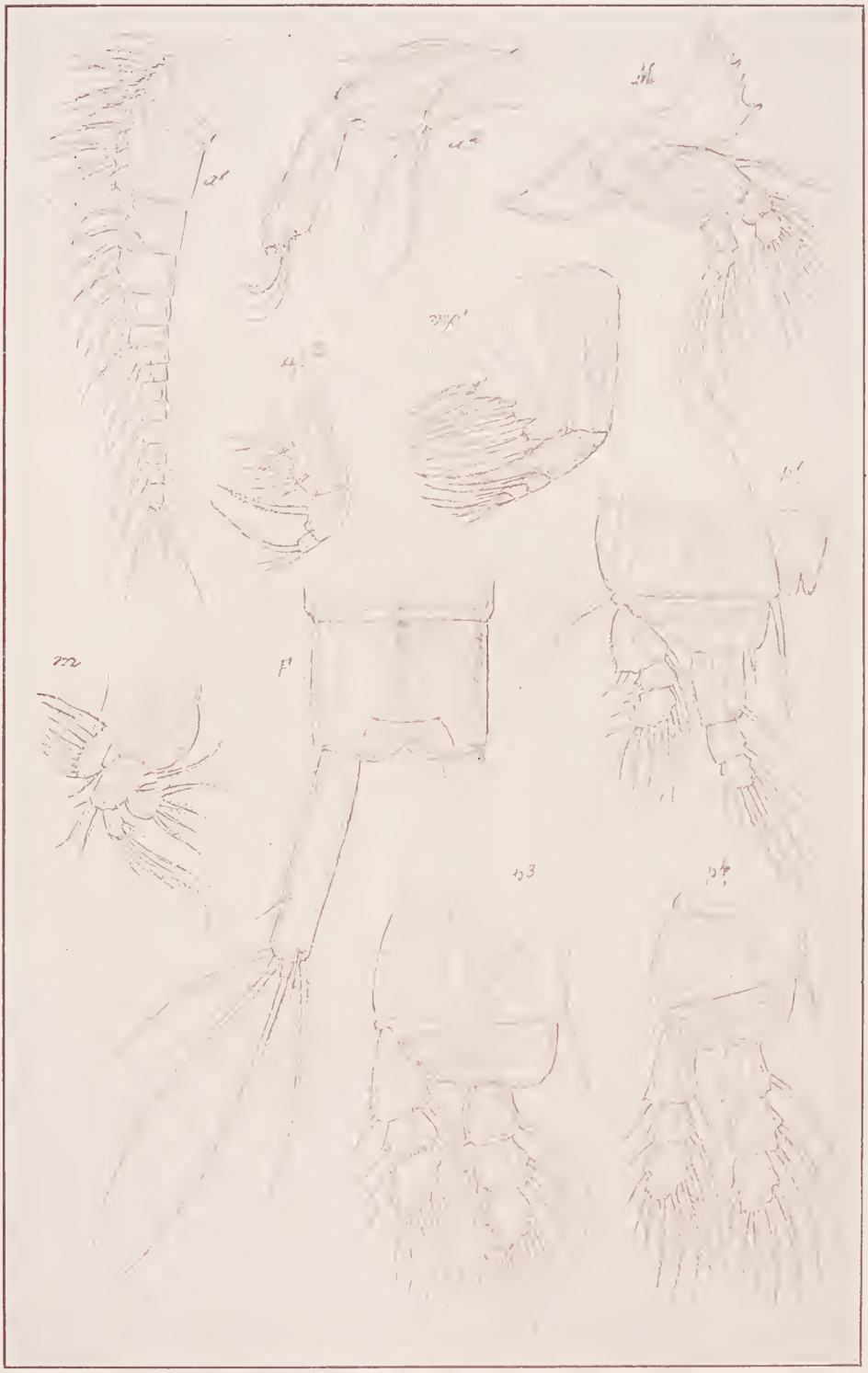
Monstrillopsis dubia, (Scott)



G. O. Sars del.

Notodelphys Allmani, Thorell



G. O. Sars del.

Notodelphys Allmani, Thorell
(continued)

AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

WITH SHORT DESCRIPTIONS AND FIGURES OF ALL THE SPECIES

BY

G. O. SARS

VOL. VIII

COPEPODA

MONSTRILLOIDA & NOTODELPHYOIDA

PARTS III & IV

NOTODELPHYIDÆ (concluded), DOROPYGIDÆ, BUPRORIDÆ, ASCIDICOLIDÆ

WITH 16 AUTOTYPIC PLATES

BERGEN
PUBLISHED BY THE BERGEN MUSEUM

SOLD BY
ALB. CAMMERMEYERS FORLAG, CHRISTIANIA
1921

and may moreover be recognised by the relative length of the caudal rami, by the shape of the incubatory pouch in the female, and, when examined in the living state, also by the colour of the ripe ova. It may be, that Allman has had before him specimens of this form, but as he has evidently combined in his species *N. ascidicola* several other very different forms, I agree with Thorell in the discarding of the specific name proposed by that author. The form recorded by Buchholtz from the Mediterranean under the name of *N. mediterranea* I am unable to distinguish from the present species.

Occurrence.—I have met with this species in many different places on the Norwegian coast, from the Christiania Fjord to Finmark (Hammerfest). It occurs, often in considerable number, within the branchial cavity of several kinds of simple Ascidians, being generally found attached by the aid of the posterior antennæ to the inner wall of that cavity. When losened from its hold, the animal moves quickly about in the usual jerking manner observed in most Cyclopoida; but very soon it again get hold of some other place. Male specimens are much more scarce than female ones, and indeed among the numerous specimens of this species collected, I have only succeeded in finding 3 or 4 males.

Distribution.—Coast of Bohuslän (Thorell), British Isles (Brady), coast of France (Canu), Mediterranean (Buchholz).

2. Notodelphys rufescens, Thorell.

(Pl. XVII, 1).

Notodelphys rufescens, Thorell, l. c. p. 35, Pl. II, 2.

Specific Characters.—Female. Body comparatively a little more slender than in *N. Allmani*, otherwise of a very similar appearance. Incubatory pouch oval in outline, with the posterior extremity evenly rounded. Caudal rami scarcely twice as long as the anal segment, and rather narrow, sublinear in form, with the apical setæ comparatively shorter and less divergent than in *N. Allmani*; bristle of outer edge more remote from the apex. Anterior antennæ almost exactly as in that species. Posterior antennæ however comparatively less slender, with the terminal joint not nearly attaining the length of the other 2 combined. Oral parts and natatory legs very like those parts in *N. Allmani.* Last pair of legs likewise very similar, though having the proximal joint comparatively less broad, and the distal joint of a more irregular shape.

Body, according to Thorell, in the living animal pellucid, of a whitish grey colour, with the ovarial tubes and the ripe ova pale reddish.

Length of adult female attaining 4.20 mm.

Remarks.—The present form is so closely allied to *N. Allmani,* that I have had much trouble in finding any more reliable character to distinguish it from that species. It is however of somewhat smaller size, and, on a closer comparison, the caudal rami are found to differ somewhat in their relativ length, and more particularly in the position of the outer-edge bristle, which is conspicuously more remote from the apex than in *N. Allmani.* Moreover the shape of the incubatory pouch is rather different, and, according to Thorell, also the colour of the ovarial tubes and the ripe ova in the living animal.

Occurrence.—A few female specimens of this form were selected from some material collected many years ago off the south coast of Norway. From what species of Ascidia they were derived, I am unable to ascertain. Thorell found it in *A. scabra* Müll. and Aurivillius in *Phallusia obliqva* Alder.

Distribution.—Coast of Bohuslän (Thorell, Aurivillius).

3. Notodelphys cærulea, Thorell.

(Pl. XVII, 2).

Notodelphys cærulea, Thorell, l. c. p. 37, Pl. III & IV, 4.

Specific Characters.—Female. Body conspicuously more slender than in the 2 preceding species, with the anterior division narrower and the posterior more produced. Incubatory pouch oval in outline, with the greatest width somewhat in front of the middle, posterior extremity evenly rounded. Caudal rami rather shorter and broader than in the 2 preceding species, only very slightly exceeding in length the anal segment, and scarcely more than 3 times as long as they are broad; apical setæ comparatively short, bristle of outer edge considerably remote from the apex, being attached nearly in the middle of the edge. Antennæ, oral parts, and natatory legs not exhibiting any marked difference from those appendages in the preceding species. Last pair of legs, however, rather different in shape, the proximal joint being not nearly so broad, with the inner corner less prominent; distal joint rounded in shape and less conspicuously constricted at the base.

Body in the living animal whitish pellucid, with the ovarial tubes and the ripe ova of a bright bluish colour.

Length of adult female attaining 4.30 mm.

Remarks.—The above-described form may be easily distinguished from the 2 preceding ones by the comparatively much shorter and broader caudal rami, and by the position of the outer-edge bristle on these rami. In the living state the female of this species may moreover at once be recognised by the bright bluish colour of the ova included within the incubatory pouch.

Occurrence.—Several specimens of this form have been selected from material collected in different places on the south coast of Norway. Thorell found it rather frequently in *Ascidia venosa*, and Aurivillius records it from *Phallusea virginea*.

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

4. **Notodelphys agilis**, Thorell.

(Pl. XVII, 3).

Notodelphys agilis, Thorell, l. c. p. 40, Pl. IV & V, 6.

Specific Characters.—Female. Body moderately slender, resembling in shape that of *N. rufescens*, but of much smaller size. Incubatory pouch subovaI in outline, slightly widening distally, with the hind extremity broadly rounded. Caudal rami rather slender, nearly twice as long as the anal segment, and somewhat narrowed in their outer part, with the outer edge finely ciliated, the inner smooth; apical setæ of moderate length; bristle of outer edge attached to a distinct ledge in the middle of the edge. Both pairs of antennæ somewhat more slender than in the 3 preceding species. Last pair of legs with the proximal joint rather broad and quite smooth, digitiform process comparatively short; distal joint not at all constricted at the base, and of a somewhat irregular form, with the outer edge angularly bent in the middle and the spine of the inner edge very thin.

Body in the living animal whitish pellucid, with the ripe ova dark fuscous in colour.

Length of adult female scarcely exceeding 3.60 mm.

Remarks.—This form also is most readily distinguished by the shape of the caudal rami, and more particularly by the exactly median position of the outer-edge bristle on these rami. Otherwise it agrees closely with the 3 preceding species.

Occurrence.—I have met with this form in many different places on the Norwegian coast, from the Christiania Fjord to Finmark (Hammerfest). It is found in different kinds of Ascidians, most frequently perhaps in *A. paralello-*

gramma. In its movements it is more active than most other species, and thus deserves the specific name given to it by Thorell.

Distribution.—Coast of Bohuslän (Thorell), British Isles (Brady), coast of France (Canu).

5. Notodelphys tenera, Thorell.

(Pl. XVIII, 1).

Notodelphys tenera, Thorell, l. c. p. 36, Pl. III, 3.

Specific Characters.—Female. Body comparatively slender, with the anterior division somewhat dilated in its anterior part. Cephalic segment exceeding in length the 2 succeeding segments combined, and conically produced in front. Incubatory pouch, when fully developed, of rather a characteristic shape, being almost gibbously dilated in the middle and fully as broad as it is long. Caudal rami rather narrow, and exceeding the anal segment by about $^1/_4$ of their length; apical setæ unusually slender and elongated; bristle of outer edge occurring close to the apex. Both pairs of antennæ conspicuously more slender and elongated than in the other known species. Last pair of legs with the proximal joint short, but rather broad, and having the digitiform process large and extended obliquely outwards; distal joint very narrow at the base, but gradually widening distally, so as to assume a somewhat claviform shape, spine and seta issuing close together from the inner distal corner.

Body in the living animal whitish hyaline, with the ripe ova yellowish red in colour.

Length of adult female 3.20 mm.

Remarks.—The present species may be recognised by the unusual slenderness of both pairs of antennæ and the rather elongated caudal setæ. The shape of the caudal rami and the position of the outer-edge bristle is also peculiar. Another easily observable distinguishing character, not mentioned by Thorell, is derived from the shape of the incubatory pouch, which differs conspicuously from that in any of the other known species.

Occurrence.—I have taken this form occasionally in 3 widely remote localities on the Norwegian coast, viz., Risør, Trondhjem Fjord, and Valdersund on the Nordland coast. The specimens were found in the branchial cavity of *A. canina.*

Distribution.—Coast of Bohuslän (Thorell).

6. Notodelphys elegans, Thorell.

(Pl. XVIII, 2).

Notodelphys elegans, Thorell, l. c. p. 39, Pl. IV, 5.

Specific Characters.—Female. Body less slender than in any of the preceding species, with the cephalic segment comparatively large, considerably exceeding the length of the 2 succeeding segments combined. Incubatory pouch nearly of equal width throughout and obtusely truncated behind. Caudal rami shorter and broader than in *N. tenera,* only slightly exceeding in length the anal segment, and scarcely more than 3 times as long as they are broad; apical setæ comparatively short; bristle of outer edge occurring at a short distance from the apex. Antennæ comparatively far less slender than in the said species, the posterior ones being in particular distinguished by the unusually short and stout terminal joint. Last pair of legs very unlike those in *N. tenera,* the proximal joint being nearly quadrate in form and finely denticulate inside, with the digitiform process extending straight backwards; distal joint broadly oval in form and scarcely at all constricted at the base, spine of inner edge rather strong.

Body of the living animal, according to Thorell, of a pale yellowish hue, with the ripe ova fuscous green.

Lenght of adult female about 3 mm.

Remarks.—This species may be easily distinguished from the preceding ones by the less slender form of the body and the shape of the incubatory pouch. The structure of the posterior antennæ, and more particularly that of the last pair of legs, is also rather peculiar. Moreover the caudal rami, as usual, exhibit some well marked distinguishing characters.

Occurrence.—Two or 3 female specimens only of this form have as yet come under my notice. They were selected from some material collected on the south coast of Norway, the exact locality not being noted. Thorell found this species within the branchial cavity of *Styela intestinalis.*

Distribution.—Coast of Bohuslän (Thorell), coast of France (Canu).

7. Notodelphys prasina, Thorell.

(Pl. XVIII, 3).

Notodelphys prasina, Thorell, l. c. p. 41, Pl. V, 7.
Syn: *Notodelphys pusilla,* Buchholtz.

Specific Characters.—Female. Body comparatively short and stout, considerably dilated in its anterior part. Cephalic segment rather large, and conically produced in front. Incubatory pouch subquadrangular in outline,

being of almost equal width throughout and transversely truncated behind. Caudal rami very short, being scarcely as long as they are broad, and subquadrate in form, with the outer edge densely hairy; apical setæ rather strong, the 2 middle ones considerably longer than the others and conspicuously dilated at some distance from the base; bristle of outer edge occurring close to the apex. Anterior antennæ fully as long as the cephalic segment, and having the setæ rather long and slender. Posterior antennæ of the usual structure, with the terminal joint about the length of the other 2 combined. 1st pair of legs with the rami of nearly equal length, terminal joint of the outer one bent abruptly outwards, at nearly a right angle to the preceding part; joints of inner ramus triangularly produced at the end outside. Last pair of legs very small, with the proximal joint extending inwards as a narrow band-like plate finely spinulose at the edge, digitiform process recurved; distal joint comparatively small and subfusiform in shape, being conically produced at the end, spine of inner edge occurring about in the middle.

Body in the living animal rather pellucid, with the ovarial tubes and the ripe ova of a bright grass-green colour.

Length of adult female scarcely exceeding 1.80 mm.

Remarks.—This is much the smallest of the species here recorded, and may moreover at once be recognised by the very short caudal rami, as also, when examined in the living state, by the bright green colour of the ovarial tubes and the ripe ova. The form recorded by Buchholtz from the Mediterranean under the name of *N. pusilla* is quite certainly identical with Thorell's species.

Occurrence.—I have taken this form, often in considerable number, from the branchial cavity of several kinds of Ascidians, most frequently however in *Phallusia mentula.* It seems to be distributed along the whole south and west coasts of Norway, at least to the Trondhjem Fjord.

Distribution.—Coast of Bohuslän (Thorell), British Isles (Brady), Mediterranean (Buchholtz).

Gen. 2. **Agnathaner,** Canu, 1892.

Generic Characters.—Body (of male) resembling in shape that in *Notodelphys,* being quite straight, with the anterior division somewhat dilated and well marked off from the posterior; the latter narrow and composed of 5 segments. Caudal rami sublinear in shape, with the normal number of setæ.

Antennæ and legs built on the very same type as in *Notodelphys*. Oral parts however (in male) considerably reduced, so as not to be adapted for mastication. Anterior lip transformed to a somewhat tubular prominence containing the outer part of the gullet. Mandibles with the palp normally developed, biramous, masticatory part however reduced to a short simple point. Maxillæ with the masticatory lobe likewise much reduced, but having the other parts distinctly defined. Anterior maxillipeds without any setiferous lobes inside, and terminating in a single straight spine. Posterior maxillipeds extremely small and rudimentary.

Remarks.—The exact limits of this genus cannot at present be stated, as only the male sex is as yet known. It is very likely to believe that the female will be found to exhibit several essential differences from the male, and it is even not improbable that the structure of the oral parts, upon which the present genus has chiefly been founded, will turn out to be rather different in the female sex. Canu placed this genus, on account of the reduced oral parts, next to the genus *Enterocola*. It is however otherwise very different from that genus, and evidently so closely related to *Notodelphys*, that in any case it ought to be included in the same family with it. Two different species of this genus have been recorded by Canu, both of them only observed in the male sex. The one of these species also occurs on the Norwegian coast, and will be described below.

8. Agnathaner typicus, Canu.

(Pl. IX).

Agnathaner typicus, Canu, Copépodes du Boulonnais, p. 211, Pl. XVII, figs. 1—10.

Specific Characters.—Male. Body rather slender, with the anterior division conspicuously dilated in the middle. Cephalic segment comparatively large, occupying more than half the length of the anterior division, and gradually somewhat contracted anteriorly, frontal part narrowly truncated and produced below to a recurved rostrum. The 3 succeeding segments gradually diminishing in size, and having the epimeral plates somewhat exstant and separated by deep lateral incisions. Last truncal segment very small, with the lateral parts not expanded. Tail rather slender, almost attaining half the length of the anterior division, with the segments gradually diminishing in size behind; 1st segment somewhat swollen, to receive the 2 usual spermatophores. Caudal rami narrow linear in shape and not at all divergent, exceeding somewhat in length the anal segment, and about 3 times as long as they are broad; apical

setæ of very unequal length, the innermost but one being much the longest and nearly attaining the length of the tail, the innermost seta considerably smaller than the outermost; bristle of outer edge attached a little beyond the middle, dorsal bristle near the end of the ramus. Eye well developed. Anterior antennæ of moderate size, not however attaining the length of the cephalic segment, and composed of 13 well-defined joints rather densely clothed with setæ; hinge, as in *Notodelphys*, occurring between the penultimate and antepenultimate joints. Posterior antennæ almost of exactly same structure as in *Notodelphys*. Natatory legs well developed, with both rami 3-articulate and of about equal size, the outer one armed outside and at the tip with slender cultriform spines. Last pair of legs very small and rudimentary, with the proximal joint quite short and produced outside to the usual digitiform process; distal joint rounded, scale-like, with a thin bristle at the tip and a very minute spine inside.

Colour of the living animal not yet ascertained.

Length of the specimen examined 1.15 mm.

Remarks.—Though the figure of the animal (dorsal view) in Canu's work does not fully agrees with that here given, I cannot doubt that these 2 forms are identical, as no obvious difference could be detected in the structure of the several appendages.

Occurrence.—A solitary male specimen of this form was found in some dredged material taken af Grimstad, south coast of Norway, from a depth of about 20 fathoms.

Distribution.—Coast of France (Canu).

Fam. 2. Doropygidæ.

Gencral Characters.—Body of female more or less compressed and curved ventrally, with the anterior and posterior divisions sharply marked off from each other; that of male more slender, with less sharply marked limit between the 2 chief divisions. Head well defined from trunk, and produced in front to a blunt rostral prominence, lateral parts deflexed and rounded off. 1st segment of trunk distinctly defined both in front and behind, but of much smaller size than the succeeding ones. The last 2 trunkal segments in female united, to form dorsally the large and prominent incubatory pouch. Tail

cylindrical in shape, and in most cases only composed of 4 distinctly defined segments. Caudal rami with the setæ much obliterated, in some cases apparently wholly absent, in other cases replaced by curved hooks. Anterior antennæ short and stout, deflexed, with the number of joints more or less reduced; those in male, as a rule, of the very same structure as in female. Posterior antennæ distinctly prehensile, terminating in a more or less strong claw. Oral parts on the whole well developed, though the posterior maxillipeds in some cases may be rather reduced. The 4 anterior pairs of legs, as a rule, not adapted for swimming, and of somewhat different structure in the different genera. Last pair of legs generally less rudimentary than in the *Notodelphyidæ*, rarely quite absent.

Remarks.—This family was proposed in the year 1878 by Prof. Brady, to include the 3 genera *Doropygus*, *Notopterophorus* and *Botachus*, which formerly were referred by Thorell to his family *Notodelphyidæ*. I am of opinion that this family ought to be maintained, although indeed some of the forms apparently exhibit a rather close relationship to the genus *Notodelphys*. However, as indicated in the above-given general characteristic of the family, certain very conspicuous peculiarities are found, which are common to all the forms, and by which the present family seems in reality to distinguish itself pretty well. Several well marked types are comprised within the family, and this has rendered it necessary to establish rather a great number of genera, some of which have been formerly combined within the genus *Doropygus* of Thorell. Seven different genera belonging to the present family will be treated of in the sequel, and 3 other genera, not represented in the Fauna of Norway, are also evidently referable to the same family, viz., *Goniodelphys* Buchholtz, *Doroixys* Kerschner, and *Bonnierilla* Cann. The family thus comprises at present no less than 10 genera.

As to habits, the forms comprised within this family agree with the *Notodelphyidæ* in so far that they, like the latter, lead a symbiotic existence within the branchial cavity of several kinds of Ascidians. Their mobility is however far inferior, and they seem indeed in most cases to be wholly devoid of swimming power, being only enabled to change their place within the branchial cavity of their hosts by a slow ramping motion. This applies not only to the females, but also to the males, with perhaps a single exception, viz., *Doropygopsis longicauda* (see farther below).

Gen. 3. **Doropygus,** Thorell, 1859.

Generic Characters.--Body in female distinctly compressed, and exhibiting a pronounced ventral curvature; that in male more cylindrical in shape, and gradually tapered behind. Incubatory pouch very large and gibbously prominent behind. Tail narrow cylindric in form, and more or less abruptly bent downwards, last segment deeply cleft behind. Caudal rami more or less produced, narrowed distally, and only provided with very small rudiments of setæ. Anterior antennæ of the very same structure in the 2 sexes, being composed of 8 or 9 joints, the first 2 of which are very broad and compressed. Posterior antennæ scarcely shorter than the anterior, but much narrower, and highly chitinised, tapering distally, and armed at the tip with an apparently immobile claw. Mandibular palp with the outer ramus well developed, narrowly exerted at the end, and divided into 4 more or less distinctly defined joints. Endopodal part of maxillæ with a distinctly defined terminal joint. Anterior maxillipeds with the terminal part bi-or 3-articulate. Posterior maxillipeds more or less reduced. The 4 anterior pairs of legs with the basal part very thick and muscular, rami generally 3-articulate and of equal size. Last pair of legs with the proximal joint sub-quadrangular in form and not produced outside to any distinctly defined process, distal joint more or less slender, sub-linear in shape.

