

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



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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 loosened 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 ovarian 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 relative 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 ovarian 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 obliqua* 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 ovarian 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 sub-oval 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. parallelo-*

*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  $\frac{1}{4}$  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.

Length 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 ovarian 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 ovarian 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 *Noto-delplys*, 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 agree 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 at Grimstad, south coast of Norway, from a depth of about 20 fathoms.

*Distribution.*—Coast of France (Canu).

## Fam. 2. Doropygidæ.

*General 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 chitinated, 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 *Doropygidae*. 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 immature 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 appearance 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  $\frac{1}{3}$  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 parallellogramma*.

*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 appears indeed in some respects to form a connecting link between these 2 families.

## 12. *Doropygopsis longicauda*, (Aurivillius).

(Pl. XXIII).

*Doropygus longicauda*, Aurivillius, Bidrag til kännedommen om Krustaceer, som lefva hos Mollusker och Tuniceater, 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 other 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 a 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  $\frac{2}{3}$  of the length of the antenna. Posterior antennæ strongly chitinated, 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 maxillipeds 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 thread-like 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 off 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; ovarian 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 lead to the suggestion that they belonged to a species different from that observed in the Mediterranean and on the French coast.<sup>1)</sup> 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).

<sup>1)</sup> 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  $\frac{1}{3}$  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  $\frac{1}{3}$  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 maxillipeds 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: Coellacola, 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 teeth, 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<sup>1)</sup> 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

<sup>1)</sup> 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 ovarian 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 off 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 sequel. 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 (æsthetascs?), 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)

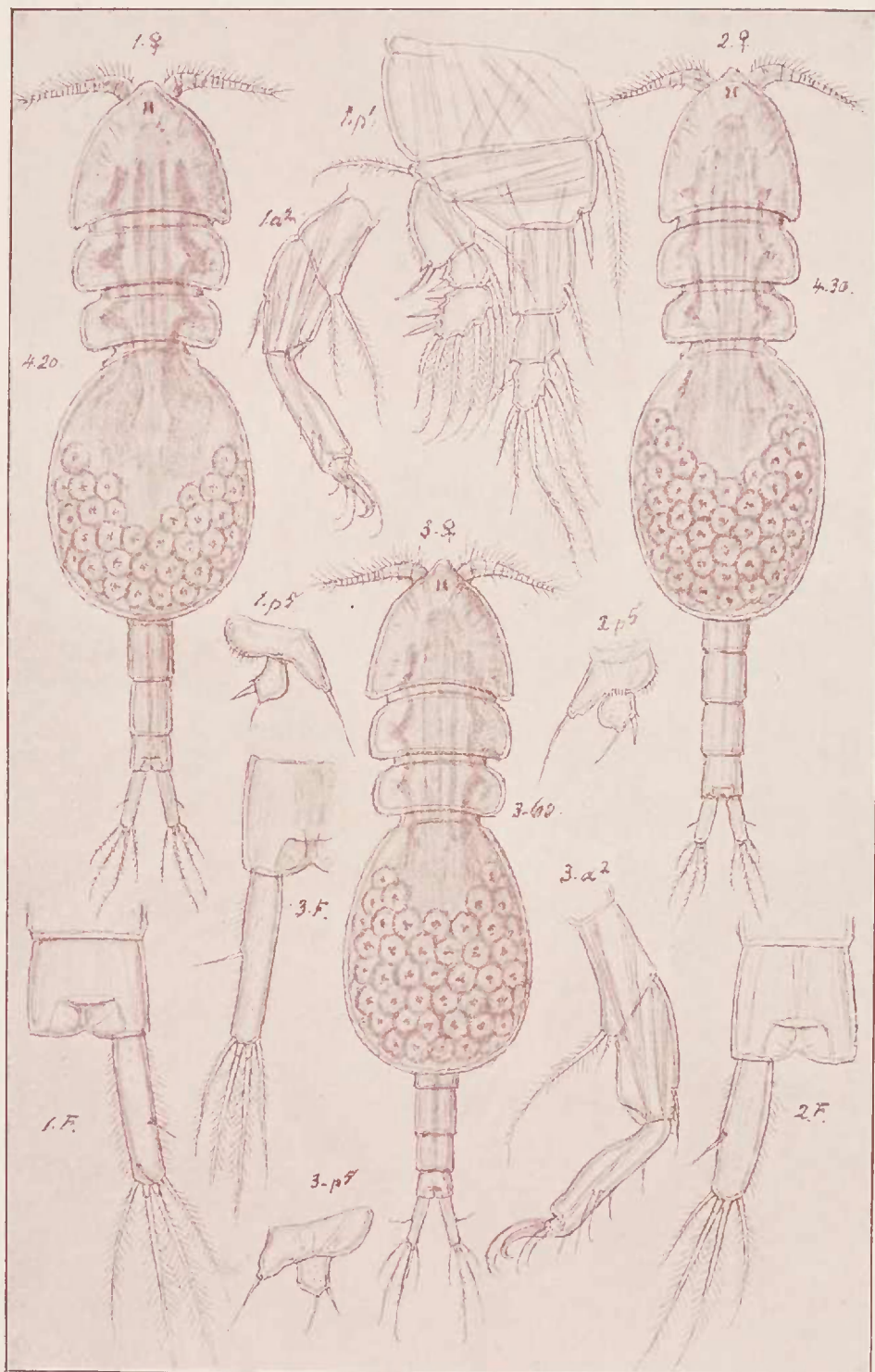
*Specific Characters.*—*Female.* Body comparatively short and stout, with the anterior division oblong oval in form, and having all the segments confluent, no traces of any dividing sutures being observable. Cephalic part defined from the trunk above by a very slight depression, and gradually contracted anteriorly, being produced in front to a very small, abruptly deflexed rostral prominence. Dorsal face of trunk gently vaulted and abruptly 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

# Copepoda

Notodelphyidæ

Notodelphyoida

Pl. XVII



G. O. Sars del.

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



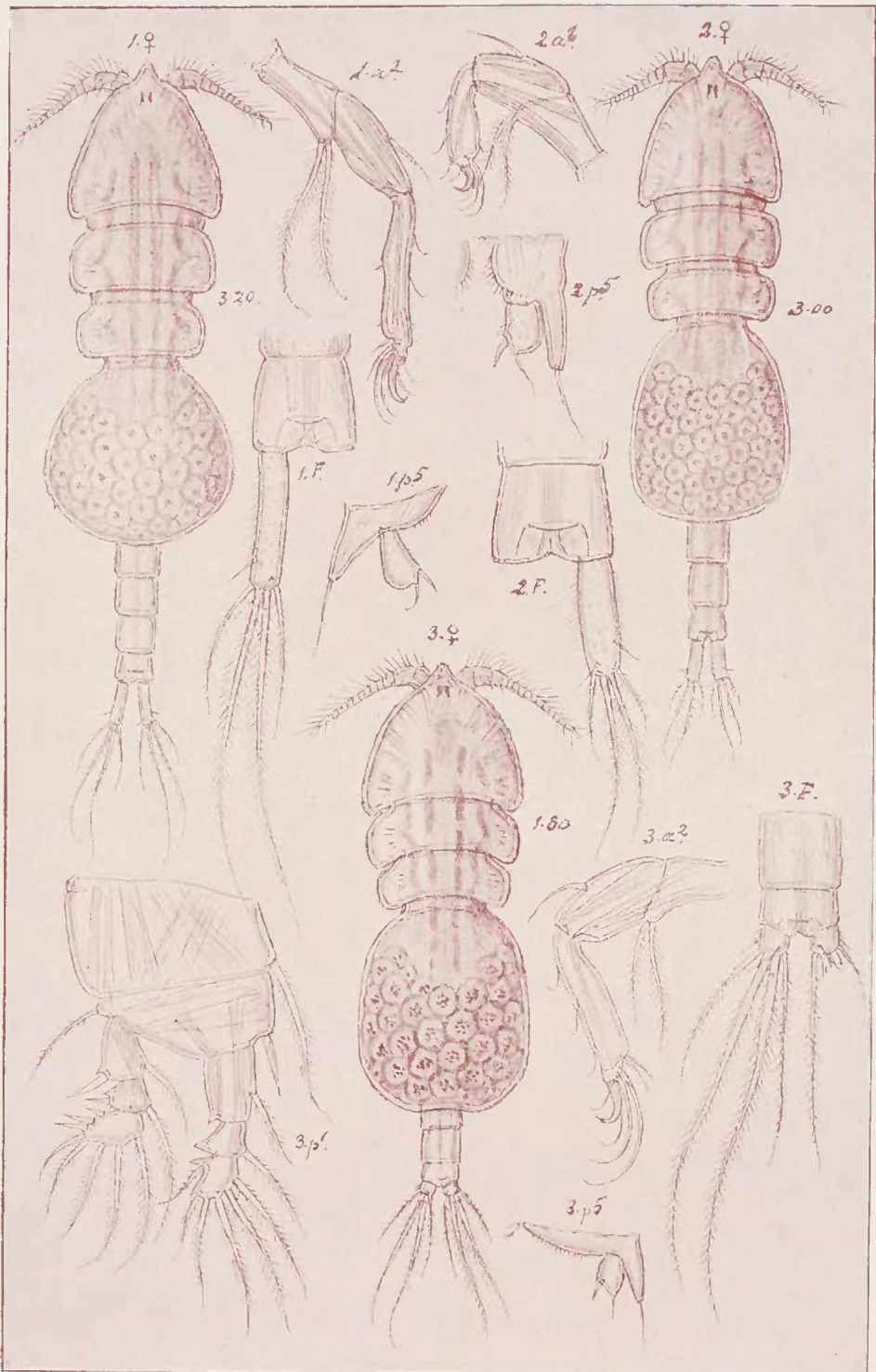