Remarks.—The present genus, being that established at the earliest date, must of course be regarded as the type of the family *Doropygidæ.* It is here taken in a more restricted sense than done by Thorell and most other authors, some of the species referred by them to this genus having turned out to represent types of nearly allied genera. In the restriction here adopted, the genus as yet comprises 6 species, 3 of which have been found on the Norwegian coast and will be described below.

9. Doropygus pulex, Thorell.

(Pl. XX).

Doropygus pulex, Thorell, l. c. p. 46, Pl. VI, 8.

Syn: *Doropygus pullus,* Buchholtz.

Specific Characters.—Female. Body comparatively short and stout, with the anterior division, seen laterally, oblong oval in form and somewhat widening distally. Incubatory pouch gently curved and greatly prominent behind, its posterior part being somewhat exerted and narrowly rounded at the end.

Tail about equalling in length half the anterior division, and apparently composed of 5 segments, the last one cleft by a deep angular insision into 2 diverging triangular lappets, carrying on the tips the caudal rami. The latter nearly twice as long as the anal segment, and of a narrow blad-like shape, tapering distally, and terminating in an obtuse point, on which slight rudiments of 3 or 4 setæ may be observed. Eye very small, but easily observable in the living animal. Anterior antennæ scarcely attaining the length of the head, and apparently composed of 8 joints clothed with comparatively short setæ, some of the joints exhibiting slight traces of a sub-division, the first 2 much larger than the others. Posterior antennæ rather slender and quite smooth, except at the tip, which is armed with a very strong curved claw accompanied by a small bristle. Endopodal part of maxillæ with 3 setæ inside the base; terminal joint comparatively small, quadrangular in form, and only provided with 2 setæ. Anterior maxillipeds with the terminal part well developed, and composed of 3 well defined joints. Posterior maxillipeds much reduced in size, each forming an undivided oval lamella clothed inside and at the tip with a number of thickish plumose setæ. The 4 anterior pairs of legs with the rami comparatively short and broad, the inner one in 1st pair distinctly 3-articulate, in the succeeding pairs however only biarticulate, the 2 outer joints being confluent. Last pair of legs with the distal joint somewhat cultriform in shape, and armed outside near the end with 3 small denticles, apex blunted and, as usual, provided with a spine and a very thin bristle.

Male of very small size, as compared with the female, and having the body gradually tapered behind, though curved in a similar manner. Structure of the several appendages much as in female.

Body of female, when alive, rather pellucid, with a slight whitish gray hue, ripe ova in the incubatory pouch generally of a dark fuscous or violaceous colour.

Length of adult female attaining 3.80 mm.; that of male scarcely exceeding 1.50 mm.

Remarks.—The present species is the type of the genus *Doropygus*, and may be easily recognised by the characteristic shape of the incubatory pouch in the female. The form recorded by Buchholtz from the Mediterranean under the name of *D. pullus* is evidently identical with Thorell's species. On the other hand, are the figures given by Brady on Pl. XXVIII in his monograph scarcely referable to the present species, but more properly to an immuture specimen of *D. porcicauda*.

Occurrence.—I have met with this form in many different places on the Norwegian coast, from the Christiania Fjord at least to the Trondhjem Fjord. It is found, often in considerable number, within the branchial cavity of several kinds of Ascidians. When loosened from its hold, the animal rests nearly immobile on the bottom, lying on the one or other side. Only from time to time it is seen slowly to bend its body and to move the antennæ and legs, without however thereby to be enabled to change its place in any perceptible manner.

Distribution.—Coast of Bohuslän (Thorell), British Isles (Brady), coast of France (Canu), Mediterranean (Buchholtz.

10. Doropygus psyllus, Thorell.

(Pl. XXI).

Doropygus psyllus, Thorell, l. c. p. 49, Pl. VII, 9.

Specific Characters.—Female. General form of the body rather like that in the preceding species, though perhaps still shorter and stouter. Incubatory pouch of very large size and quite evenly rounded behind. Tail scarcely attaining half the length of the anterior division, and, as usual, composed of 4 segments, the last of which, as in *D. pulex*, is cleft into 2 diverging triangular lappets. Caudal rami still more slender than in that species, otherwise of a very similar structure. Anterior antennæ composed of 9 well defined joints, the 1st of which is much the largest, occupying almost half the length of the antenna, 2nd joint much shorter but nearly as broad, and gibbously expanded in front, being armed with 2 short spines in addition to the setæ; the remaining part of the antenna abruptly much narrower and extending at an angle to the first 2 joints. Posterior antennæ very slender, exceeding in length the anterior ones, with the terminal joint considerably produced and somewhat curved, apical claw very small. Endopodal part of maxillæ with 4 setæ inside the base, terminal joint much larger than in *D. pulex* and of rounded oval form, being fringed with 6 plumose setæ. Anterior maxillipeds about as in *D. pulex*. Posterior maxillipeds however more fully developed, being composed of 2 well defined joints, distal joint however rather small, with 3 unequal setæ on the end. 1st pair of legs about as in *D. pulex*, the succeeding pairs however having both rami distinctly 3-articulate and rather slender, joints of outer ramus remarkably produced at the end outside. Last pair of legs with the distal joint comparatively narrower than in *D. pulex,* sublinear in form,

with the outer edge smooth, the inner clothed with a few bundles of small spinules.

Body in the living animal, according to Thorell, of a whitish grey hue, with the ripe ova fuscous green.

Length of adult female 2.30 mm.

Male unknown.

Remarks.—This form exhibits in its general apearance a rather close resemblance to *D. pulex*, and may indeed at the first sight easily be confounded with it. It is however of much inferior size, and, on a closer inspection, is found to differ conspicuously in the shape of the incubatory pouch. In the structural details, moreover, several well-marked differences are found, as indicated in the above diagnosis. The form recorded by Brady as *D. Normani*, seem to be very closely allied to the present species, but, to judge from the figures given by that author, it is scarcely the same species.

Occurrence.—Some few female specimens of this form were selected from material collected, many year ago, on the western coast of Norway, the exact locality not being ascertained.

Distribution.—Coast of Bohuslän (Thorell), coast of France (Canu).

11. **Doropygus porcicauda**, Brady.

(Pl. XXII).

Doropygus porcicauda, Brady, Monogr. British Copepoda, Vol. I, p. 138, Pl. XXVII, figs. 1—9, Pl. XXXIII, figs. 14—16.

Specific Characters.—Female. Body comparatively somewhat more slender than in the 2 preceding species, with the hind edge of the head and the 3 anterior trunkal segments elevated on each side dorsally to a small knob-like prominence. Incubatory pouch of very large size and greatly prominent behind, extending far beyond the limits of the tail, and terminating in an obtuse point. Tail unusually short, scarcely exceeding in length $^1/_3$ of the anterior division, and composed of 4 segments, the penultimate of which exhibits a slight indication to a subdivision; last segment not expanded distally, though, as in the 2 preceding species, deeply cleft behind in the middle. Caudal rami of rather a peculiar shape, being greatly prolonged and terminating in a very flexible thin lash, which may be curled up in a remarkable manner, as indicated in the figure given by Brady. Anterior antennæ rather elongated, being fully as long as the head, and composed of 9 well defined joints, the first 2 of which, as usual, are much the largest, though combined scarcely exceeding half the

length of the remaining very slender part of the antenna; 1st joint provided near the end with 3 remarkably strong and densely plumose setæ, 2nd joint with 2 short spines in addition to the setæ. Posterior antennæ resembling in structure those in *D. psyllus*. Endopodal part of maxillæ with the terminal joint subfusiform in shape, and fringed inside with 5 setæ gradually increasing in length distally, its tip somewhat exerted and carrying 2 subequal setæ. Anterior maxillipeds with the terminal part comparatively short and only composed of 2 joints. Posterior maxillipeds distinctly biarticulate, distal joint slightly constricted near the end. The 4 anterior pairs of legs with both rami distinctly 3-articulate, and gradually increasing in length behind, those of 4th pair remarkably long and narrow, with most of the setæ obliterated. Last pair of legs of a similar structure to those in the 2 preceding species, but of comparatively smaller size.

Colour of the living animal not yet ascertained.

Length of the specimen examined 3.40 mm.

Male unknown.

Remarks.—The present species may at once be recognised by the peculiar structure of the caudal rami, a character which indeed has given rise to the specific name proposed by Brady. The shape of the incubatory pouch is also rather characteristic, and some peculiarities are moreover found in the structural details, as indicated in the above diagnosis.

Occurrence.—A solitary female specimen only of this distinct species has as yet come under my notice. It was obtained, many years ago, at Hvalør outside the Christiania Fjord, and, as far as I remember it, was taken from the branchial cavity of a *Corella paralellogramma*.

Distribution.—British Isles (Brady).

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

Generic Characters.—Body comparatively more slender than in Doropygus, distinctly curved in female, straight in male. Incubatory pouch of moderate size. Tail composed in both sexes of 4 segments, the last not cleft behind. Caudal rami slender and narrow, with the apical setæ less rudimentary than in *Doropygus*. Anterior antennæ in female of a similar structure to that in the said genus; those in male however conspicuously transformed and distinctly prehensile. Posterior antennæ rather unlike those in *Doropygus*, and more resembling in structure those in the *Notodelphyidæ*. Oral parts well developed

in both sexes. Mandibular palp with the outer ramus shorter than the inner, forming a rather broad undivided plate fringed with the usual number of strong plumose setæ. Endopodal part of maxillæ with the terminal joint distinctly subdivided. Posterior maxillipeds composed of 3 well defined joints. The 4 anterior pairs of legs more perfectly developed than in *Doropygus* and apparently adapted for swimming, at least in the male; both rami 3-articulate. Last pair of legs built on the same type as in *Doropygus*.

Remarks.—This new genus is established, to include the form recorded by Aurivillius under the name of *Doropygus longicauda*. A closer examination of this form, and more particularly of the hitherto unknown male sex, has led me to the conclusion, that it more properly should be separated generically from *Doropygus*. The genus, though undoubtedly referable to the present family, exhibits a closer affinity to the *Notodelphyidæ*, than does any of the other genera here treated of, and apears indeed in some respects to form a connecting link between these 2 families.

12. Doropygopsis longicauda, (Aurivillius).

(Pl. XXIII).

Doropygus longicauda, Aurivillius, Bidrag til kännedomen om Krustaceer, som lefva hos Mollusker och Tunicater, p. 18, Pl. III.

Specific Characters.—Female. Body rather slender and only slightly compressed, exhibiting the usual ventral curvature. Head comparatively large, fully attaining the length of the 2 succeeding segments combined, with the lateral edges evenly curved in front, but almost straight in the middle; rostral prominence very small. Incubatory pouch well developed and rather prominent behind, with the extremity quite evenly rounded. Tail about half the length of the anterior division, and narrow cylindrical in form, last segment smaller than the others and nearly transversely truncated at the end. Caudal rami slender and narrow about twice the length of the anal segment, and provided at the obtusely pointed tip with 4 well defined, though comparatively small setæ; 2 minute bristles moreover present on each ramus the one attached to the outer edge at a short distance from the base, the other occurring inside nearer the apex and somewhat dorsally. Anterior antennæ shorter than the head and, as usual, deflexed, being composed of 9 well defined joints rather densely clothed with setæ; 1st joint with 2 very strong plumose setæ near the end; 2nd joint without any spines. Posterior antennæ with the basal and terminal parts sharply marked

off from each other, the former provided at the end of the 1st joint behind with a well developed plumose seta; terminal part a little shorter than the basal one, and provided outside, at some distance from the end, with 2 small juxtaposed setæ; apical claw of moderate size and accompanied by 2 curved bristles. Endopodal part of maxillæ with the terminal joint rather produced and fringed inside with 3 setæ, its outermost part cut off as a well defined apical joint carrying 4 setæ. Posterior maxillipeds with the middle joint well defined, and armed inside with a curved spiniform seta; terminal joint comparatively small and fringed with 4 setæ. The 4 anterior pairs of legs with the rami rather slender and somewhat unequal in size, the inner one being the longer, especially in 1st pair; spines of outer ramus very thin, almost setiform. Last pair of legs with the proximal joint very broad at the base; distal joint slender, sublinear, with the edges somewhat waved and clothed with small hairs and spinules.

Male of smaller size than female, and rather unlike it in its general appearance, the body being very slender, attenuated behind, and quite straight, with the 1st trunkal segment united with the head. Caudal rami still more slender than in female, and having the apical setæ more fully developed and distinctly ciliated. Anterior antennæ built on the very same type as in the male *Notodelphyidæ,* being composed of 10 joints, the last 2 of which are much larger than in female and together form a movable terminal part admitting to be impinged against the preceding part of the antenna. The remaining appendages of exactly same structure as in female.

Body of female, in the living state, of an uniform light reddish hue; ripe ova of a similar, though somewhat darker colour.

Length of adult female attaining 4.50 mm., of male 2.40 mm.

Remarks.—The above described form, the only species as yet known of the present genus, may be easily distinguished from the other Doropygidæ by its comparatively slender and less compressed body, as also by the unusually long and narrow caudal rami. The female is at once recognised as a true Doropygid by the characteristic ventral curvature of the body and the gibbously prominent incubatory pouch. The male, on the outer hand, may on the first sight easily be taken for a Notodelphyid, exhibiting, as it does, a much similar form of the body and a similar transformation of the anterior antennæ.

Occurrence.—Several specimens of this form have been collected by me at different times and in different places, both on the south and west coasts of Norway. Most of the specimens were taken from the branchial cavity of

Phallusia obliqua. The animal, when alive, is rather more mobile than the other Doropygidæ, and even females encumbered with ripe ova are seen, when loosened from their holds, moving to some extent freely in the water, though in a rather clumsy manner. The males are much more agile and are scarcely in this respect overmatched by the Notodelphyidæ. Indeed, one of the male specimens obtained was found out of his host, swimming quickly about together with other free-living Copepoda.

Distribution.—Coast of Bohuslän (Aurivillius).

Gen. 5. **Doropygella,** G. O. Sars, n.

Generic Characters.—Body comparatively short and stout, being scarcely at all compressed. Head remarkably large and broad, produced in front to a deflexed conical rostrum. Incubatory pouch not much prominent. Tail composed in both sexes of 4 segments, the last of which is transversely truncated behind. Caudal rami quite simple, terminating in a blunt point, and without any distinctly defined setæ. Anterior antennæ short and deflexed, with the proximal joints very broad and compressed; those in male not transformed. Posterior antennæ strongly built and nearly smooth, apical claw well developed. Mandibular palp with the outer ramus undivided. Endopodal part of maxillæ with a distinctly defined terminal joint extending outwards along the exopodal lamella. Anterior maxillipeds rather robuste, but with the terminal part poorly developed. Posterior maxillipeds distinctly 3-articulate. The 4 anterior pairs of legs of comparatively small size and not adapted for swimming, basal part broad and flattened, rami in all the pairs 3-articulate, but rather short, with the setæ poorly developed. Last pair of legs small, with the distal joint scale-like.

Remarks.—This genus also is founded upon a single species detected by Aurivillius and referred by him to the genus *Doropygus*. Several peculiarities found in this species, both as regards the outward appearance of the body and the structure of some of the appendages, have however led me to the conclusion, that it more properly ought to be regarded as the type of a separate genus.

13. **Doropygella Thorelli,** (Aurivillius).

(Pl. XXIV)

Doropygus Thorelli, Aurivillius, l. c. p. 45, Pl. V.

Specific Characters.—Female. Body of a rather short and clumsy form, exhibiting the usual ventral curvature. Head unusually large and expanded, exceeding both in height and width the adjoining part of the trunk, seen

dorsally almost semicircular in outline; rostral prominence terminating in a knob-like point. The 3 succeeding segments gradually increasing in size, with the lateral parts not extant. Incubatory pouch subquadrangular in shape and scarcely dilated behind, with the extremity transversely truncated and slightly overlapping the base of the tail. The latter about half the length of the anterior division, with the last segment considerably larger than the preceding one and not dilated distally. Caudal rami comparatively short, scarcely exceeding half the length of the anal segment, and terminating in a blunt point. Eye apparently absent. Anterior antennæ scarcely attaining half the length of the head, and composed of 8 joints, the 3 or 4 proximal ones lamellarly expanded, the 4 outer joints abruptly much narrower. Posterior antennæ with the middle joint somewhat dilated; apical claw well developed and accompanied by 2 very small bristles. Endopodal part of maxillæ with 3 setæ inside the base, terminal joint somewhat fusiform in shape and edged with 6 setæ, 2 of which issue from the strongly convex inner edge, the 4 others from the tip. Anterior maxillipeds with the claw-like spine issuing from the 2nd basal joint very strong, terminal part short, biarticulate. Posterior maxillipeds with the middle joint quite unarmed, terminal joint carrying 3 subequal setæ. The 4 anterior pairs of legs somewhat diminishing in size behind, and wanting the usual plumose seta inside the 1st basal segment; outer ramus in all the pairs larger than the inner and armed outside with strong spines. Last pair of legs with the proximal joint rather broad at the base and provided at the end outside with the usual small bristle; distal joint scale-like, with the outer edge boldly curved, tip provided with a single small bristle.

Male resembling in shape the males of most other Doropygidæ, being however easily recognisable by the large size of the head.

Body in the living animal of an uniform whitish colour.

Length of adult female 2.10 mm., of male 1.50 mm.

Remarks.—The present form may be easily recognised from the other known Doropygidæ by its short and clumsy body, and more particularly by the unusual development of the head and the characteristic shape of the incubatory pouch.

Occurrence.—I have taken this form not unfrequently in several places, both of the south and west coasts of Norway. It is generally found within the branchial cavity of *Phallusia obliqua,* more rarely in that of other kinds of Ascidians. The animal is very slow in its movements, and is quite unable to move freely in the water.

Distribution.—Coast of Bohuslän (Aurivillius).

Gen. 6. **Pachypygus,** G. O. Sars, n.

Generic Characters.—Body of female very stout and compact, and pronouncedly compressed, with the back boldly curved; that of male, as usual, more slender and gradually attenuated behind. Head of moderate size and rather deep. Incubatory pouch large and prominent, more or less exerted at the end. Tail composed in both sexes of 4 segments, the last of which is the smallest and peculiarly produced at the end both dorsally and ventrally. Caudal rami claw-like- curved downwards, and tipped with a stout spine accompanied by a number of smaller denticles. Anterior antennæ comparatively short and stout, with the number of joints somewhat reduced; those in male not transformed. Posterior antennæ quite smooth, terminating in a well developed claw. Oral parts on the whole built on the same type as in the preceding genus. The 4 anterior pairs of legs not adapted for swimming, both rami 3-articulate and rather unequal, the outer one being the larger, and having the setæ more or less obliterated. Last pair of legs resembling in shape those in *Doropygus*.

Remarks.—This genus is established to include the *Doropygus gibber* of Thorell. The generic difference of this form from *Doropygus* was indeed recognised by Giesbrecht; but I am not prepared to consent with him in referring this species to the genus *Notopterophorus* Costa, as it differs very conspicuously not only in the character from which that genus has derived its name, but also in some of the structural details, as seen from the diagnoses here given of the 2 genera. The genus *Goniodelphys* of Buchholtz seems to come very near to the present genus, and should perhaps be united with it.

14. Pachypygus gibber, (Thorell).

(Pl. XXV)

Doropygus gibber, Thorell, l. c. p. 52, Pl. VIII, 11.

Specific Characters.—Female. Body of a very robust and compact appearance, and strongly curved ventrally, with the back boldly arched and the tail more or less bent below the anterior division. Head comparatively short, but rather deep, and produced in front to a short and obtuse rostral prominence. The 3 succeeding segments rapidly increasing in size, the 3rd being exceedingly large and deep; 1st trunkal segment only visible in its dorsal part, being otherwise concealed by the adjoining segments. Incubatory pouch large and prominent, with the hind extremity somewhat deflexed and

angular at the tip, the angle being more prominent in young specimens; enclosed ova very numerous and densely accumulated. Tail not nearly attaining half the length of the anterior division, and slightly tapered distally; last segment rather short and remarkably produced at the end both dorsally and ventrally. Caudal rami of rather a peculiar appearance, forming 2 somewhat claw-like and very mobile lamellæ curving downwards, each armed at the narrowly exerted tip with a stout spine accompanied by 2 or 3 smaller denticles. Anterior antennæ comparatively short and stout, being only composed of 7 joints clothed with rather small curved setæ, the first 2 joints very large and expanded, occupying combined $^2/_3$ of the length of the antenna. Posterior antennæ strongly chitinised, with the terminal joint comparatively short, not even attaining the length of the middle one. Endopodal part of maxillæ with 3 somewhat unequal setæ inside the base; terminal joint extending straight outwards, and fringed on the inner edge with 4 very small setæ, at the somewhat exerted knob-like tip with 3 considerably longer setæ. Posterior maxillipeds rather fully developed, with all the joints setiferous, the last one exhibiting traces of a subdivision. 1st pair of legs with the rami nearly equal-sized, the 3 succeeding pairs however having the outer ramus considerably larger than the inner, with most of the setæ obliterated and replaced by tufts of small spinules. Last pair of legs with the distal joint cultriform, and armed on the inner edge with small denticles.

Body in the living animal of a whitish gray hue, with the ripe ova dark fuscous green.

Length of adult female attaining 5.00 mm.

Remarks.—This is much the largest of the known Doropygidæ, and moreover easily recognisable by its unusually robuste body. The male of this species has been well described and figured by Canu.

Occurrence.—I have met with this form occasionally in several places, both on the south and west coasts of Norway. It is found in several kinds of Ascidians, most frequently perhaps in *Phallusia mentula*. The mobility of the living animal is very restricted.

Distribution.—Coast of Bohuslän (Thorell), British Isles (Norman, Scott), coast of France (Canu), Mediterranean (Buchholtz).

Gen. 7. **Notopterophorus,** Costa, 1852.

Generic Characters.—Body of female strongly curved ventrally, with the free segments of trunk sharply defined and produced dorsally to more or less

prominent wing-like expansions in some instances divided into soft filiform processes; that of male simple cylindric, without any dorsal expansions. Incubatory pouch of moderate size and more or less produced at the end. Tail composed in both sexes of 4 segments, the last of which is simple, truncate at the end. Caudal rami forming 2 compressed pieces curving downwards and each armed on the narrowly truncated end with 4 subequal hooks. Anterior antennæ alike in the 2 sexes, and comparatively more slender than in *Pachypygus*. Posterior antennæ and oral parts built on a similar type to that in the said genus. The 4 anterior pairs of legs however conspicuously differing in the structure of the inner ramus, which in all the pairs is only composed of 2 joints. Last pair of legs comparatively small with the distal joint narrow linear in form.