# Copepoda

Notodelphyidæ

Notodelphyoida

Pl. XVIII



G. O. Sars del.

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

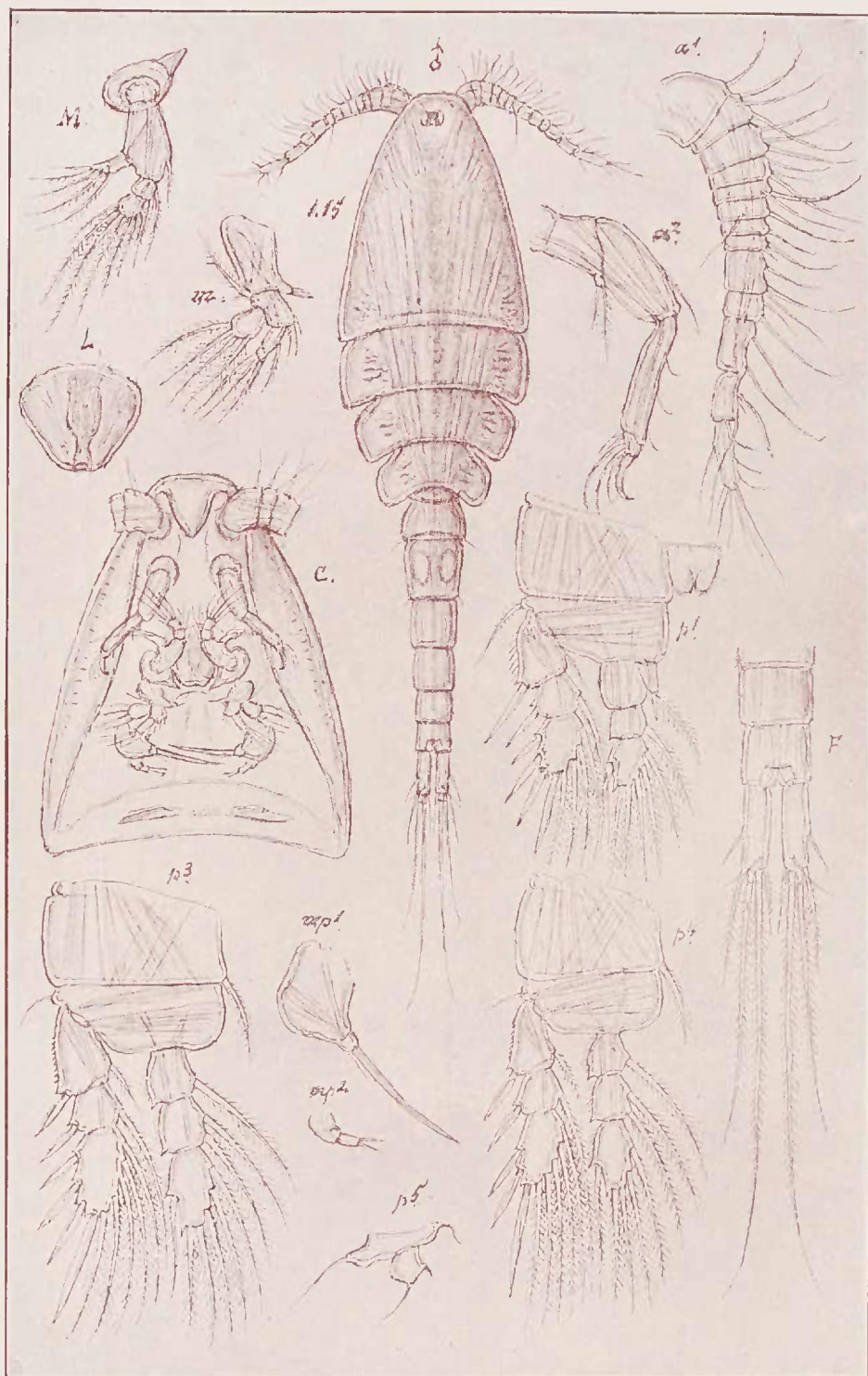


# Copepoda

Notodelphyidæ

Notodelphyoida

Pl. XIX



G. O. Sars del.

*Agnathaner typicus*, Canu



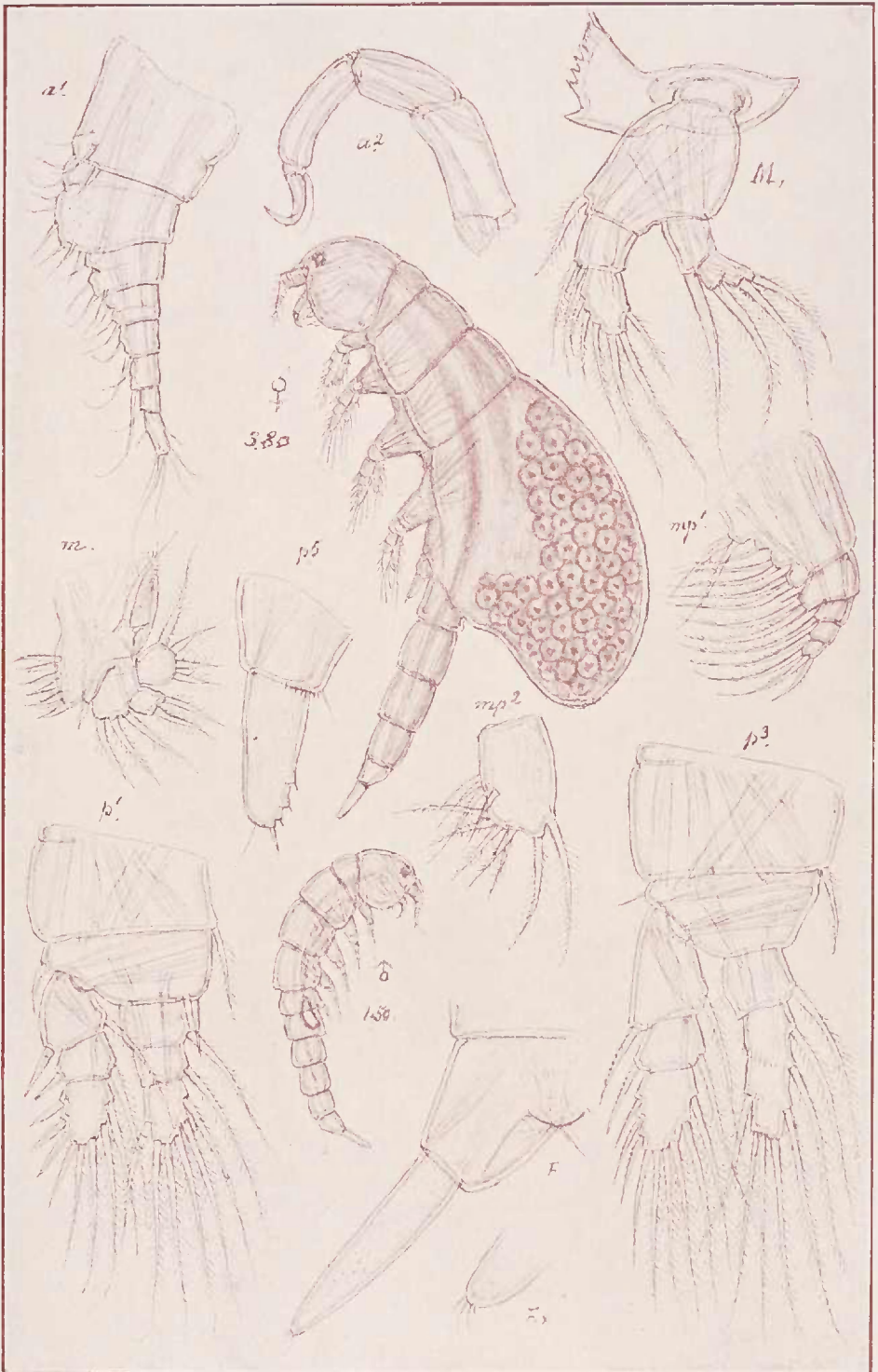


# Copepoda

## Notodelphyoida

Doropygidæ

Pl. XX