Remarks.—This genus was established as early as the year 1852 by Costa, and is chiefly characterised by the peculiar wing-like expansions of the free trunkal segments in the female, these expansions attaining in some instances quite an extraordinary development. Otherwise it comes very near to the genus *Pachypygus*, yet differing from it also somewhat in the structure of the legs and that of the caudal rami. Several species of this genus have been recorded by different authors, and chiefly distinguished by the different development of the above-mentioned expansions. As however these expansions appear to be subjected to some variation, the limits between the several species are not always easy to fix exactly. Three Norwegian species referable to this genus will be described below.

15. Notopterophorus auritus, (Thorell).

(Pl. XXVI)

Doropygus auritus, Thorell, l. c. p. 50, II. VII, Pl. VIII, 10.

Specific Characters.—Female. Body moderately slender and gently curved, with the free segments of trunk sharply defined by deep constrictions; wing-like expansions only slightly prominent and quite evenly rounded at the end, those of 1st segment confluent, the others well defined, though contiguous at the base anteriorly. Incubatory pouch not very large, irregularly quadrangular in outline, and terminating behind in an obtuse point. Tail about half the length of the anterior division, and slightly tapering distally, with the last segment the smallest. Caudal rami slightly curved and gradually attenuated distally, with a small bristle somewhat beyond the middle of the upper edge; tip narrowly truncated and armed with 4 hooks of equal size. Anterior an-

tennæ somewhat shorter than the head, and composed of 9 well defined joints, the first 2 of which, as usual, are the largest, though combined not much longer than the remaining part of the antenna. Posterior antennæ rather stout, with the terminal joint much shorter than the middle one; apical claw very strong. Mandibular palp with the outer ramus very short and broad, undivided. Endopodal part of maxillæ with 4 setæ inside the base, one of them much larger than the others; terminal joint fringed inside with 4 small setæ and carrying on the slightly exerted tip 3 somewhat longer setæ. Anterior maxilipeds with the terminal part rather slender, 3-articulate, middle joint considerably longer than the others. Posterior maxillipeds distinctly 3-articulate, with the last joint simple, fringed with 4 setæ. 1st pair of legs with the rami not much different in length, but rather unlike in structure, the inner ones being, as in the 3 succeeding pairs, only composed of 2 joints, the distal one much the larger and clothed with unusually long and slender setæ. Outer ramus of the 3 succeeding pairs longer than the inner and tapered distally, with the 1st joint very large, setæ much reduced, being wholly absent in the 4th pair. Last pair of legs with the distal joint narrow linear in form and provided on both edges with small spinules.

Male much smaller than female and without any traces of dorsal expansions.

Body of female, in the living state, of a pale yellowish brown hue, with the ripe ova fuscous green.

Length of adult female attaining 4.20 mm.; that of male scarcely exceeding 1.40 mm.

Remarks.—This form was described in the year 1859 by Thorell and referred by him to the genus *Doropygus*. In a note to his description he has however alluded to its apparent relationship to the genus *Notopterophorus* of Costa. Indeed, it ought evidently to be referred to that genus, though the dorsal expansions of the body are far less conspicuous than in the other known species.

Occurrence.—The present form is not seldom found in large Ascidians of different kinds. I have noted it from many places on the Norwegian coast, from the Christiania Fjord at least to the Trondhjem Fjord. Like most other Doropygidæ, it is very slow in its movements.

Distribution.—Coast of Bohuslän (Thorell), British Isles (Norman & Scott).

16. Notopterophorus papilio, Hesse.

(Pl. XXVII).

Notopterophorus papilio, Hesse, Ann. Scienc. Nat., ser. 5, Vol. 1, p. 338, Pl. XI, figs. 1—13.

Specific Characters.—Female. Body comparatively more slender than in the preceding species and generally more strongly curved, being moreover highly distinguished by the extraordinary development of the wing-like expansions, which are very delicate, hyaline, and divided at the end into soft threadlike processes. The number of these expansions is 6 in all, the 4 middle ones being arranged in pairs on the 2nd and 3rd trunkal segments, the other 2 forming median plates issuing the one from the 1st trunkal segment, the other from the end of the incubatory pouch. Both these median expansions are somewhat spatulate in form and divided at the end into 3 threadlike processes, whereas only 2 such processes occur on each of the paired expansions. Structure of the caudal rami and of the several limbs almost exactly as in the preceding species.

Male of very small size, and exhibiting an appearance rather unlike that in female, being wholly devoid of any dorsal expansions, and resembling in shape the males of most other Doropygids.

Body of female, in the living state, semipellucid, of a light yellowish gray hue, with the ovarial tubes and the ripe ova dark fuscous in colour.

Length of adult female attaining 4.30 mm.; that of male scarcely exceeding 1.20 mm.

Remarks.—The present species exhibits a most peculiar appearance by the strongly prominent wing-like expansions surrounding the back of the body and extending in different directions. Some variability of these expansions may however be found to occur, and in younger specimens they are, as a rule, much smaller than in fully adults, though always, unlike what is the case in *N. auritus* and *elongatus*, distinctly divided at the end into well-marked threadlike processes.

Occurrence.—I have only met with this remarkable form in a single locality, viz., at Moldøen, west coast of Norway. It was found occasionally in the branchial cavity of large specimens of *Phallusia mentula*. Most of the specimens obtained were of the female sex; but on a closer examination of the collected material, also some few male specimens were detected, one of them still attached to the back of a young female by the aid of his rather powerfully developed posterior antennæ.

Distribution.—Coast of France (Hesse), British Isles (Brady).

17. Notopterophorus micropterus, G. O. Sars, n. sp.

(Pl. XXVIII. 1.)

Specific Characters.—Female. Body comparatively more robust than in *N. papilio*, and more resembling in shape that of *N. auritus*, being gently curved, with the segments very sharply marked of from each other. Wing-like expansions much reduced in size and conspicuously differing in shape from those in both the said species. The foremost expansion, issuing from the 1st trunkal segment, very slight, hood-like, with the edge entire, the 4 succeeding ones each exerted behind in a single thread-like point, the hindmost expansion, issuing from the end of the incubatory pouch, likewise simple, being exerted to a narrow point somewhat curved downwards. Structure of the several appendages scarcely differing from that in the 2 preceding species.

Colour of the living animal not yet ascertained.

Length of adult female 4.10 mm.

Remarks.—Though this form looks very different from *N. papilio*, as described and figured here, I am by no means fully convinced on its real specific validity, and indeed I do not regard it as impossible, that on a closer investigation it might turn out to represent only a peculiar variety of that species. As I however have not found any decided transition between them, I have found it advisable provisionally to record it as a separate species.

Occurrence.—Two female specimens only of this form have as yet come under my notice. They were obtained in the same locality as the preceding species.

Gen. 8. **Gunentophorus**, Costa, 1843.

Syn: Sphæronotus, Claus.

Generic Characters.—Trunkal part of the body in female greatly inflated, with the segments partly confluent, to form the large and prominent incubatory pouch, the cavity of which is prolonged anteriorly over the 2nd and 3rd segments. Head procumbent and well defined from the 1st trunkal segment, terminating in a blunt rostral prominence. Tail nearly straight and only composed of 3 distinctly defined segments. Caudal rami curved outwards and armed at the tip with small denticles. Anterior antennæ very short and compressed, with the joints imperfectly defined. Posterior antennæ distinctly prehensile. Mandibles well developed. Maxillæ with the endopodal part transversally truncated and without any terminal joint. Posterior maxillipeds much reduced, uniarticulate.

1st pair of legs very unlike the others and closely applied to the oral parts, both rami 3-articulate and provided with long plumose setæ. The 3 succeeding pairs of legs apparently immobile and without any armature whatever; outer ramus elongate, 3-articulate, inner very small and peculiarly contorted. 5th pair of legs apparently absent.

Remarks.—This is a very anomalous genus, exhibiting some rather extraneous characters. Yet in some respects, and more particularly in the peculiar composition of the incubatory pouch, it shows an unmistakable relationship to the genus *Bonnierilla* Canu, which is a true member of the present family. The genus as yet only comprises a single species, to be described below.

18. Gunentophorus globularis, Costa.

(Pl. XXVIII, 2)

Gunentophorus globularis, Costa, Fauna del regno di Napoli. Entomostraca, Pl. II.
Syn: Sphæronotus Thorelli, Claus.

Specific Characters.—Female. Body comparatively rather robuste, with the anterior division distinctly curved, the posterior straight. Head not very deep, with the lateral edges scarcely at all curved, and terminating in front in an obtuse corner. 1st trunkal segment short and narrow; the 3 succeeding segments wholly confluent dorsally, to form the greatly prominent, almost hemispherical incubatory pouch; last trunkal segment well defined in its posterior part. Tail considerably exceeding half the length of the anterior division, and cylindric in form, though slightly tapered distally, 1st segment much the largest and a little protuberant below at the base, last segment exhibiting dorsally, somewhat beyond the middle, a slight transverse suture indicating a subdivision of the segment. Caudal rami comparatively small, slightly tapered, and abruptly bent outwards, being armed on the tip with a few very small denticles and on the outer edge, at some distance from the end, with a minute bristle. Eye imperfectly developed, without any lenses, and only represented by an irregular patch of a light yellowish red pigment. Anterior antennæ very short and stout, subtriangular in outline, and only clothed with a few very small bristles, joints imperfectly defined and apparently 6 or 7 in number. Posterior antennæ strongly chitinised and rather powerful, with the terminal joint comparatively short and somewhat tapered distally, apical claw well developed. Mandibular palp with the inner ramus shorter than the outer and less perfectly subdivided. Maxillæ with 4 short, but densely plumose setæ

on the transversely truncated end of the endopodal part. Anterior maxillipeds with the terminal part very short, uniarticulate. Posterior maxillipeds forming each an oval undivided lamella clothed inside and at the tip with a number of thickish plumose setæ. 1st pair of legs with the rami of about equal size, the outer one exhibiting only very slight traces of spines outside, its terminal joint of a somewhat irregular shape, being expanded, inside the insertions of the setæ, to a rounded lobe edged with 3 short denticles. The 3 succeeding pairs of legs much longer than the 1st, and of a very different structure, being apparently quite immobile, as only very slight traces of muscular bands are detected within them; outer ramus considerably produced and conically tapered, inner one extremely small, being composed of a short basal joint followed by a narrow, peculiarly twisted terminal piece, which in the 4th pair is simple, but in the 2 preceding pairs divided by 2 successive circular crests as it were in 3 joints. Of a 5th pair of legs not the slightest trace could be detected in the specimens examined.

Body in the living animal of a pale yellowish grey colour, with a slight bluish tinge; ovarial tubes and ripe ova of a somewhat darker violaceous hue.

Length of adult female attaining nearly 5 mm.

Male unknown.

Remarks. The present form is easily recognisable from any of the other Doropygidæ, both as regards its outward appearance and the structure of the several appendages. The large size of the Norwegian specimens is very remarkable, and could led to the suggestion that they belonged to a species different from that observed in the Mediterranean and on the French coast.[1]) As however no other reliable difference could be detected to distinguish the Norwegian form, I have not felt justified to separate it specifically. The *Sphæronotus Thorelli* of Claus is evidently identical with Costa's species.

Occurrence.—Some few female specimens of this remarkable form were obtained, many years ago, from large specimens of *Phallusia mentula* taken in the upper part of the Trondhjem Fjord.

Distribution.—Mediterranean (Costa), coast of France (Canu), coast of Bohuslän (Aurivillius).

[1]) Canu gives the length of the body to only 2.50 mm.

Gen. 9. **Botachus,** Thorell, 1859.

Generic Characters.—Body of female narrow, sub-cylindrical in shape, with the matrical part remarkably elongate and the incubatory pouch only slightly prominent. Tail short, deflexed, and composed of 4 segments, the last of which is very short and conspicuously produced ventrally. Caudal rami short, lamelliform, and armed at the end with strong claw-like spines. Anterior antennæ comparatively slender, attenuated, and rather densely clothed with setæ. Posterior antennæ with a well developed plumose seta outside the basal part, apical claw rather strong. Mandibular palp with the inner ramus undivided, outer one narrow, sabre-like. Endopodal part of maxillæ with a well defined terminal joint. Anterior maxillipeds with the terminal part well developed, 3-articulate. Posterior maxillipeds small, uniarticulate. The 4 anterior pairs of legs comparatively slender, but not adapted for swimming, both rami 3-articulate, the outer one armed at the tip and outside with very slender spines, setæ on both rami much reduced in number. Last pair of legs very small and rudimentary, resembling somewhat in structure those in the *Notodelphyidæ*.

Remarks.—This is also a very distinct genus, though somewhat less anomalous than *Gunenterophorus*, and more agreeing with the usual Doropygian type. In addition to the typical form described below, another nearly allied species has been recorded by Buchholtz from the Mediterranean under the name of *B. fusiformis*.

19. Botachus cylindratus, Thorell.

Botachus cylindratus, Thorell, l. c. p. 55, Pl. IX, 12.

Specific Characters.—Female. Body extremely slender and narrow, with the anterior division very little dilated and somewhat tapered anteriorly. Head gradually contracted in front and terminating in a nearly horizontal, obtusely rounded rostral plate. 1st trunkal segment very small and partly concealed by the rounded lateral corner of the head. The 2 succeeding segments well defined and slightly increasing in size behind. Matrical part of body, composed of the last 2 coalesced trunkal segments, almost occupying half the length of the body, and of oblong form, with the dorsal face only slightly vaulted and encompassing the comparatively narrow incubatory cavity. Tail very short, scarcely attaining in length $^1/_3$ of the anterior division, and more or less abruptly bent downwards; last segment very small, but produced below to a rather prominent bifurcate lappet. Caudal rami forming 2 vertically placed

lamellæ of sub-quadrangular shape, and armed at the upper corner with 2 strong claw-shaped spines, lower corner produced to an acute prominence accompanied below by a slender bristle. Anterior antennæ angularly bent in the middle, and composed of 9 well defined joints, the first 3 of which are much larger than the others and have the setæ distinctly ciliated. Posterior antennæ rather strongly built and attached to the head by a short and thick basal joint, terminal joint longer than the preceding one and finely ciliated on both edges, apical claw only slightly curved and accompanied by 2 small bristles. Mandibular palp with the basal part narrower than usual, inner ramus lamelliform, undivided, outer ramus more slender and provided in its outer part with 5 setæ, the 2 outermost issuing from a small but well defined apical joint. Endopodal part of maxillæ with the terminal joint somewhat spatulate in form and provided at the end with 3 setæ. Anterior maxillipeds not particularly strong and gradually tapered distally. Posterior maxillipeds forming each an undivided oblong oval lamella clothed at the tip and inside with a number of partly ciliated setæ. The 4 anterior pairs of legs gradually somewhat increasing in length, 4th pair with the outer ramus considerably longer than the inner and having the terminal joint rather produced. Last pair of legs with the proximal joint produced outside to a conical process tipped with a slender bristle; distal joint very small and narrow, with a single apical seta.

Body in the living animal rather pellucid, of a whitish grey hue with the rather large ripe ova dark bluish or purplish.

Length of adult female 2.10 mm.

Male unknown.

Remarks.—The present form is at once distinguished from any of the other known Doropygidæ by its very slender and narrow body, the short and abruptly bent tail, and the shape of the incubatory pouch.

Occurrence.—I have met with this form not unfrequently in several places on the Norwegian coast. It is found in several kinds of Ascidians and, as observed by Thorell, almost exclusively between the lamellæ of the branchial sac, more or less firmly attached to these lamellæ by the aid of its powerful posterior antennæ. When loosened from its hold, the animal rests nearly motionless on the bottom, only a slight bending of the body being perceptible.

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

Fam. 3. Buproridæ.

Remarks.—This very distinct family, established by Thorell, only comprises as yet a single genus, the characters of which are given below.

Gen. 10. **Buprorus,** Thorell, 1859.

Generic Characters.—Body short and stout, unsegmented, and only composed of head and trunk, the tail being wholly obliterated or only present as a trifling rudiment. Ripe ova received into a roomy incubatory cavity formed by the dorsal and lateral walls of the trunk in almost its entire extent, Anterior antennæ short and stout, with the number of joints much reduced. Posterior antennæ not prehensile, the terminal joint being only provided with simple spines, none of which is unguiform. Oral parts of rather simple structure, though apparently well adapted for mastication. The 4 anterior pairs of legs poorly developed, with the rami short and stout, armed at the end with short spines, the outer one biarticulate, the inner one uniarticulate. Last pair of legs forming 2 simple conical prominences tipped with a few small spines.

Remarks.—This genus exhibits some very extraneous characters, by which it seems to distinguish itself very sharply from any of the other genera comprised within the present division of Copepoda, and Thorell was certainly quite right in regarding it as the type of a very distinct family. He was indeed of opinion that this family was even more distinct than his family *Ascidicolidæ*, which latter he merely regarded as a subfamily of the *Notodelphyidæ*. Yet, on a closer examination, it will be found, that the present genus agrees with those treated of in the preceding pages at least in one very essential character, viz., in the presence of an incubatory cavity for the reception of the ripe ova. Such a cavity, on the other hand, does not exist either in the *Ascidicolidæ* or in the other families treated of in the sequel, the ova pured out from the ovarial tubes being here, as in most other Copepoda, accumulated in free ovisacs appended to the body. The reception of the genus *Enterocola* within the family *Buproridæ,* as proposed by Brady, cannot therefore by any means be admitted. The present genus as yet only comprises a single species, to be described below.

20. Buprorus Lovéni, Thorell.

(Pl. XXX)

Buprorus Lovéni, Thorell, l. c. p. 63, Pl. X, 14.

Specific Characters.—Female. Body short and stout, bag-like, with the head subquadrate in form and somewhat exerted, not being however distinctly defined behind, rostral prominence short and obtuse at the tip. Trunk with the dorsal face rather strongly vaulted and almost gibbously prominent in front, seen dorsally, regularly oval or elliptical in outline. Eye wolly absent. Anterior antennæ about the length of the head, somewhat curved, and composed of only 3 distinctly defined joints clothed with comparatively short, partly spiniform setæ, middle joint much the largest, terminal joint abruptly much narrower and scarcely $^1/_3$ as long. Posterior antennæ 3-articulate, with the 1st joint about the length of the other 2 combined, and provided near the end anteriorly with a curved seta, the 2 outer joints firmly connected and forming with the 1st one a geniculate bend; middle joint armed outside with 3 strong spines, the outermost being accompanied by a slender seta; terminal joint shorter than the middle one and armed on the transversely truncated extremity with 3 unequal spines and a simple seta. Mandibles with the masticatory part not much expanded, but divided at the end into several sharply pointed teeth; palp quite rudimentary, being replaced by a single slender seta. Maxillæ with the masticatory lobe well developed and armed with strong spines, palp undivided, with 2 coarse spines at the tip and 2 juxtaposed setæ attached to a distinct ledge of the outer edge. Anterior maxilllipeds composed of 3 joints, the 1st of which is rather large and broad, being provided at the end inside with a narrow cylindrical lobe tipped with 2 slender spines; 2nd joint produced inside to a quite similar bispinose lobe, 3rd joint very small and armed with 3 spines. Posterior maxillipeds undivided, lamellar, and fringed inside in its outer half with 4 spines, each terminating in a blunt point. The 4 anterior pairs of legs of essentially same structure, outer ramus somewhat larger than the inner one and having a short spine outside the 1st joint, distal joint obliquely truncated and fringed at the end with a row of 5 stout spines, inside which another row of somewhat more slender spines is seen, the number of these spines varying in the different legs; inner ramus in all the pairs provided at the end with 5 spines, one of which is attached to the outer edge near the tip. Last pair of legs imperfectly defined at the base, and armed at the narrowly exerted extremity with 4 short spines. Between these latter legs a small triangular prominence occurs con-

taining the anal orifice, and apparently representing a trifling rudiment of the tail.

Body in the living animal of an uniform whitish colour, with the rather large ova, contained within the incubatory cavity, of same colour, but more opaque.

Length of adult female 1.10 mm.

Male unknown.

Remarks.—The above-described peculiar form looks so very different from any of the other known Copepoda, that at the first sight even its reference to that order of Crustacea could be questioned. Indeed, in its outward appearance it more resembles some kinds of *mites,* especially the *Tardigrada.* On a closer examination however it is soon proved to be a true member of the present division of Copepoda, its extraneous appearance being the result of a close adaption to its sedentary life within Ascidians.

Occurrence.—I have found this peculiar form, often in considerable number, within the branchial cavity of different kinds of Ascidians, most frequently in *Phallusia obliqua.* It may however easily escape attention, on account of its small size and inconspicuous colour. The mobility of the animal is almost wholly lost, and the only token of life perceptible is a slight fumbling movement of the antennæ and legs. I have carefully looked over the numerous specimens collected, but have not succeeded in detecting even a single male among them.

Distribution.—Coast of Bohuslän (Thorell).

Fam. 4. Ascidicolidæ.

Remarks.—This family was established by Thorell, to include his genus *Ascidicola,* which indeed exhibits several well marked peculiarities distinguishing it very conspicuously from the other Notodelphyoida. As to the relation of this family to the other known families of the present division of Copepoda, it is evidently more sharply defined from the preceding families than from those treated of farther below, agreeing with the latter in one very essential character not recognised by Thorell, viz., in the absolute absence of any true incubatory cavity for the reception of the ripe ova. As the family only contains a single genus, it may suffice to give the characters of the latter.

Gen. 11. **Ascidicola,** Thorell, 1859.

Syn: Coeliacola, Hesse.

Generic Characters.—Body of female slender, vermiform, with no sharp demarcation between the anterior and posterior divisions. Head well defined from trunk and terminating in a broad rostral plate. The last 2 trunkal segments in female not coalesced. Tail composed in both sexes of 4 segments. Caudal rami simple, not clawed at the end. Anterior antennæ short and thick, alike in both sexes. Posterior antennæ more slender and distinctly prehensile. Oral parts poorly developed and rather differing in structure from those in the other Notodelphyoida. The 4 anterior pairs of legs in female only adapted for crawling, the rami being very short, biarticulate, the inner one armed at the end with exceedingly long and slender spines; those in male of quite normal appearance and well adapted for swimming. Last pair of legs in female transformed to large lamellæ encompassing the genital region of the body, those in male very small and rudimentary. Ripe ova accumulated in 2 juxtaposed ovisacs appended to the dorsal face of the body and arched over by the transformed last pair of legs.

Remarks.—The present genus comprises as yet only a single species, to be described below.

21. Ascidicola rosea, Thorell.

(Pl. XXXI)

Ascidicola rosea, Thorell, l. c. p. 59, Pl. IX & X, 13.

Syn; Coeliacola setigera, Hesse.

Specific Characters.—Female. Body almost perfectly cylindrical in form, the anterior division being very little broader than the posterior. Head slightly contracted in front, and terminating in a broadly rounded rostral plate. The first 2 trunkal segments imperfectly separated, the 2 succeeding ones however well defined. Last trunkal segment not clearly defined from the 1st caudal segment, both having the dorsal face somewhat hollowed to make an underlayer for the ovisacs. Tail very fully developed, exceeding in length the anterior division, and composed of 4 well defined segments gradually somewhat diminishing in size, the penultimate one having the ventral part of the hind edge remarkably thickened and densely clothed with small pricks, last segment transversely truncated at the end. Caudal rami a little shorter than the anal segment, and narrow linear in form, tip somewhat obliquely

truncated and carrying 3 spiniform setæ, the innermost but one much longer than the others, outer edge provided with a well defined seta about in the middle, and the dorsal face with another smaller seta at a short distance from the tip. Eye inconspicuous. Anterior antennæ short and thick, somewhat curved and terminating in a blunt point, each antenna composed of 6 joints densely clothed with comparatively short but rather strong curved setæ. Posterior antennæ rather broad at the base, but rapidly tapered distally, the first 2 joints each armed near the end anteriorly with a slender spine, terminal joint narrow, sublinear in form, and provided with a short spine in about the middle of the outer edge, tip armed with a comparatively small claw slightly curved at the end and accompanied by 2 or 3 small bristles. Anterior lip broad, almost trapezoid in form. Mandibles with the masticatory part divided at the end into several sharply pointed teath, partly bi- or tri-partite; palp very small and apparently undivided with 3 or 4 short setæ at the tip and one considerably larger seta outside, apparently replacing the outer ramus. Maxillæ divided into 2 nearly equal triangular lobes, the inner one representing the masticatory lobe, the outer the palp, both edged with a number of partly spiniform setæ. Anterior maxillipeds only composed of 2 distinctly defined joints, the proximal one rather large and provided inside with a short lobe tipped with 2 small spines; distal joint produced at the end to a strong claw-like spine accompanied outside by another much narrower spine, its outer edge provided with 4 small bristles arranged in pairs. Posterior maxillipeds very small and closely approximate, each forming a narrow somewhat curved lamella, with 3 small setæ at the tip and 2 other similar setæ in about the middle of the outer edge. The 4 anterior pairs of legs of essentially same structure, with both rami biarticulate, the outer one somewhat incurved and without any setæ inside, but armed outside and at the tip with strong spines; inner ramus carrying on the extremity 3—4 exceedingly long and quite smooth spiniform setæ extending backwards along the median line of the belly. Last pair of legs transformed to 2 very large curved lamellæ [1]) encompassing the middle part of the body and completely arching over the ovisacs. The latter closely juxtaposed and of oblong oval form, reaching nearly to the end of the 1st caudal segment. Ovarial tubes very conspicuous in the living animal, and extending far into the tail.

Male of very small size, as compared with the female, and rather unlike it in its outward appearance, the body being somewhat depressed in its anterior

[1]) It is the merite of Canu to have given a right interpretation of these lamellæ, the significance of which was wholly miscomprehended by Thorell and most other authors.

part and gradually attenuated behind, with the head comparatively of larger size. Antennæ, oral parts, and caudal rami of exactly same structure as in the female. Legs however very different, the 4 anterior pairs exhibiting quite a normal structure, with both rami 3-articulate and armed in the usual manner, being all well adapted for swimming. Last pair of legs very small, knoblike.

Body of female, in the living state, of a light reddish hue, with the ovarial tubes and the ripe ova of a deep rosy colour.

Length of adult female attaining 4.10 mm., that of male only 1.20 mm.

Remarks.—The present form cannot be confounded with any of the other known Notodelphyoidæ, being at once recognised by its slender vermiform body. The specimen described by Thorell as the male of this species, is quite certainly not a male, but an immature female, in which the 5th pair of legs had not yet attained its full development. The form recorded by Hesse under the name of *Coeliacola setifera* is apparently identical with the present species.

Occurrence.— Several female specimens of this peculiar Copepod have been collected by me at different times and in different places on the Norwegian coast. They were found in the branchial cavity of several kinds of Ascidians. Of males I have only as yet come across a single specimen, and this was not found in Ascidians, but freely among some dredged material obtained at Drøbak, upper part of the Christiania Fjord.

Distribution.—Coast of Bohuslän (Thorell), British Isles (Brady), coast of France (Hesse, Canu).

Fam. 5. Botryllophilidæ.

General Characters.—Body more or less distinctly segmented, with the anterior division, as a rule, much broader than the posterior. Ripe ova not received in any incubatory cavity, but accumulated to form one or 2 free ovisacs appended to the dorsal face of the genital segment. Tail cylindric in form, and composed of a varying number of segments in the different genera. Caudal rami armed at the extremity with strong claw-like spines. Anterior antennæ short and compressed, narrowly exerted at the end. Posterior antennæ not prehensile. Oral parts well developed, but rather different in structure from those in the preceding families. Posterior maxillipeds

exceedingly powerful, representing the chief attaching organs of the animal. The 4 anterior pairs of legs more or less reduced and, as least in female, quite unsuitable for swimming. Last pair of legs in female transformed as supports for the ovisacs.

Remarks.—This family is established to include 3 nearly allied genera, to be treated of in the sequel, that of the earliest date being *Botryllophilus* Hesse. The family agrees with the *Ascidicolidæ* in the presence of free orisacs in the female, but differs considerably in the structure of the several appendages, the most prominent difference being the transfer of the affixing faculty to the posterior maxillipeds.

Gen. 12. **Botryllophilus,** Hesse, 1864.

Generic Characters.—Anterior division of body in female very sharply marked of from the posterior and rather tumid, carrying at the end, on each side, the transformed 5th pair of legs. Tail narrow cylindric in form, and composed of 4 well defined segments. Anterior antennæ with the number of segments rather reduced. Posterior antennæ with the middle joint very short, terminal joint elongate and armed with strong spines. Mandibles with the masticatory part considerably expanded, palp biramous with the inner ramus largely developed, the outer very small. Maxillæ with the exopodal lobe obsolete. Anterior maxillipeds comparatively feeble in structure, and divided inside into a number of digitiform lobes, each tipped with a single curved spiniform seta. Posterior maxillipeds very powerfully developed, and pronouncedly prehensile, terminating in a claw-like biarticulate digit. The 4 anterior pairs of legs (in female) with the rami short, uni- or biarticulate, the outer one spiniferous, the inner setiferous. Last pair of legs in female forming 2 narrow setiferous lappets attached to the sides of the last trunkal segment and extending backwards, encompassing between them the single or double ovisac. The latter more or less globular in form.

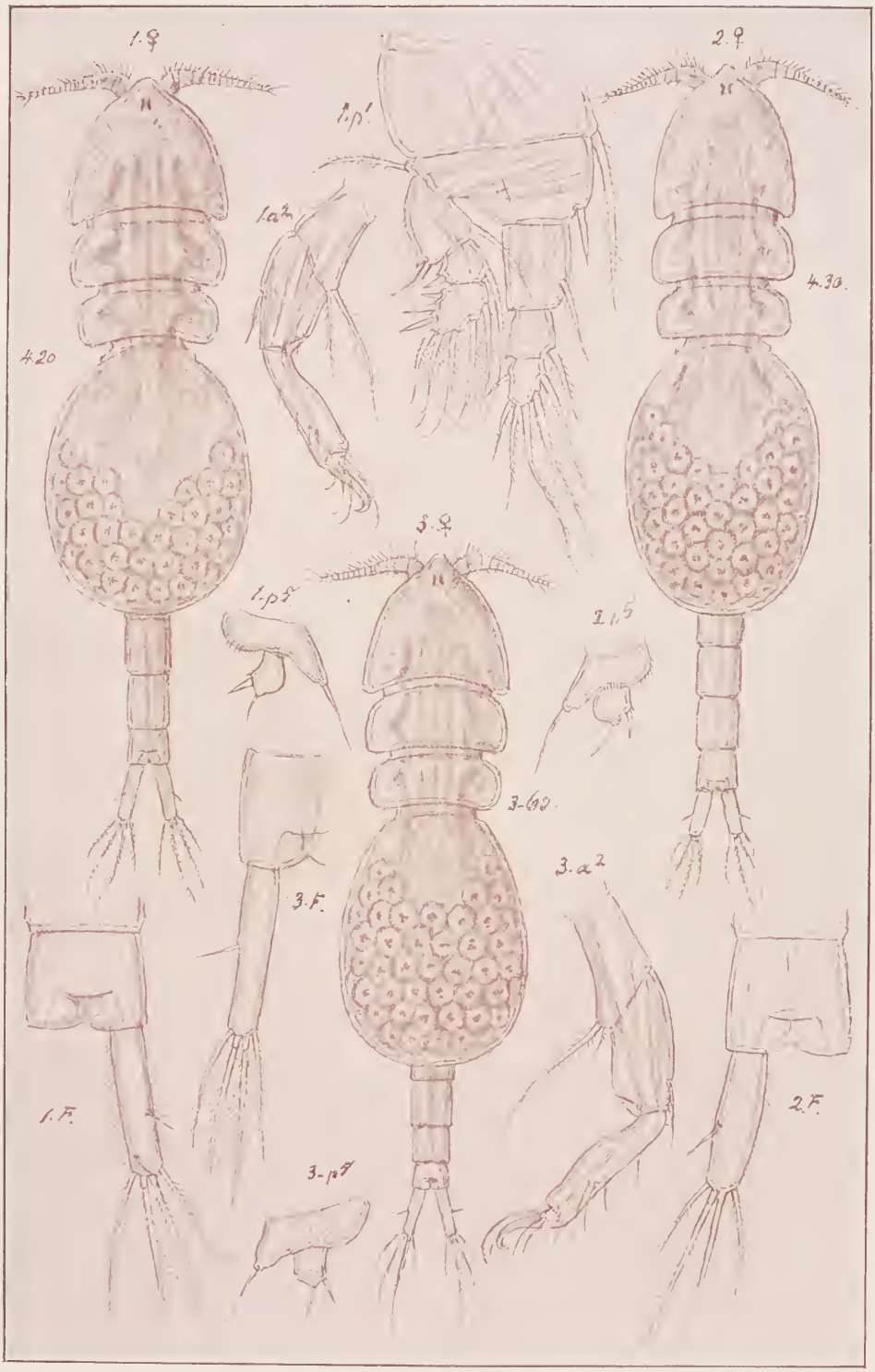
Remarks.—The present genus was established as early as the year 1864 by Hesse, to include a peculiar Copepod *(B. ruber)* found by him within a compound Ascidian *(Botryllus)*. Subsequently 2 forms evidently referable to the same genus were recorded, the one by Scott from the Scottish coast, the other by Canu from the French coast. Scott identified, though with some doubt, the form observed by him with Hesse's species, whereas Canu regarded his form as a new species and described it under the name of *B. macropus*. As

the original description and figures given by Hesse are very imperfect, it remains still questionable, whether the one or the other of these 2 forms should be regarded as identical with *B. ruber* Hesse. I should be inclined to believe that these 3 forms in reality represent as many distinct species. They all however agree in the peculiar shape of the transformed last pair of legs, and this is indeed one of the most conspicuous characters distinguishing the present genus from the other 2 genera treated of in the sequal. Scott has described the adult male of the species observed by him. It is about half the size of the female, and differs from it conspicuously, both as regards the general form of the body and the structure of some of the appendages. Thus the anterior antennæ are densely clothed, especially at the base, with delicate band-like setæ (æsthetasks?), and the legs are built on a quite different type, the 4 anterior pairs being apparently well adapted for swimming. A well defined new species referable to the present genus will be described below.

22. Botryllophilus brevipes, G. O. Sars, n. sp.

(Pl. XXXIII)

Specific Characters.—Female. Body comparatively short and stout, with the anterior division oblong oval in form, and having all the segments confluent, no traces of any dividing sutures being observable. Cephalic part defined from the trunk above by a very slight depression, and gradually contracted anteriorly, being produced in front to a very small, abruptly deflexed rostral prominence. Dorsal face of trunk gently vaulted and abruply curved behind. Tail considerably exceeding half the length of the anterior division, and perfectly straight; 1st segment much the largest and rather tumid in its proximal part; anal segment somewhat longer than the preceding one. Caudal rami short and somewhat curved outwards, being armed at the extremity with 4 strong curved claws. Eye imperfectly developed, though easily observable in the living animal. Anterior antennæ short and compressed, very broad at the base, but rapidly tapered distally, being composed of only 4 joints sharply defined from each other, and clothed with a few rigid setæ issuing from knob-like prominences of the edge. Posterior antennæ a little longer than the anterior and abruptly bent in the middle, 1st joint fully as long as the other 2 combined and perfectly smooth; terminal joint linear in form and armed on the outer edge with 2 strong spines, the obtusely rounded extremity of the joint carrying 3 somewhat smaller spines followed by 2 slender setæ. Mandibles with the outermost tooth of the cutting edge distinctly bifurcate, palp rather

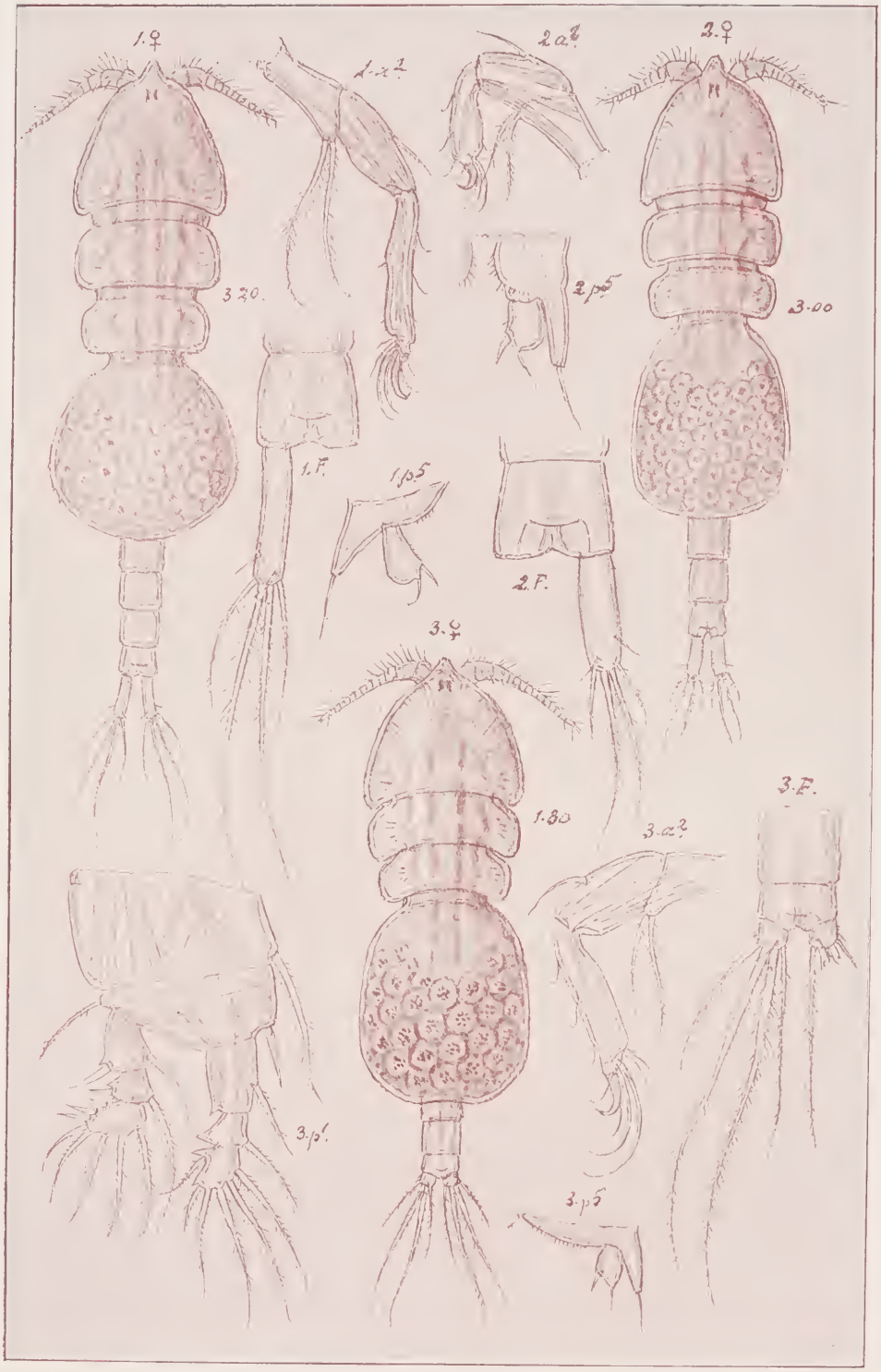


G. O. Sars del.

1. Notodelphys rufescens, Thorell
2. ,, cærulæa, Thorell
3. ,, agilis, Thorell

Copepoda

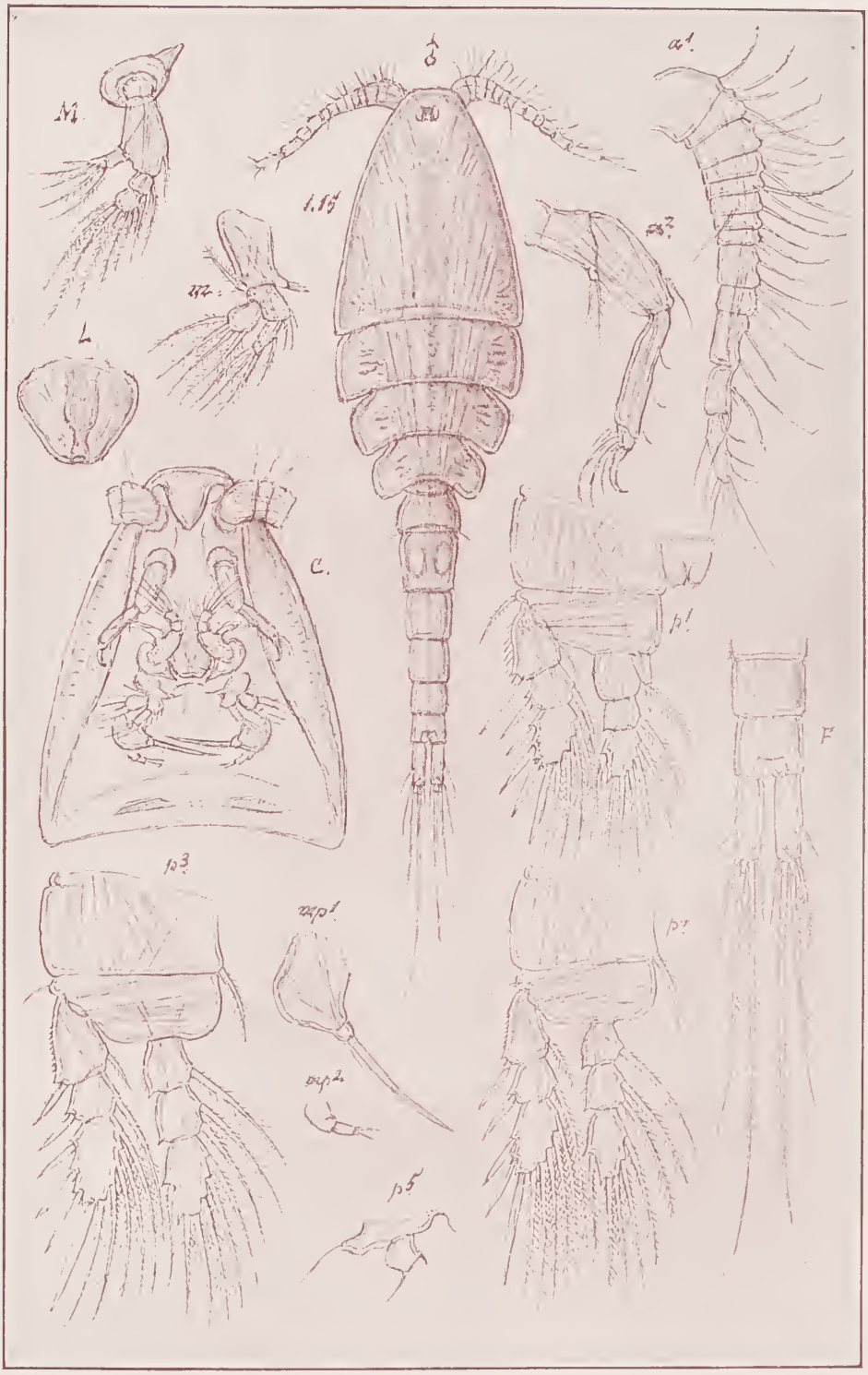
Notodelphyoida



G. O. Sars del.

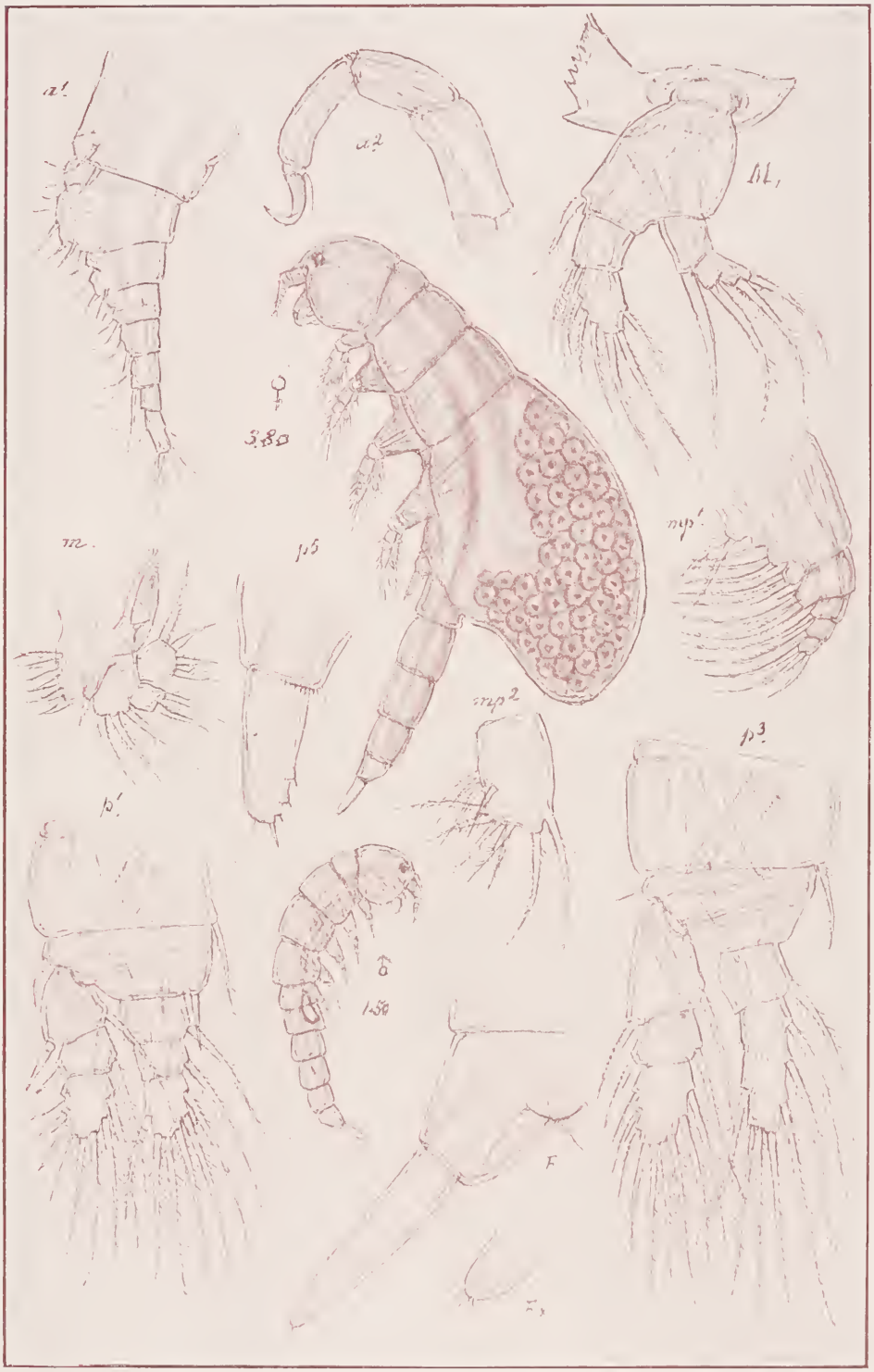
1. Notodelphys tenera, Thorell
2. ,, elegans, Thorell
3. ,, prasina, Thorell

Copepoda



G. O. Sars del.

Agnathaner typicus, Canu



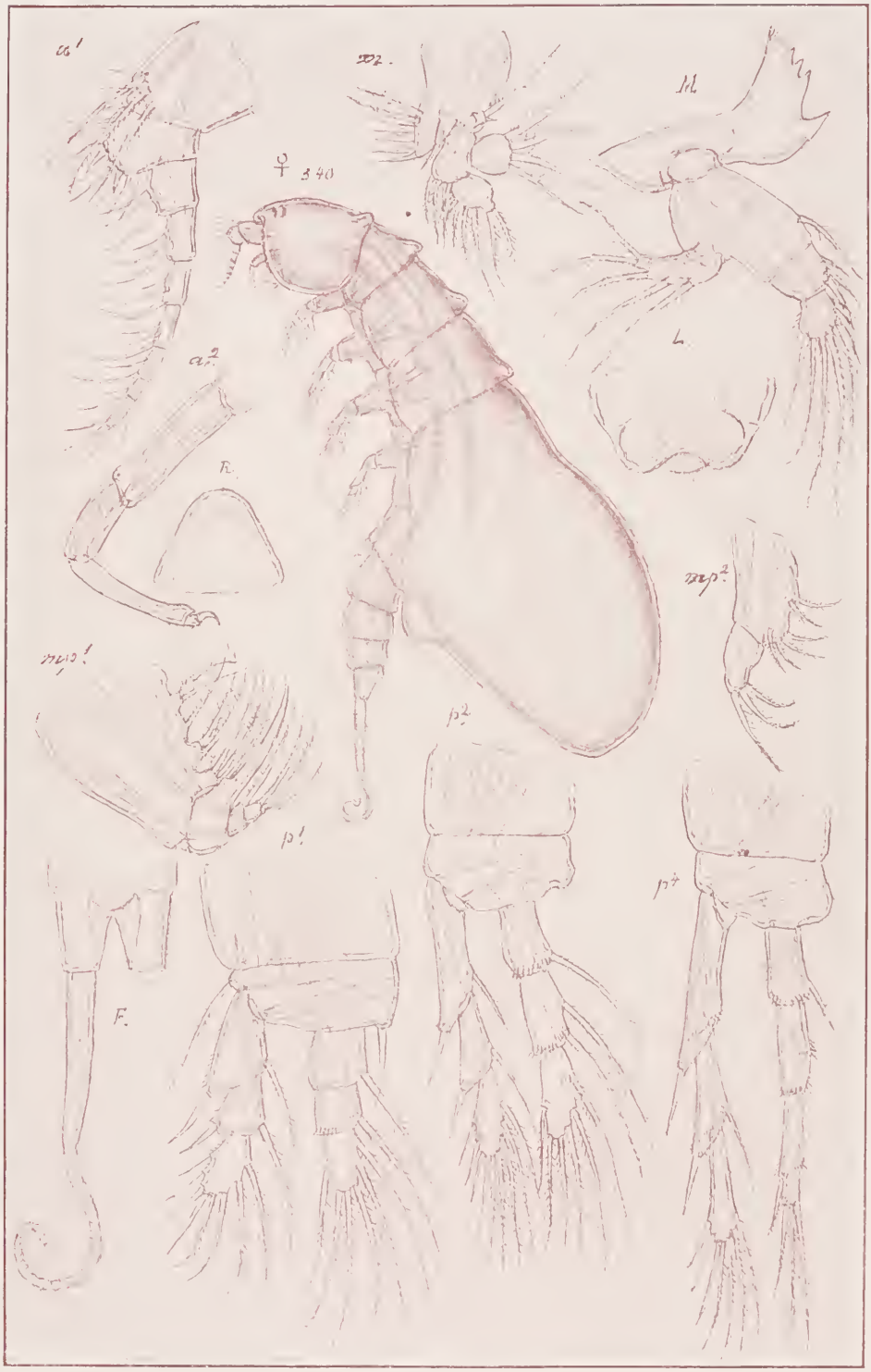
G. O. Sars del.

Doropygus pulex, Thorell

G. O. Sars del.

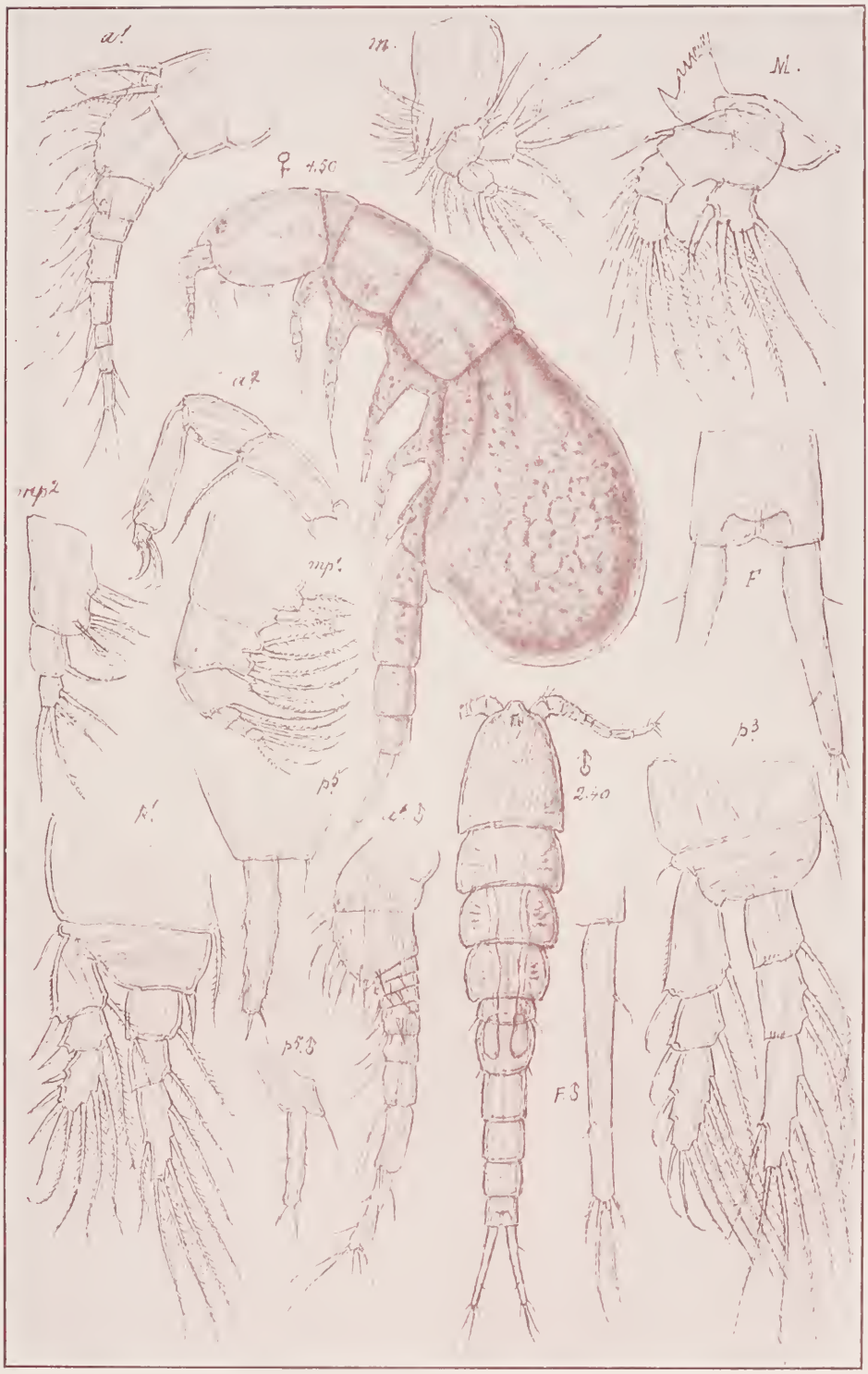
Doropygus psyllus, Thorell

Copepoda



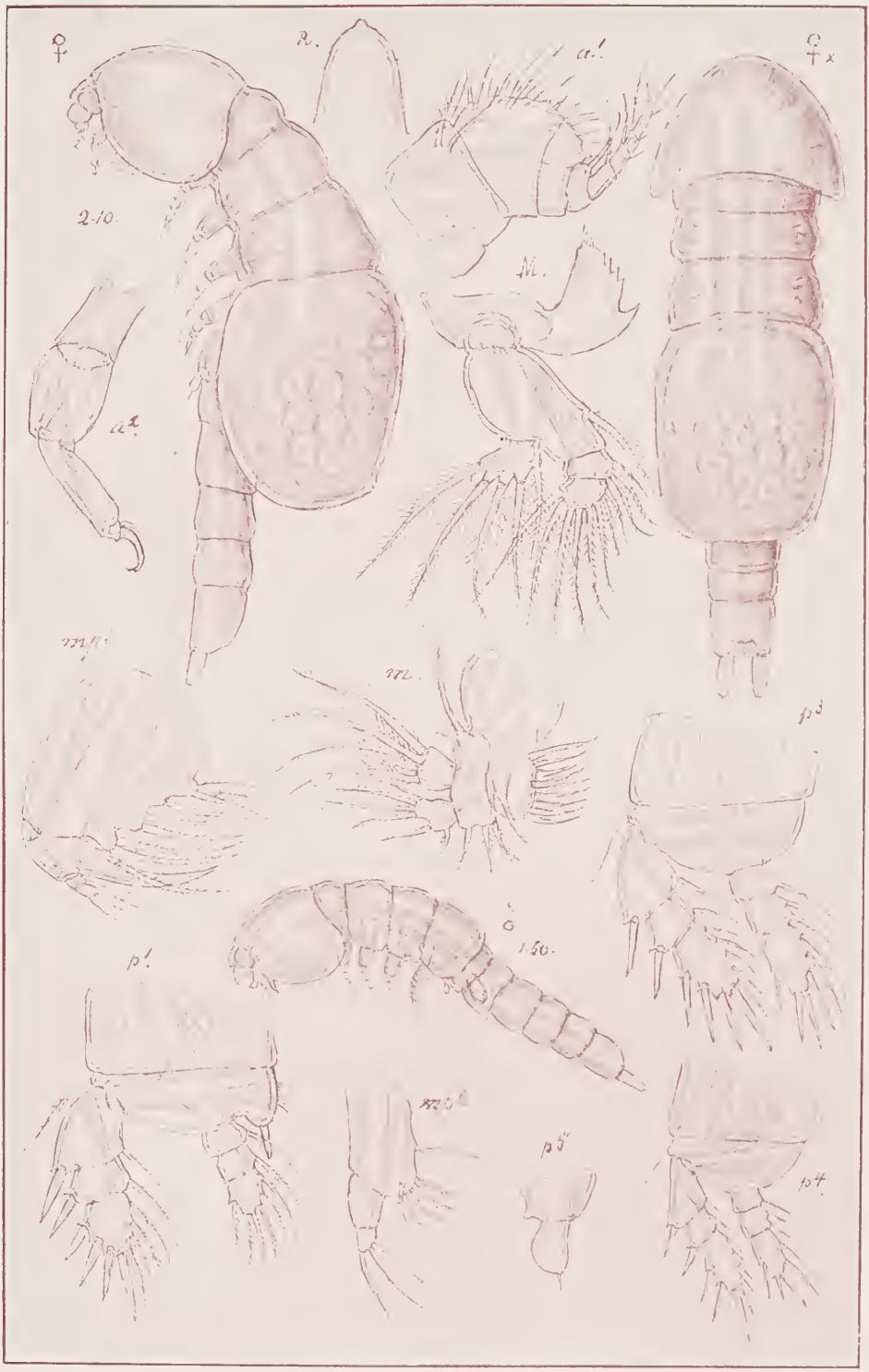
G. O. Sars del.

Doropygus porcicauda, Brady



G. O. Sars del.

Doropygopsis longicauda, (Auriv.)



G. O. Sars del.

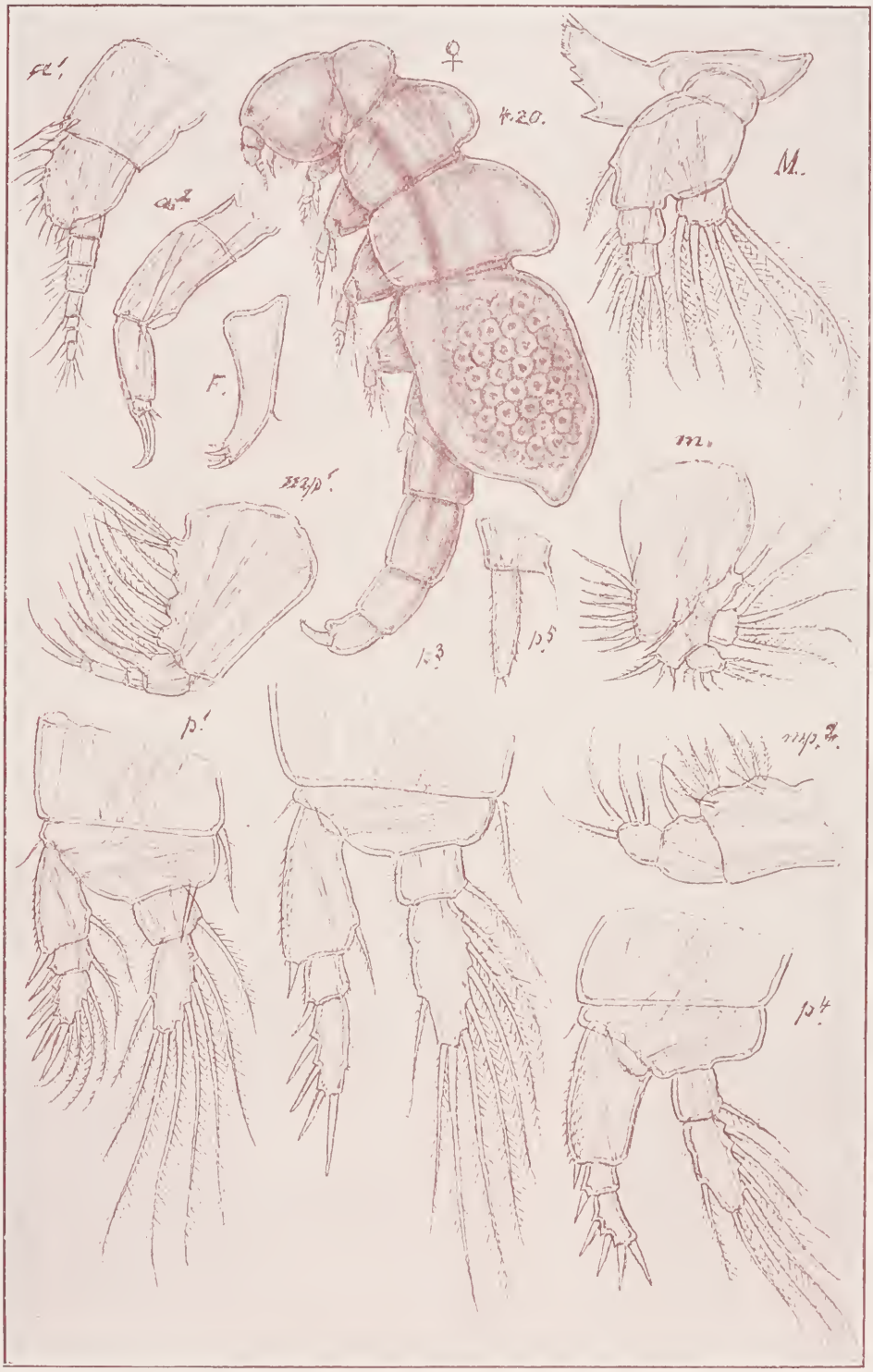
Doropygella Thorelli, (Auriv.)

Copepoda

G. O. Sars del.

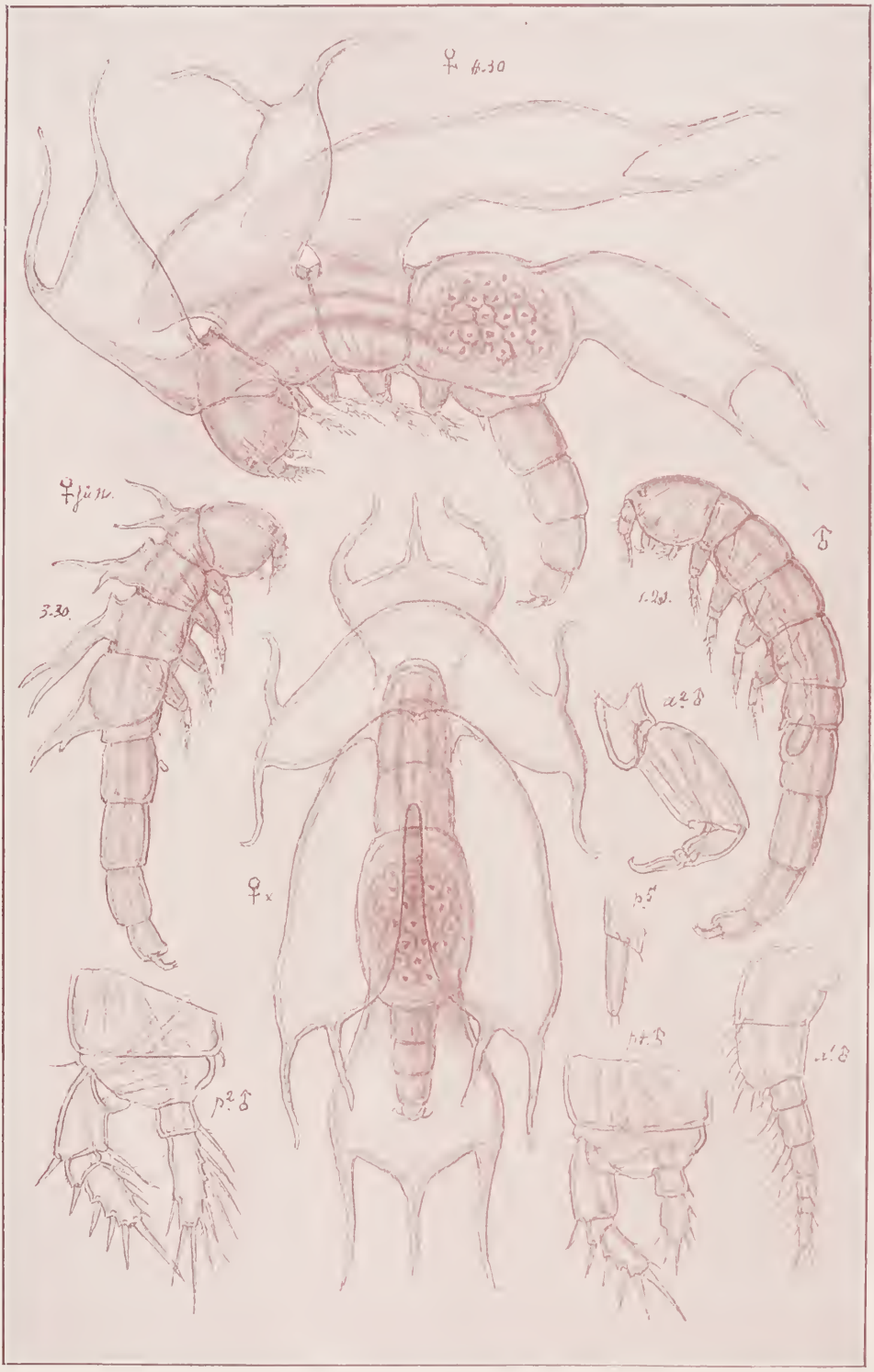
Pachypygus gibber, (Thorell)

Copepoda



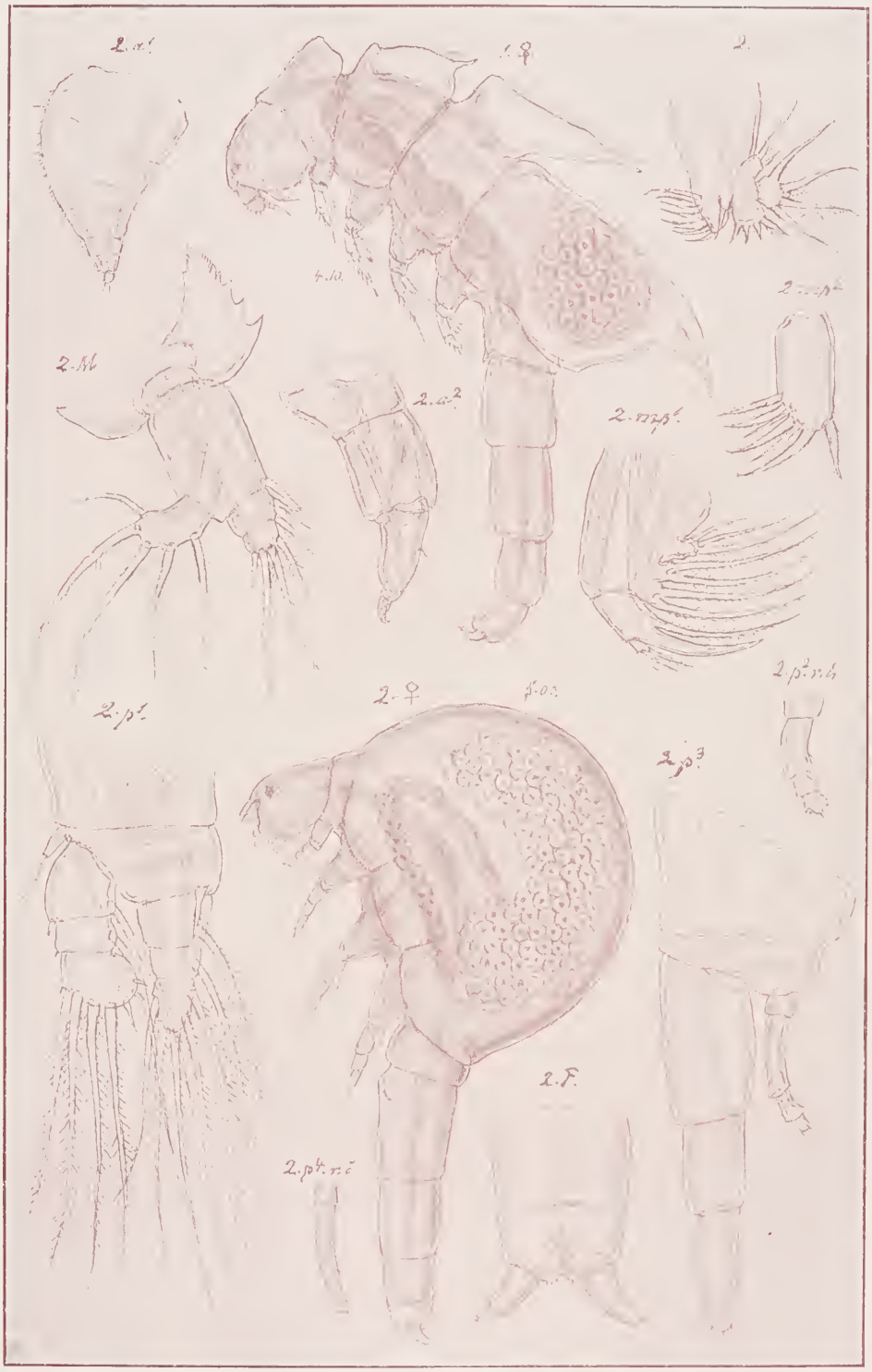
G. O. Sars del.

Notopterophorus auritus, (Thorell)



G. O. Sars del.

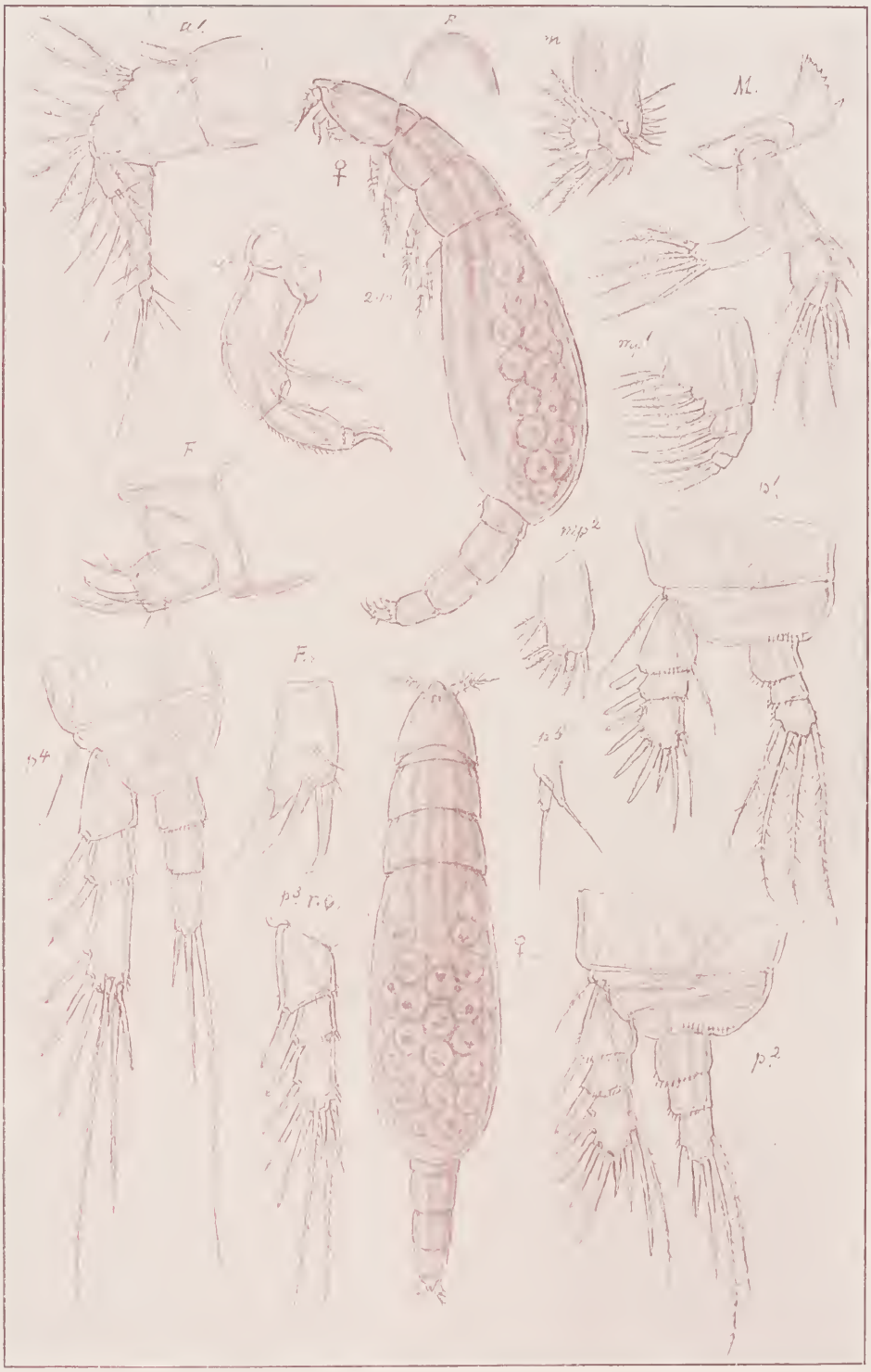
Notopterophorus papilio, Hesse



G. O. Sars del.

1. Notopterophorus micropterus, G. O. Sars
2. Gunentophorus globularis, Costa

Copepoda



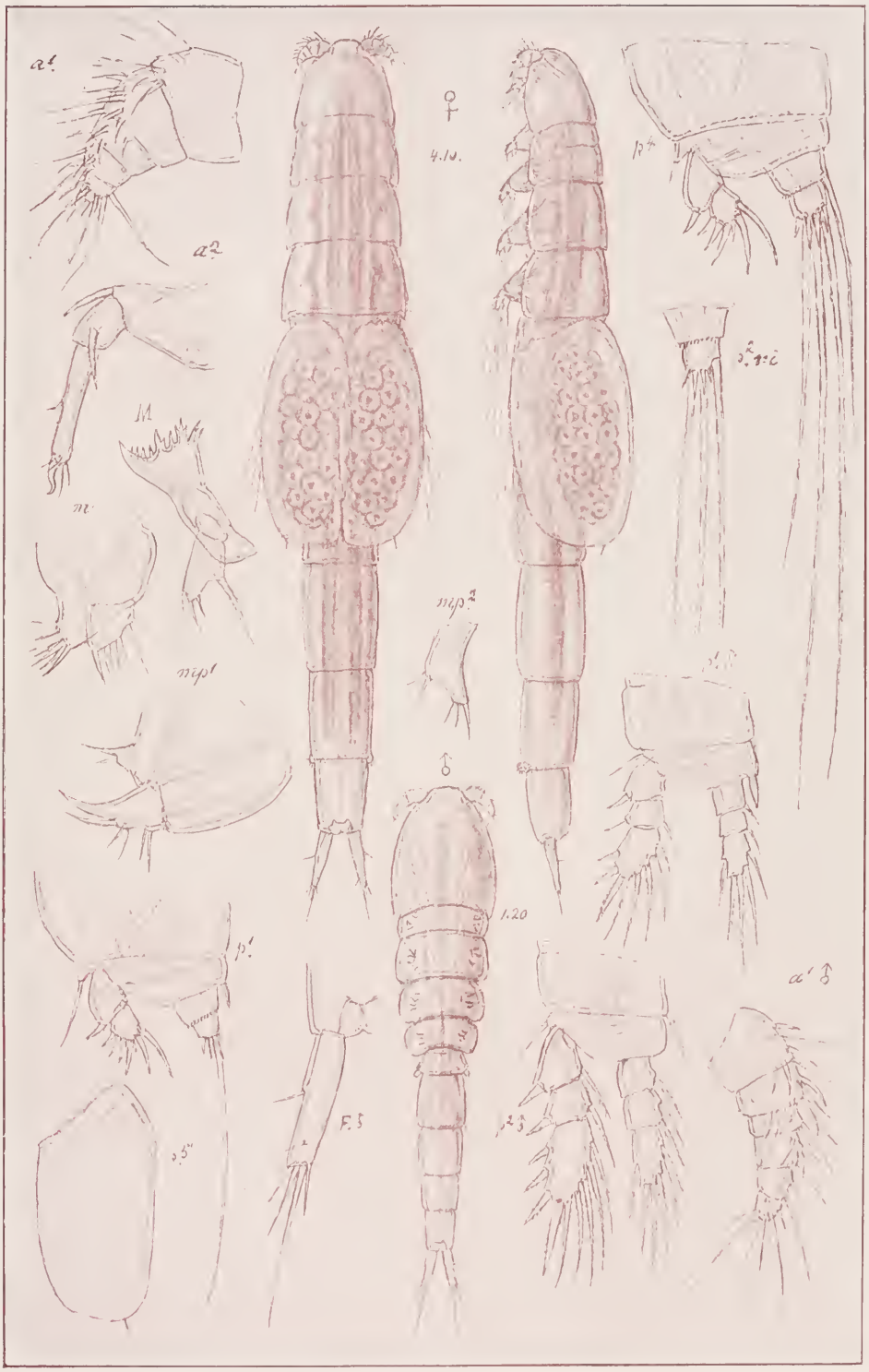
G. O. Sars del.

Botachus cylindratus, Thorell

Copepoda

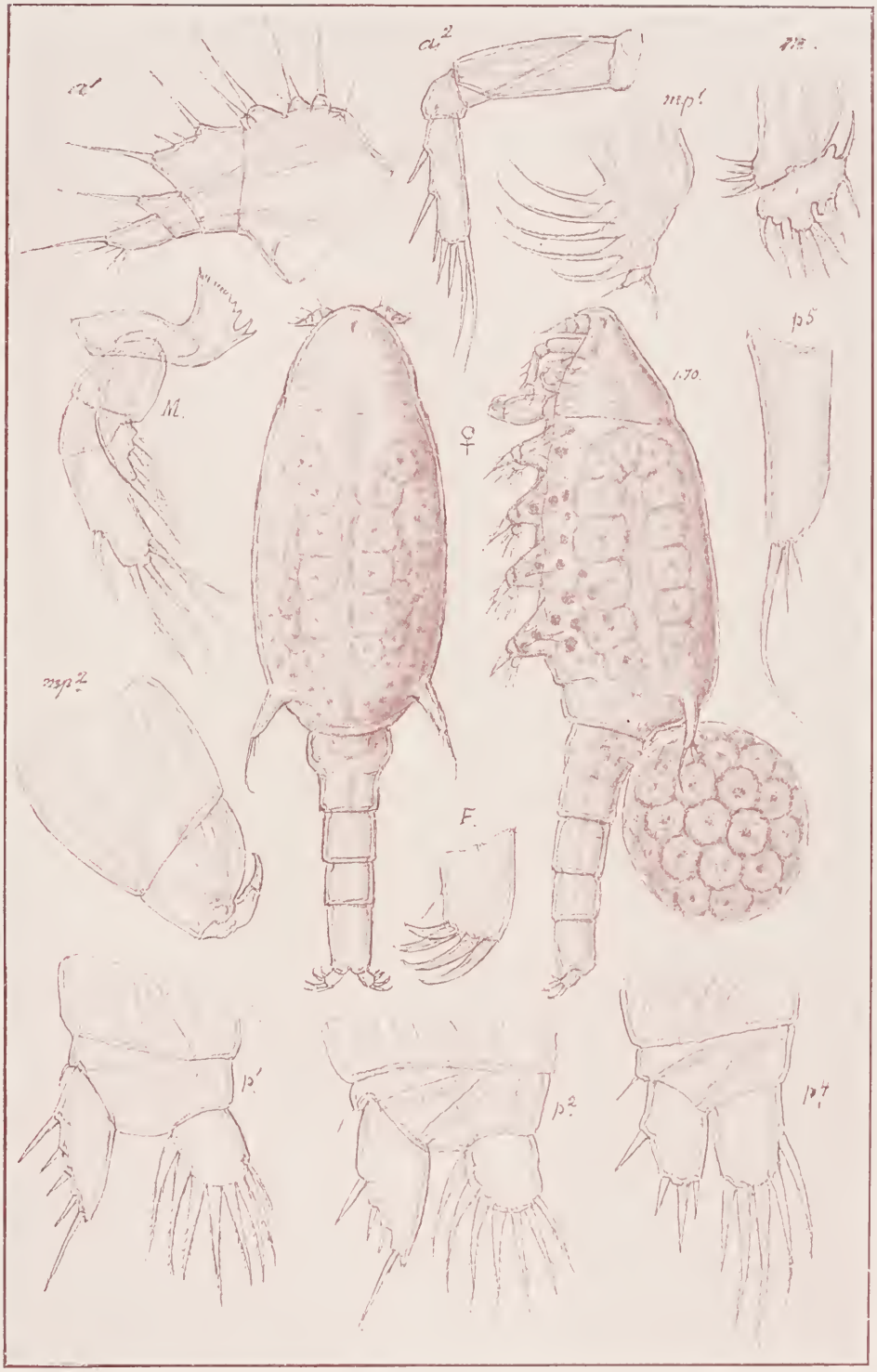
G. O. Sars del.

Buprorus Lovéni, Thorell



G. O. Sars del.

Ascidicola rosea, Thorell



G. O. Sars del.

Botryllophilus brevipes, G. O. Sars

AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

WITH SHORT DESCRIPTIONS AND FIGURES OF ALL THE SPECIES

BY

G. O. SARS

VOL. VIII

COPEPODA

MONSTRILLOIDA & NOTODELPHYOIDA

PARTS V & VI

BOTRYLLOPHILIDÆ, ENTEROCOLIDÆ, SUPPLEMENT

WITH 16 AUTOTYPIC PLATES

BERGEN
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1921

large, far exceeding in length the body of the mandible, rami however of very unequal size, the inner one being much the larger and fully twice as long as the basal part, proximal joint of this ramus imperfectly defined and without any setæ, distal joint oblong oval in form, and provided with 5 coarse setæ, one of which is attached to the outer edge, the other 4 to the obtusely rounded extremity; outer ramus attached close to the base of the inner, and forming a small triangular lamella, edged with 3 plumose setæ. Maxillæ with the masticatory lobe comparatively small, with a restricted number of spines; endopodal part with 2 comparatively short setæ inside the base, terminal joint imperfectly defined and edged with 3 similar setæ; exopodal lobe obsolete and replaced by 3 short setæ attached to the outer nearly straight edge of the palp, which is produced both proximally and distally to a small knob-like prominence. Anterior maxillipeds with the basal part imperfectly subdivided, and exhibiting inside 5 digitiform lobes and as many curved setæ; terminal part small, uniarticulate, with a minute apical spine and a densely ciliated seta outside the base. Posterior maxillipeds composed each of a very large and massive basal part divided into 2 segments, and of a comparatively short, but very mobile biarticulate dactylus curved inwards. The 4 anterior pairs of legs much reduced, with both rami quite short and uniarticulate, the outer one narrow triangular in form, with the inner edge perfectly smooth, the outer armed with 5 somewhat unequal spines; inner ramus rounded oval in form and fringed with thickish, sparingly ciliated setæ, the number of which is somewhat varying in the different pairs. Last pair of legs far less produced than in the other species, and attached to the sides of the posterior part of the trunk, somewhat nearer the dorsal face; each having the form of a narrow lanceolate lappet carrying on the tip a rather strong curved seta accompanied by 2 much smaller bristles, another still smaller bristle occurring on the upper edge somewhat beyond the middle. Only a single comparatively large globular ovisac present, attached to the dorsal face of the genital segment.

Body in the living animal of a pale reddish orange hue, with the ovarial tubes and the ripe ova bright green in colour. Length of adult female 1.70 mm.

Male unknown.

Remarks.—The above-described species may be easily distinguished from any of the other forms recorded by the quite unsegmented anterior division of the body, as also by the poor development of the legs.

Occurrence.—Some few female specimens of this form were found, many years ago, within the body cavity of a species of Botryllus, taken at Espevær, west coast of Norway.

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

Generic Characters,—Body (of female) perfectly segmented, with the anterior division well marked off from the posterior, but less tumid than in *Botryllophilus.* Tail much narrower than the anterior division, and only composed of 3 segments; caudal rami short, clawed at the end. Antennæ and oral parts of a structure similar to that in *Botryllophilus.* The 4 anterior pairs of legs with both rami short, uniarticulate, the outer one spiniferous, the inner setiferous. Last pair of legs transformed to 2 large wing-like lamellæ encompassing the last trunkal segment and meeting each other at the base dorsally, partly obtecting the single cake-like ovisac.

Remarks.—The present new genus is nearly allied to *Botryllophilus,* but differs conspicuously in the perfect segmentation of the anterior division of the body, the 3-articulate tail, and more particularly in the very unlike appearance of the last pair of legs, which are developed in a somewhat similar manner to that in the genus *Ascidicola.* The genus comprises as yet only a single species, to be described below.

23. **Pteropygus vestitus,** G. O. Sars, n. sp.

(Pl. XXXIII).

Specific Characters.—Female. Body comparatively short and stout, with the anterior division of nearly equal width throughout, and only very slightly vaulted dorsally. Cephalic segment scarcely narrower than the succeeding segment and evenly rounded in front, rostral prominence very slight. Last trunkal segment well defined and abruptly narrowed behind. Tail about equalling in length the trunk, and narrow cylindrical in form, with its 3 segments of nearly equal size. Caudal rami turned straight outwards, and armed at the end with 4 strong curved claws arranged in pairs. Eye very small. Anterior antennæ short and compressed, broad at the base, but rapidly tapered distally, being composed of 6 well defined joints clothed in front with numerous unequal rigid setæ. Posterior antennæ very like those in *Botryllophilus*, last joint armed with 8 spines, 4 on the outer edge and 4 on the tip. Mandibles with the 2 outermost teeth of the cutting edge much larger than the others; palp very large, nearly twice the length of the body of the mandible, and of a structure very similar to that in *Botryllophilus.* Maxillæ likewise rather similar, though having the terminal joint of the palp distinctly defined at the base. Anterior maxillipeds comparatively more fully developed than in that

genus, but built on the very same type. Posterior maxillipeds large and massive, forming, as in *Botryllophilus*, the chief attaching organs. The 4 anterior pairs of legs very imperfectly developed, outer ramus cultriform, with 6 strong spines outside, inner ramus rather smaller and scarcely lamelliform, being narrowed distally, and only provided with a restricted number of setæ at the tip. Last pair of legs forming 2 broadly oval lamellæ encompassing the body like a mantle, and extending nearly to the middle of the tail, each lamella provided at the end below with a small bristle. Ovisac oval, flattened, and extending almost to the end of the tail.

Colour whitish gray.

Length of adult female 1.80 mm.

Male unknown.

Remarks.—The above-described form cannot be confounded with any of the other members of the present family. From the species of the genus *Botryllophilus* it is at once distinguished by the very different appearance of the transformed last pair of legs, in which respect it more resembles the form next to be described.

Occurrence.—A few female specimens only of this peculiar form have as yet come under my notice. They were taken at Risör, south coast of Norway, and, as far as I remember it, from the branchial cavity of *Phallusia obliqua*.

Gen. 14. **Schizoproctus,** Aurivillius, 1885.

Generic Characters.—Body of female fusiform in shape, with thin and soft integuments and the segments only indicated by slight constrictions; that of male more distinctly segmented and of extremely small size, as compared with the female, to the ventral face of which it is found attached. Tail apparently composed of 5 segments, and not very sharply marked off from the trunk. Caudal rami small, curving outside, and minutely clawed at the end. Antennæ and oral parts built on the same type as in the 2 preceding genera, but on the whole less fully developed. The 4 anterior pairs of legs very small, with the rami uniarticulate and nearly of equal structure, both forming small triangular pieces armed outside with short spines. Last pair of legs (in female), as in *Pteropygus,* transformed to broad lamellæ extending on each side along the base of the tail and separated dorsally by a deep and narrow cleft. Ovisac not yet observed.

Remarks.—This genus, established by Aurivillius, is evidently referable to the same family as the 2 preceding genera, though the outward appearance

of the body looks rather different, and more resembles that in some forms belonging to the next family. In the structure of the several appendages it seems to come nearest to the genus *Pteropygus*, but differs conspicuously in the general form of the body and its less distinctly marked segmentation, as also very essentially in the structure of the tail. The genus comprises as yet only a single species, to be described below.

24. Schizoproctus inflatus, Aurivillius.

(Pl. XXXIV)

Schizoproctus inflatus, Aurivillius, Krustaceer hos arktiske Tunicater, Vega Expeditionens vetenskaplige Arbeten, p. 248, Pl. 9, figs. 21—32.

Specific Characters.—Female. Body oblong fusiform in shape and rather tumid in the middle, but gradually narrowed both in front and behind; dorsal face evenly vaulted. Tail about equalling in length $^2/_3$ of the anterior division and somewhat tapered distally, last segment nearly twice the length of the preceding one and narrowly rounded at the extremity. Caudal rami comparatively small, each armed with 4 short, somewhat unequal claws. Anterior antennæ very short and stout, composed of only 4 joints clothed in front with comparatively short spiniform setæ of unequal length. Posterior antennæ shorter and stouter than in the 2 preceding species, terminal joint armed outside with 3 short spines and at the broadly truncated extremity with 3 similar spines followed by 2 thickish setæ. Mandibles and maxillæ of essentially same structure as in *Pteropygus*. Anterior maxillipeds however considerably shorter and stouter, with an additional small seta inside the base; seta of 3rd joint replaced by a claw-like spine. Posterior maxillipeds very thick at the base, with the posterior edge of 1st joint coarsely serrate. The 4 anterior pairs of legs with both rami short, triangular in form, the outer one armed outside with 5 stout spines. Last pair of legs, as in *Pteropygus,* broad, mantle-like and approximate dorsally.

Male of dwarfy size, scarcely exceeding in length $^1/_5$ of the female, and found attached to the ventral face of her genital segment. Body somewhat depressed and gradually attenuated behind, with all the segments sharply defined, the genital one rather swollen and containing on each side a pear-shaped spermatophore.

Colour not yet ascertained.

Length of adult female 6.10 mm, of male 1.30 mm.

Remarks.—The present remarkable form was described by Aurivillius in

the above-quoted paper from a solitary female specimen found in the branchial cavity of a *Phallusia* obtained off the coast of Spitsbergen. It was regarded by that author as the type of a particular family, for which he proposed the name *Shizoproctidæ,* not being aware of the close relationship of this form to the genus *Botryllophilus* of Hesse.

Occurrence.—Some few specimens of this form were obtained, many years ago, from the branchial cavity of *Phallusia obliqua* taken at Vadsö, eastern Finmark, from a depth of about 60 fathoms. Aurivillius also records a single female specimen from the Finmark coast.

Distribution.—Spitsbergen (Aurivillius).

Fam. 6. Enterocolidæ.

General Characters.—Body of female more or less vermiform in shape and nearly motionless, with thin and soft integuments and the segments only faintly indicated; that of male (according to Canu) cyclopoid in shape and provided with well developed locomotory appendages. Tail, as a rule, poorly developed, terminating in 2 small and simple blad-like caudal rami. Anterior antennæ very small. Posterior antennæ biarticulate and not prehensile (in female). Only 2 pairs of oral appendages present, the mandibles and the anterior maxillipeds being wholly absent[1]). The 4 anterior pairs of legs (in female) very imperfectly developed, with the rami more or less rudimentary. 5th pair of legs, when present, forming 2 short lateral lappets issuing from the end of the anterior division of the body. Two free ovisacs present in female appended to the base of the tail and generally very long, cylindrical in form.

Remarks.—The type of this family is the genus *Enterocola* of v. Beneden which in many respects differs considerably from the other Notodelphyoida, and in the general appearance of the body (in female) bears a strong resemblance to some of the Lernæoida (Condracanthidæ). This is perhaps still more the case with some of the other forms belonging to the present family. Yet, some well marked points of agreement with the family *Botryllophilidæ* are

[1]) True, in some of the forms (Enteropsis, Aplostoma) mandibles have been described; but in my opinion the appendages so named are in reality not mandibles but more properly the maxillæ.

found to exist, and it therefore may be allowed to include the present family in the same great division. Moreower in habits these forms agree with the other Notodelphyoida in so far that they are parasites of the same group of animals, viz., the Tunicata. The want of any true masticatory appendages would seem to prove, that these Copepoda do not feed on any firm particles, but only on some nourishing fluids licked up from their hosts. In so far they present an evident agreement with the *poecilostomous Cyclopoida,* from which they indeed may be assumed to have been originally derived by a close adaption to changed conditions of life, just as the other Notodelphyoida in all probability by a similar adaption have taken their origin form *gnathostomous Cyclopoida.* 3 genera referable to the present family will be treated of below. Another genus, *Enteropsis,* has been established by Aurivillius, and moreover several of the peculiar forms recorded by Hesse, as found in compound Ascidians, may in all probability be included in the same family.

Gen. 15. **Cryptopodus,** Hesse, 1865.

Syn: Aplostoma, Canu.

Generic Characters.—Body of female oblong, more or less curved ventrally, with the anterior division well marked off from the posterior and terminating behind on each side in a short rounded lobe (the transformed 5th pair of legs), the last 2 trunkal segments coalesced. Tail very small and imperfectly segmented. Posterior antennæ smaller than the anterior ones, distal joint sublinear and minutely denticulate outside. Oral aperture forming a transverse fissure limited in front by a slightly prominent bell-shaped anterior lip. Maxillæ only present as a very trifling rudiment on each side of the oral aperture. Maxillipeds comparatively small, biarticulate, and terminating in a minute hook. The 4 anterior pairs of legs very imperfectly developed, basal part not distinctly defined, rami confluent at the base, the outer one forming a simple rounded lobe, the inner knife-shaped, with a few short denticles inside. Last pair of legs having the appearance of 2 simple conical lobes projecting on each side somewhat dorsally from the last trunkal segment. Ovisacs large, cylindrical in form.

Remarks.—This genus was established in the year 1865 by Hesse, but very imperfectly characterised, and on that account it was not recognised by subsequent authors. I think however I am right in identifying the genus *Aplostoma* of Canu with Hesse's genus. In any case the generic name proposed by Canu cannot be supported, as it has been long ago preoccupied.

The genus is prominently characterised by the small size of the posterior antennæ and the imperfect development of the oral parts, as also by the structure of the legs. Hesse records 2 species of this genus, *C. flavus* and *viridis*, none of which seems to be identical with the 2 Norwegian species here described.

25. Cryptopodus brevicauda, (Canu)

(Pl. XXXV)

Aplostoma brevicauda, Canu, Copépodes de Boulonnais, p. 223, Pl. XX, figs. 5—18.

Specific Characters.—Female. Body rather slender, with the anterior division nearly cylindrical in shape, though gradually narrowed in its anterior part; limits of the segments indicated by well-marked constrictions. Cephalic segment comparatively small and less distinctly defined, terminating in front in a minute tuberculiform prominence. Tail very short, scarcely exceeding in length $^1/_6$ of the anterior division, and only composed of 2 distinctly defined segments, the 1st rather broad at the base and rapidly tapered distally, the 2nd very small. Caudal rami somewhat divergent, each with a minute bristle in the middle of the outer edge and another still smaller one at the apex. Anterior antennæ conical in form and apparently composed of 4 joints, the outer 3 quite short and clothed with small bristles. Posterior antennæ much smaller than the anterior, with the distal joint narrow linear in form and armed outside with 4 minute denticles. Anterior lip with the hind edge quite smooth. Ovisacs fully as long as the entire body, cylindrical in form, and more or less twisted.

Body of the living animal rather opaque, of a pale rosy colour, with the ovarial tubes of a somewhat darker hue.

Length of adult female 2.50 mm.

Remarks.—The above-described form is unquestionally identical with that recorded by Canu as the type of his genus *Aplostoma*. Canu has also observed the male of this species, and has given good figures of it in the above-quoted work.

Occurrence.—Some few female specimens of this peculiar Copepod were taken, many years ago, at Espevær, west coast of Norway. They were found in the compound Ascidian, *Polyclinum luteum,* lying within a diverticle of the branchial sac of the Zooids.

Distribution.—Coast of France (Canu).

26. Cryptopodus eruca, (Norman).

(Pl. XXXV, 2)

Enterocola eruca, Norman, Last Shetland dredging Report, p. 300.

Specific Characters.—Female. Body resembling in shape that of the preceding species, but (in the specimens observed) more strongly curved and with the constrictions between the segments deeper. Tail comparatively still smaller than in *C. brevicauda*, with the caudal rami much shorter and without any bristles. Anterior antennæ apparently only composed of 3 joints. Posterior antennæ comparatively stouter than in that species, with the distal joint coarser and only armed with 3 short denticles outside. Anterior lip with the posterior edge divided into 6 very conspicuous tooth-like processes, 2 mediate and 2 on each side near the outer corner. The other appendages scarcely differing in structure from those in *C. brevicauda*. Ovisacs of quite an extraordinary length, being more than 3 times as long as the body, and of narrow cylindrical form.

Colour of the living animal not yet ascertained.

Length of adult female 2.30 mm.

Remarks.—My identification of the above-described form with Norman's *Enterocola eruca* is only based on its occurrence in the same host. For the remarks given by Norman are much too scanty for allowing any more exact comparison. It is undoubtedly congeneric with Canu's species, but differs conspicuously in the structure of the anterior lip, and more particularly in the enormous development of the ovisacs.

Occurrence.—Two female specimens, the one ovigerous, of this form were taken, many years ago, from as many specimens of *Styela intestinalis* collected in the upper part of the Christiania Fjord. Norman also obtained his specimen from the same Ascidian.

Distribution.—Shetland Isles (Norman).

Gen. 16. **Enterocola**, v. Benden 1860.

Generic Characters.—Body (of female) more or less slender, with the anterior division well marked off from the posterior and divided by slight constrictions into the normal number of segments. Tail more perfectly segmented than in *Cryptopodus*. Anterior antennæ very small. Posterior antennæ much larger, with the terminal joint lamellar and fringed at the end with spines or setæ. Anterior lip rounded. Maxillæ and maxillipeds rather

coarsely built, the former terminating in a stout conical process turned obliquely inwards, and having outside a scale-like palp edged with coarse spines; the latter imperfectly prehensile, with the distal joint produced at the end into 2 coarse spines. The 4 anterior pairs of legs more perfectly developed than in *Cryptopodus*, the basal part being well defined and biarticulate; rami comparatively small, uniarticulate, the outer one simple mucroniform, the inner lamelliform and provided at the end with 2 setæ; between each pair of these legs a thin connecting plate present, of different form in the different species. Last pair of legs transformed to 2 rather large curved lamellæ projecting on each side from the hind end of the trunk, and separated dorsally by a narrow cleft. Ovisacs less produced than in the preceding genus.

Remarks.—This genus was established as early as the year 1860 by v. Beneden, and ought of course to be considered as the type of the present family. It differs conspicuously from the preceding genus, especially as regards the structure of the posterior antennæ and the oral parts. Moreover the legs are built on a somewhat different type, and the transformed last pair bear an evident ressemblance to those in some of the *Botryllophilidæ* (Pteropygus, Schizoproctus). A quite peculiar character of this genus is also found in the presence of a well-marked connecting plate between each pair of the 4 anterior pairs of legs. Two species of the present genus have been formerly recorded, viz., *E. fulgens* v. Beneden and *E. Betencourti* Canu. The Norwegian form described below cannot be referred to any of these 2 species.

27. Enterocola bilamellata, G. O. Sars, n. sp.

(Pl. XXXVI, 1)

Specific Characters.—Female. Body comparatively slender, with the anterior division almost perfectly cylindrical in shape, being scarcely at all narrowed in front. Cephalic segment nearly as large as the succeeding segment, and terminating in a blunt rostral prominence. Tail nearly attaining in length $^1/_3$ of the anterior division and rather swollen at the base, being composed of 4 well defined segments gradually narrowed behind. Caudal rami about the length of the last 2 segments combined and rather narrow, without any armature whatever. Anterior antennæ comparatively small, conical in form, and apparently composed of 4 joints, the 1st much the largest, the last very small, tuberculiform, without any bristles. Posterior antennæ with the distal joint remarkably large, forming a recurved oblong or linguiform plate divided at the end into 7 thin setiform appendages of unequal length. Maxilles with a

small bispinose lappet inside turning towards the mouth, terminal prominence very coarse, resembling somewhat in shape the molar process of the mandibles in higher Crustacea; palpe sub-spatulate in form, and armed on the broadly rounded terminal edge with 5 coarse spines of equal size. Maxillipeds short and stout, with a small conical process inside the large proximal joint; distal joint strongly chitinised, incurved, and projecting at the end into 2 coarse and somewhat unequal spiniform processes. The 4 anterior pairs of legs of essentially same structure, 2nd basal joint well defined from the 1st and projecting outside in a small, knob-like prominence; inner ramus oval in form, with the 2 apical setæ rather slender and considerably exceeding the ramus in length; connecting plate between these legs divided by a deep incisure into 2 rather prominent linguiform lamellæ. Last pair of legs obliquely oval in form and slightly upturned, advancing on each side somewhat over the base of the tail, each having on the posterior edge 2 small bristles. Ovisacs not present in the specimen examined.

Colour of the living animal not yet ascertained.

Length of the body 2.60 mm.

Male unknown.

Remarks.—The above-described form is unquestionably referable to the genus *Enterocola* of v. Beneden, but differs from the 2 other known species by the comparatively narrow cylindrical form of the anterior division of the body, as also in the structure of the posterior antennæ and oral parts. Another character by which this form is easily recognised is the peculiar bilamellar shape of the connecting plates between the 4 anterior pairs of legs. The specific name here proposed alludes to this character.

Occurrence.—A solitary specimen only of this form, an apparently fully grown female, but without ovisacs, has as yet come under my notice. It was found in a bottom-sample taken at Farsund, south coast of Norway, from a depth of about 40 fathoms, and had undoubtedly by some accident been thrown out from its abode within some compound Ascidian.

Gen. 17. **Mycophilus,** Hesse, 1865.

Generic Characters.—Body of female soft, vermiform, and more or less strongly curved dorsally, with no sharp demarcation between the anterior and posterior divisions. Trunkal segments indicated by slight constrictions of the body. Tail however not at all segmented, sac-like, with 2 very small lamellæ (the caudal rami) on the blunted extremity. Anal orifice not, as usual,

occurring at the end of the tail between these lamellæ, but transferred far in front on the dorsal face of the body, on which account the posterior part of the intestinal canal forms a peculiar coil within the caudal part. Antennæ and oral parts very imperfectly developed and densely crowded. Only 4 pairs of rudimentary legs present, the 5th pair being wholly absent. Ovisacs not yet observed.

Remarks.—This is one of the many genera established by Hesse for the peculiar parasites obtained by him from compound Ascidians. Indeed some of the characters distinguishing the present genus are so strange, that it could seem somewhat questionable if it might be included in the same family with the 2 preceding genera. Yet, some points of agreement are found to exist with the genus *Enteropsis* of Aurivillius, which is regarded as a true Enterocolid. The genus as yet only comprises a single species, to be described below.

28. Mychophilus roseus, Hesse.

(Pl. XXXVI, 2)

Mychophilus roseus, Hesse, Recherches sur les Crustacés rares ou nouveaux des côtes de France. Ann. d. sci. nat. Zoologie, Ser. 5, Vol. IV.

Syn: *Enteropsis wararensis*, Scott.

Specific Characters.—Female. Body slender, cylindrical in form, though having its posterior part always strongly curved dorsally. Cephalic segment comparatively small and somewhat contracted in front, terminating in a very minute knob-like rostral prominence. Trunkal segments only faintly marked, the last one confluent with the tail. Caudal part of body nearly occupying half the entire length, and scarcely at all narrower than the anterior division, its extremity bluntly rounded and carrying 2 very small blade-like caudal rami. Anal orifice occurring nearly in the middle of the dorsal face of the body, and defined by 2 distinctly projecting lips. Posterior part of the intestine rather narrow and forming a more or less deep coil within the tail, ascending along its dorsal face to the anal orifice. Anterior antennæ very small, and apparently only composed of 2 joints. Posterior antennæ with the distal joint abruptly recurved and terminating in an acute point. Maxillæ of a somewhat similar shape, but provided with a small lateral appendage (palp). Maxillipeds poorly developed, imperfectly articulate, and terminating in a very small hook-like point. Legs of uniform appearance, forming simple conical prominences extending laterally and each terminating in 2 very minute chitinous pieces (rudiments of rami). Ovisacs not yet observed.

Colour of the living animal pale rosy.

Length of adult female 1.50 mm.

Male unknown.

Remarks.—The figure given by Hesse does not leave any doubt on the identity of the above-described form with that observed by him, and it is likewise quite certain that the form recorded by Scott under the name of *Enteropsis wararensis* is the same species. Its very peculiar outward appearance renders it indeed easily recognisable from any other members of the present family.

Occurrence.—Some female specimens of this peculiar Copepod were obtained, many years ago, at Espevær, west coast of Norway. They were found in a species of *Botryllus,* taken up from a depth of about 20 fathoms.

Distribution.—Coast of France (Hesse), Scottish coast (Scott).

Supplement.

Gen. **Buprorus,** Thorell.

(See p. 61)

Of this remarkable genus, hitherto only represented by a solitary species, *B. Lovéni* Thorell, I have recently had an opportunity of examining a well defined new species, to be described below.

29. Buprorus Nordgaardi, G. O. Sars, n. sp.

(Pl. XXXVII, 1.)

Specific Characters.—Female. Body exhibiting the short bag-like form characteristic of the genus, though having the cephalic part considerably more exerted, and the posterior part, limiting the incubatory cavity, greatly expanded and broadly rounded off behind. Dorsal face of trunk exhibiting throughout a dense clothing of small scale-like prickles. Anterior antennæ resembling in shape those in *B. Lovéni,* being however divided into 7 well defined joints clothed in front with rather strong and somewhat unequal curved setæ, the 3 outermost joints much smaller than the others. Posterior antenna with the terminal joint nearly as large as the middle one and armed on the transversely truncated extremity with a stout spine followed by 4 somewhat curved setæ.

Mandibles considerably stronger than in the type species, with the palp well defined, conical in form, and provided at the tip with 2 unequal setæ. Maxillæ and posterior maxillipeds nearly as in *B. Lovéni*. Anterior maxillipeds, however, somewhat different, being comparatively more powerfully developed, with only a single bispinose lobe inside, and the terminal part undivided, claw-like, carrying outside, about in the middle, a bundle of 3 curved setæ. Legs on the whole less robust than in the type species, with the rami narrower and the spines on both of them uniseriate and much more slender, nearly setiform, 2 of them attached outside the terminal joint of the outer ramus; 4th pair smaller than the preceding ones, and having the number of spines considerably reduced. Last pair of legs about as in *B. Lovéni*, but with the apical spines more slender.

Colour of the living animal not yet ascertained.

Length of adult female scarcely exceeding 0.70 mm.

Male unknown.

Remarks.—The above-described form is unquestionably referable to the genus *Buprorus* of Thorell, but differs from the type species decidedly both as regards the general shape of the body and in the structure of some of the appendages, as indicated in the above diagnosis. It is also of much inferior size.

Occurrence.—2 female specimens of this form, the one with the incubatory cavity filled with embryos in the last (Nauplian) stage, were found in a small compound Ascidian (Amoroecium) taken by Mr. O. Nordgaard in the Trondhjem Fjord and kindly sent to me for examination together with other kinds of Ascidians. The species is named in honour of that distinguished naturalist, who also otherwise has assisted me in my investigation of the Norwegian Copepoda.

Fam. Anomopsyllidæ.

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

Generic Characters.—Body (of female) divided into 3 sharply defined sections: head, trunk and tail. Head comparatively small, triangular in form. Trunk rather tumid and without any distinct segmentation. Tail comparatively short and much narrower than the trunk, terminating in 2 diverging caudal

rami provided with the usual number of setæ. Antennæ attached close together, the anterior ones slender, multiarticulate, the posterior ones much smaller and not prehensile. Oral parts imperfectly developed, except the posterior maxillipeds, which are of a very peculiar structure and apparently prehensile, terminating in a narrow and very mobile digit minutely clawed at the tip. Only 3 pairs of legs present, all very imperfectly developed, forming small and simple triangular lamellæ without any armature whatever. 2 ovisacs present in female attached to the sides of the genital segment.

Remarks.—It is very questionable, if this remarkable genus at all is referable to the *Notodelphyoida*, and it is only provisionally recorded here, as I am at present unable to determine with certainty its true systematic position. In any case it ought to be regarded as the type of a quite distinct family, *Anomopsyllidæ*. The genus is founded on a single species, to be described below.

30. Anomopsyllus pranizoides, G. O. Sars, n. sp.

(Pl. XXXVII, 2)

Specific Characters.—Female. Body moderately slender, exhibiting in its general outline a perplexing similarity to a *Pranizа*. Head rather small and produced in front to a beak-like prominence, its lateral edges abruptly curved behind. Trunk oblong oval in form, somewhat narrower in front than behind, posterior extremity very slightly emarginated in the middle, with the lateral corners evenly rounded off. Tail scarcely exceeding in length $^1/_5$ of the trunk, and apparently only composed of 3 segments, the 1st, or genital one, being rather tumid at the base; anal segment larger than the middle one and not dilated distally. Caudal rami narrow, sublinear in form, and considerably diverging, being about as long as the anal segment, each carrying at the tip 4 setæ, the 2 middle ones rather slender and abruptly bent outwards, the other 2 very small; seta of outer edge attached about in the middle. Anterior antennæ comparatively slender and attenuated, fully attaining the length of the head, and composed of 7 joints clothed with a few slender setæ. Posterior antennæ scarcely exceeding in length $^1/_3$ of the anterior, and composed of 3 nearly equal-sized joints, the last one tipped with a number of somewhat unequal setæ. Oral area exhibiting in the middle a rather wide hollowed space limited in front by a slightly curved projecting border, probably answering the anterior lip, and behind by a narrow oblong triangular plate (metastome). Mandibles and maxillæ undistinguishable, being replaced by an irregularly twisted chitinous frame limiting the above-mentioned hollowed space on each

side and sending off inwards 2 short prominences. Anterior maxillipeds very little prominent, and of a somewhat pyriform shape, converging anteriorly, and each terminating in a knob-like point closely applied to the anterior extremity of the metastomal plate. Posterior maxillipeds freely projecting and rather fully developed, but very unlike in structure those in other Copepoda, being doubly geniculate and composed of 4 joints, the 2nd of which is very large and lamellarly expanded inside; last 2 joints much narrower and forming together a slender very mobile digit, which is allowed to impinge against the inner sharpened edge of the preceding joint; proximal joint of this digit unarmed, distal joint somewhat attenuated and armed at the tip with 2 very small claws and, at some distance from the extremity, with another somewhat stronger claw. Legs with a slight indication to a division in a basal and terminal part, the latter exerted to an obtuse point without any traces of spines or setæ; 1st pair somewhat larger than the other 2, which successively diminish in size. Ovarial tubes in the specimen examined very conspicuous, extending throughout the greater part of the trunk, 2 tubes present on each side connected behind by a narrow commissure. Ovisacs broken off in the specimen examined, though indicated by a trifling piece of their coating still adhering to each side of the genital segment.

Colour of the living animal not yet ascertained.

Length of the specimen examined about 3 mm.

Male unknown.

Remarks.—The above-described form may be at once recognised from any of the hitherto known Copepoda. Indeed, the curious similarity it exhibits in the general outline of the body with a *Praniza* is very striking, and has given rise to the specific name here proposed. On the parasitic nature of this Copepod, no doubt can arise.

Occurrence.—A solitary specimen of this remarkable Copepod was found, detached from its host, in a bottom-sample taken in the upper part of the Christiania Fjord. In the same sample several other invertebrate animals were contained, among them also some Annelids, and it seems to me not improbable, that the present Copepod had originally been attached to one of these Annelids.

BIBLIOGRAPHY.

Monstrilloida.

Aurivillius, C. W. S. Vergl. thiergeogr. Untersuchungen über die Plankton-Fauna des Skageraks. K. Sv. Vetensk. Akad. Handl., Vol. 30. 1898.

Bourne, G. C. Notes on the genus Monstrilla, Dana. Qu. Journ. Micr. Sc. 2. Vol. 30, 1890.

Breemen, Haag van. Nordisches Plankton. Copepoden 1908.

Calman, W. T. A Treatise of Zoology. Appendiculata, Part. 3. Crustacea, 1909.

Claparède, A. R. Ed. Beobachtungen über Anatomie und Entwickelungsgeschichte wirbelloser Tiere an der Küste von Normandie angestellt. 1863.

Claus, C. Die freilebenden Copepoden, mit besonderer Berücksichtigung der Fauna Deutschlands, der Nordsee und des Mittelmeeres. 1863.

Dana, J. D. Crustacea U. S. Expl, Exp. during the years 1838—42. 1855.

Giesbrecht, W. Pelagische Copepoden des Golfes von Neapel. Fauna & Flora Golf. Neapel, Vol. 19. 1892.

Kröyer, H. Crustacés, in Gaimard, Voyage en Scandinavie etc. Atlas. 1845.

— Karcinologiske Bidrag. Nat. Tidsskr. Kjøbenhavn. Vol. 20. 1849.

Lubbock, J. Description of eight new species of Entomostraca found at Weymouth, Ann. Mag. Nat. Hist. (2) Vol. 20. 1857.

Malaquin, A. Parasitisme et évolution de deux Monstrillidæ à l'intérieur du système vasculaire des Filogranes et Salmacynes. C. R. Acad. Sc. 1896.

— Evolution des Monstrillides, C. R. Ac. Sc. 1897.

— Nouvelles recherches sur l'évolution des Monstrillides, C. R. Ac. Paris. 1900.

Malaquin, A. Le parasitisme évolutif des Monstrillides. Arch. Zool. Exp. (3), Vol. 9. 1901.

Möbius, K. Syst. Darstellung der Thiere des Plankton gewonnen in der westlichen Ostsee und auf eine Fahrt von Kiel in dem Atl. Ocean. 5 Ber. Komm. wiss. Unters. Deutsch, Meere. 1887.

Nordgaard, O. Undersøgelser i Fjordene ved Bergen 1899. Bergen Mus. Aarbog. f. 1900.

Norman, A. M, & Scott, T. The Crustacea of Devon and Cornwall. 1906.

Poppe, S. A. Zur Literatur des genus Monstrilla, Dana. Nat Ver. Bremen. Vol. 12. 1891.

Scott, T. Notes on Gatherings of Crustacea collected by the Fishery Steamer "Garland" during the year 1901. 20th Ann. Rep. F. B. Scotland. 1902.

— Notes on some rare and interesting Marine Crustacea. 22th Ann. Rep. F. B. Scotland. 1904.

Thompson, J. C. Copepoda of Madeira and the Canary Islands. Journ. Linn. Soc. London Vol. 20. 1888.

— Monstrilla and the Cymbasomatidæ. Trans. Biol. Soc. Liverpool. Vol. 4. 1890.

Timm, R. Beiträge zur Fauna der südöstlichen und östlichen Nordsee. Wiss. Meeresuntersuchungen. Vol. 1. 1896.

Notodelphyoida.

Allman. Description of a new genus and species of Entomostraca. Ann. Mag. Nat. Hist., ser. 1. Vol. XX. 1847.

— On the development of Notodelphys, a new genus of Entomostraca. Rep. Brit. Assoc. 1847

Aurivillius, C. W. S. Bidrag til Kännedomen om Krustaceer, som lefva hos Mollusker ock Tunicater. Akad. Afhandl. 1883.

— Krustaceer hos arktiske Tunicater. Vega Expeditionens vetensk. Iagttagelser. Vol. IV. 1885.

Beneden, P. J. van. Sur un nouveau genre de Crustacé Lernéen. Bull. Acad. Belg. sér. 2. Vol. IX. 1860

Brady, G. S. Monograf of the free and semiparasitic Copepoda of the Brit. Isl. Ray Soc. London. Vol. 1. 1878.

Buchholz. Beiträge zur Kenntniss der innerhalb der Ascidien lebenden parasitischen Crustaceen des Mittelmeeres. Zeitschr. f. wiss. Zool. Vol. XIX. 1869.

Canu, E. Description de deux Copépodes nouveaux parasites des Synascidies. Bull. scientif. Vol. XVII. 1886.

— Sur quelques Copépodes sémiparasites du Boulonnais. Compt. rend. Acad. Paris. Vol. CXIII. 1891.

— Les Copépodes de Boulonnais. 1892.

Claus, C. Ueber den Bau von Notodelphys ascidicola. Würzb. naturwiss. Zeitschrift. Vol. 1. 1860.

Costa, O. G. Fauna del Regno di Napoli. Entomostraca. 1852.

Della Valle. Sui Copepodi che vivono nelle Ascidie composta del Golfo di Napoli. Akad. d. Linsei, ser. 3. Vol. XV. 1883 [1]).

Giesbrecht. W. Zur Kenntniss einiger Notodelphyiden. Mitt. zool. Stat., Neapel. Vol. III. 1882 [1]).

Hesse. Recherches sur les Crustacés rares ou nouveaux des côtes de France. Ann. d. sc. nat. Zoologie, ser. 5. Vol. 1, IV, VI, XI. 1864—81.

Kerschner. Ueber zwei neue Notodelphyiden. Denkschr. d. k. k. Akad. Wiss., Wien. Vol. XLI. 1897 [1]).

Norman, A. M. Last Report on Dredging among the Shetland Isles. Rep. Brit. Assoc. 1860.

Norman, A. M. & Scott, T. The Crustacea of Devon and Cornwall. 1906.

Scott, T. Notes on Gatherings of Crustacea. 19th Ann. Rep. of the Fishery Board for Scotland. Part III. 1901.

Thorell, T. Bidrag til Kännedomen om Krustaceer som lefva i Arter af slägtet Ascidia. K. Sv. Vetensk. Akad. Handl. Vol. III. 1860.

[1]) I have not had an opportunity of consulting these papers.

SYSTEMATIC LIST

OF THE SPECIES DESCRIBED IN THE PRESENT VOLUME.

Monstrilloida.

Monstrilloida cyclopimorpha.

Thaumatopsyllidæ.

Thaumatopsyllus, G. O. Sars.
paradoxus, G. O. Sars.

Monstrilloida genuina.

Monstrillidæ.

Monstrilla, Dana.
longicornis, Thompson.
longiremis, Giesbrecht.
clavata, G. O. Sars.
leucopis, G. O. Sars.
gracilicauda, Giesbrecht.
helgolandica, Claus.
serricornis, G. O. Sars.

Cymbasoma, Thompson.
rigidum, Thompson.
Thompsoni, Giesbrecht,
longispinosum, Bourne.

Monstrillopsis, G. O. Sars.
dubia, Scott.

Notodelphyoida.

Notodelphyidæ.

Notodelphys, Allman.
Allmani, Thorell.
rufescens, Thorell.
caerulea, Thorell.
agilis, Thorell.
tenera, Thorell
elegans, Thorell.
prasina, Thorell.

Agnathaner, Canu.
typicus, Canu.

Doropygidæ.

Doropygus, Thorell.
pulex, Thorell.
psyllus, Thorell.
porcicauda, Brady.

Doropygopsis, G. O. Sars.
longicauda, Aurivillius.

Doropygella, G. O. Sars.
Thorelli, Aurivillius.

Pachypygus, G. O. Sars.
gibber, Thorell.
Notopterophorus, Costa.
auritus, Thorell.
papilio, Hesse.
micropterus, G. O. Sars.
Gunentophorus, Costa.
globularis, Costa.
Botachus, Thorell.
cylindratus, Thorell.

Buproridæ.

Buprorus, Thorell.
Lovèni, Thorell.
Nordgaardi, G. O. Sars.

Ascidicolidæ.

Ascidicola, Thorell.
rosea, Thorell.

Botryllophilidæ.

Botryllophilus, Hesse.
brevipes, G. O. Sars.
Pteropygus, G. O. Sars.
vestitus, G. O. Sars.
Schizoproctus, Aurivillius.
inflatus, Aurivillius.

Enterocolidæ.

Cryptopodus, Hesse.
brevicauda, Canu.
eruca, Norman.
Enterocola, v. Beneden.
bilamellata, G. O. Sars.
Mycophilus, Hesse.
roseus, Hesse

Anomopsyllidæ.

Anomopsyllus, G. O. Sars.
pranizoides, G. O. Sars.

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AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

AN ACCOUNT

OF THE

CRUSTACEA

OF

NORWAY

WITH SHORT DESCRIPTIONS AND FIGURES OF ALL THE SPECIES

BY

G. O. SARS

PROFESSOR OF ZOOLOGY AT THE UNIVERSITY OF CHRISTIANIA

VOL. VIII

COPEPODA

MONSTRILLOIDA & NOTODELPHYOIDA

WITH 37 AUTOTYPIC PLATES

BERGEN

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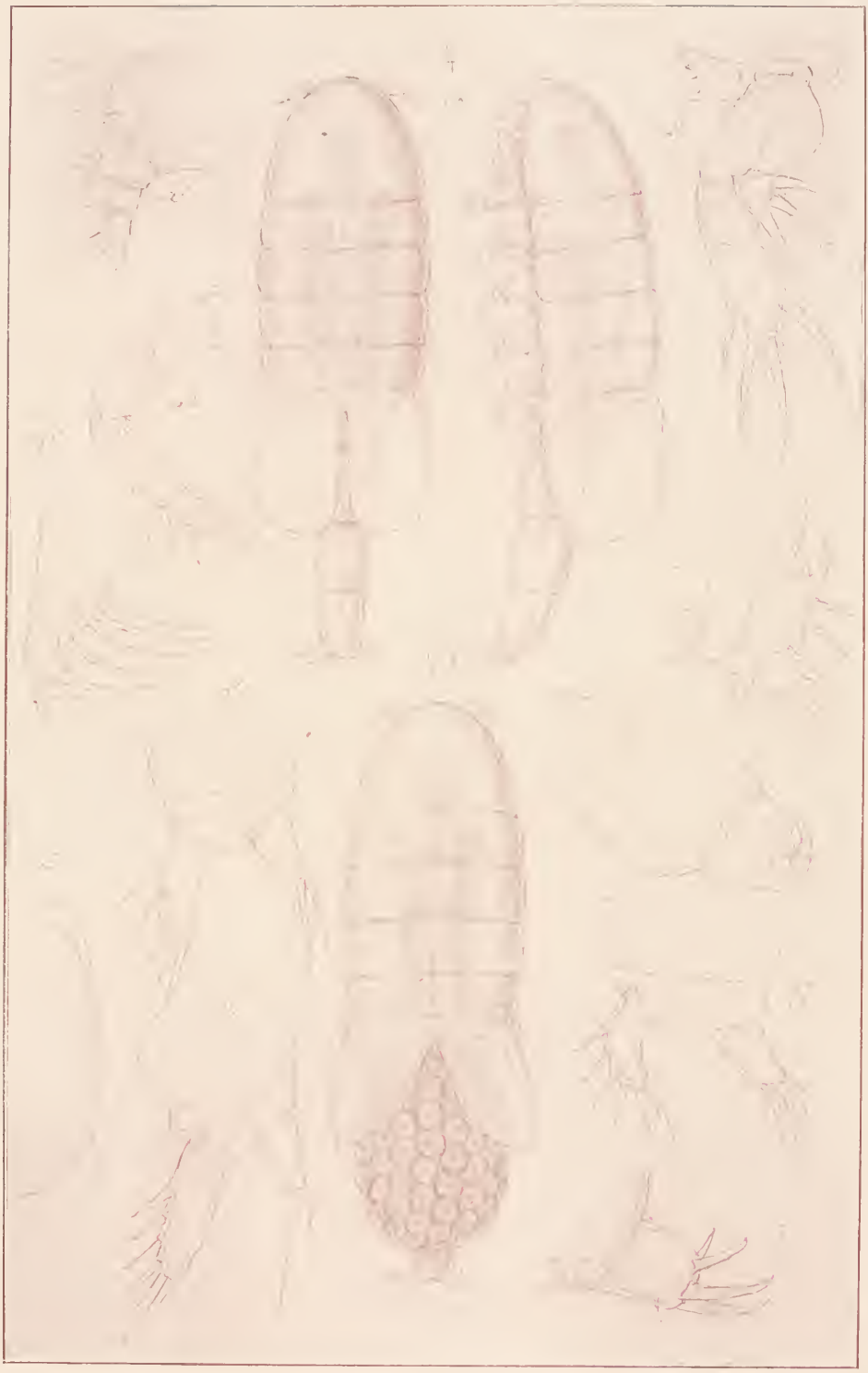
PREFACE.

By this Volume I definitely conclude my Account of the Norwegian *Copepoda,* it being my purpose in the next Volume to enter upon an entirely different group of Crustacea, viz., the *Ostracoda.* Although my Account of the former group has required no less than 5 Volumes, and more than 500 species have been described, I do not by any means imagine, that it gives a fully exhaustive record of the existing forms, and I am indeed convinced that many interesting species still remain to be detected, especially of the smaller deep-water Harpacticoida and of the semiparasitic forms. Yet, I hope that my Account may have thrown some light on this formerly much neglected part of our Fauna, and that it may serve as the basis for further investigations.

As to the two anomalous groups treated of in the present Volume, no record whatever has as yet been given on the Norwegian forms belonging to them.

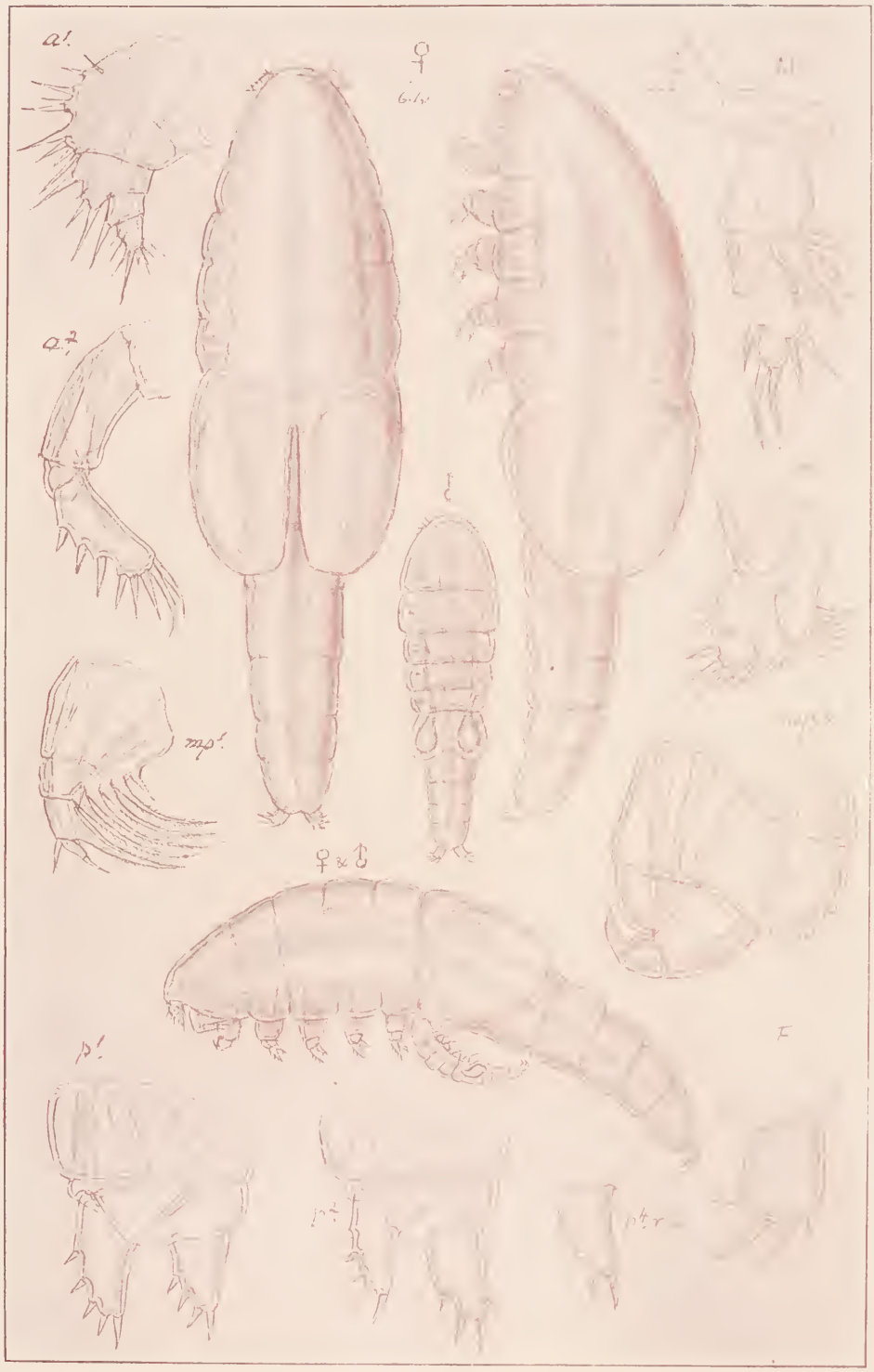
I will not omit, also on this occasion, to tender my most sincere thanks to the Direction of the Bergen Museum for the interest, it still shows for the progress of my work.

G. O. Sars



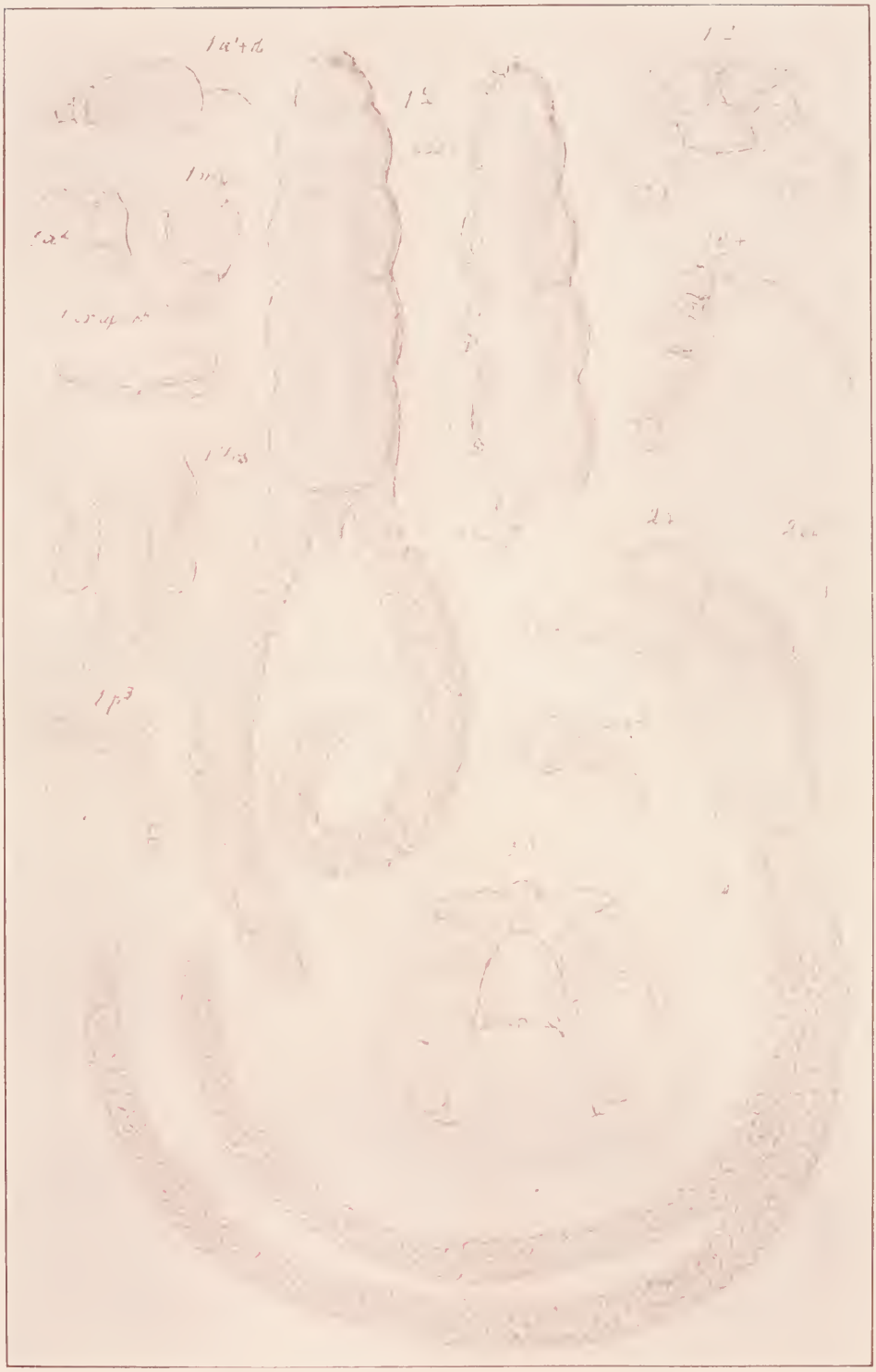
G. O. Sars del.

Pteropygus vestitus, G. O. Sars



G. O. Sars del.

Schizoproctus inflatus, Auriv.

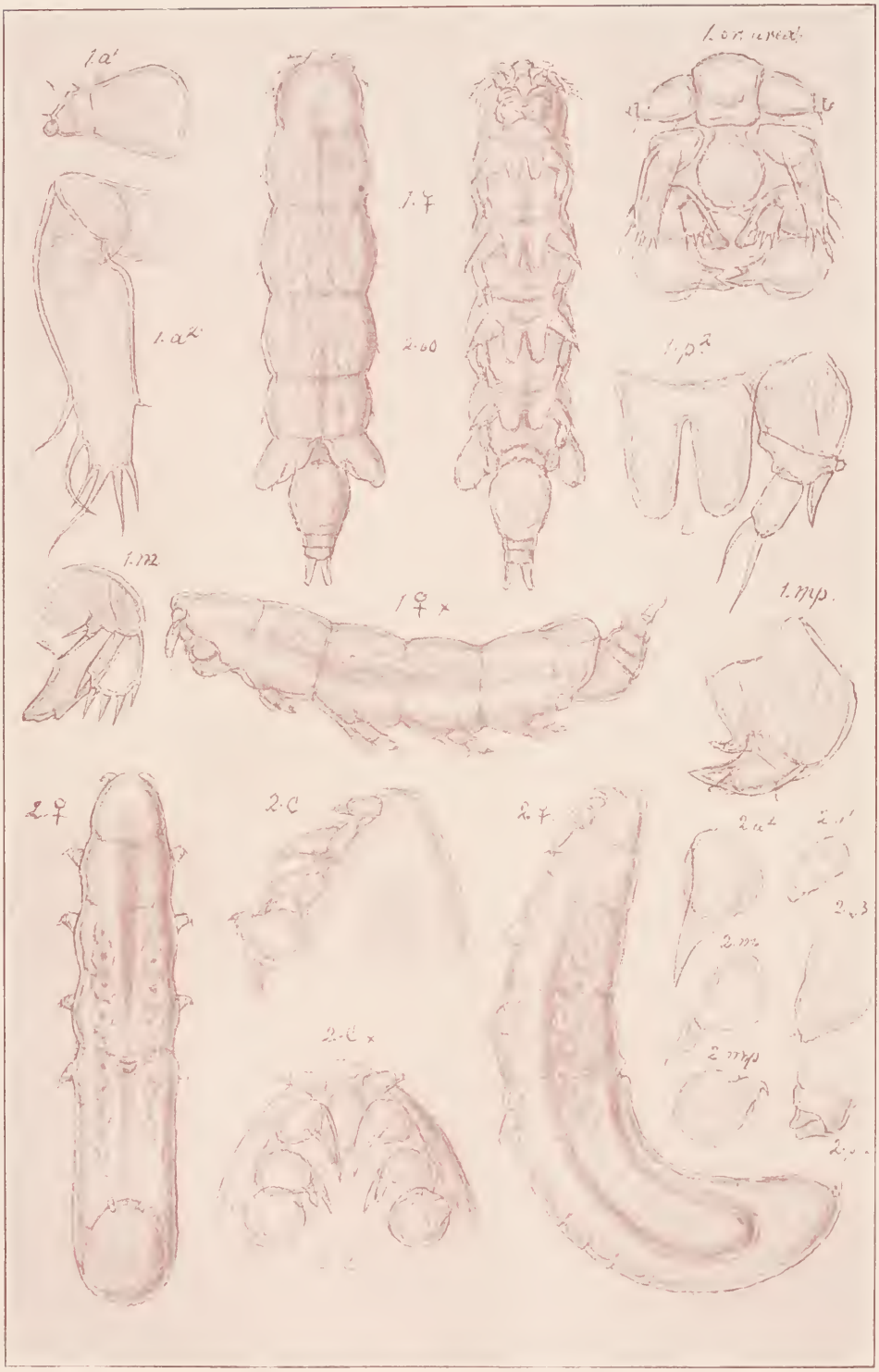


G. O. Sars del.

1. Cryptopodus brevicauda (Canu)
2. ,, eruca (Norman)

Copepoda

Notodelphyoida



G. O. Sars del.

1. Enterocola bilamellata, G. O. Sars
2. Mychophilus roseus, Hesse

Copepoda

G. O. Sars del.

1. Buprorus Nordgaardi, G. O. Sars
2. Anomopsyllus pranizoides, G. O. Sars