G. O. Sars del.

*Doropygus pulex*, Thorell



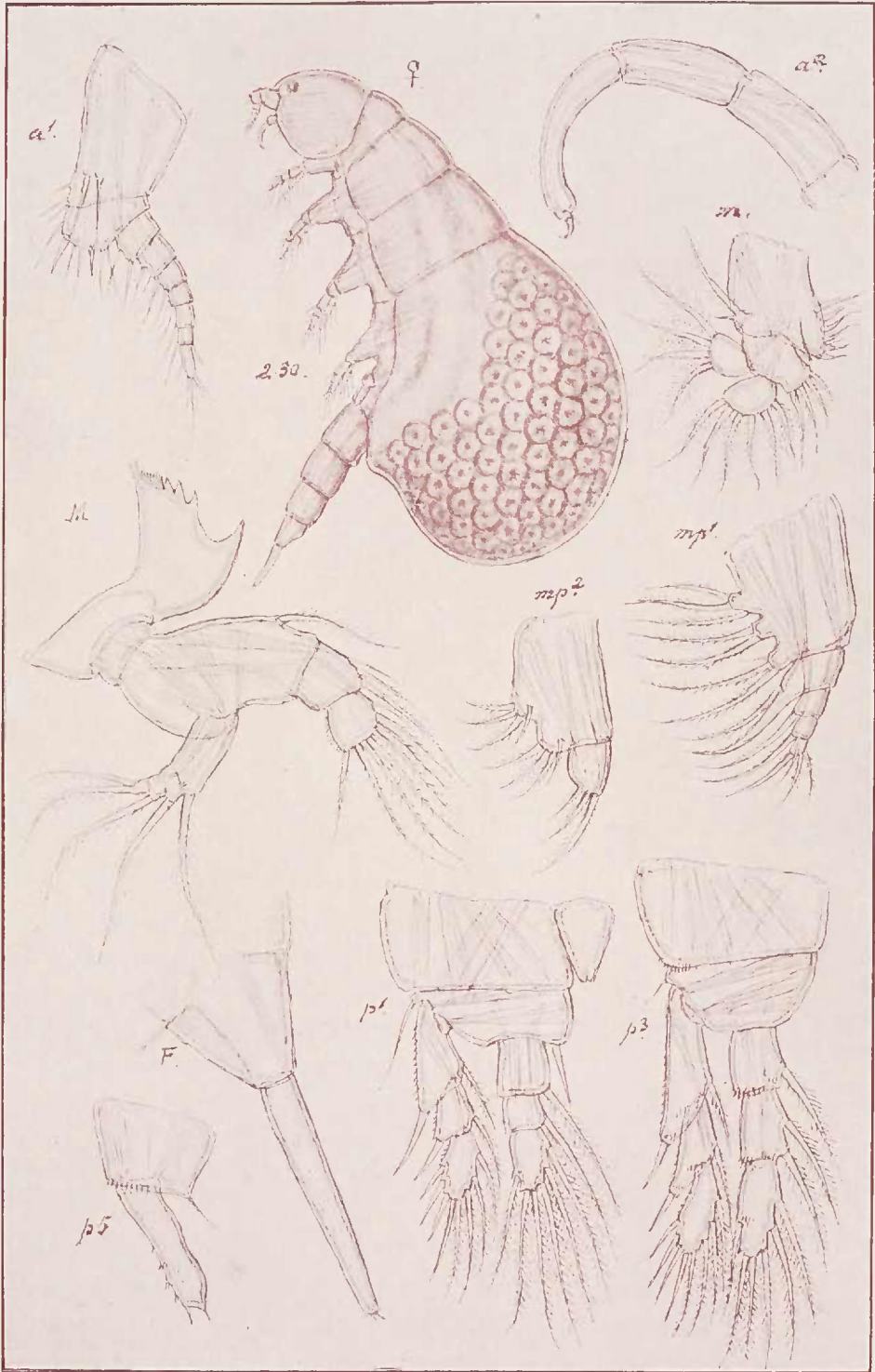


# Copepoda

Doropygidæ

Notodelphyoida

Pl. XXI



G. O. Sars del.

*Doropygus psyllus*, Thorell

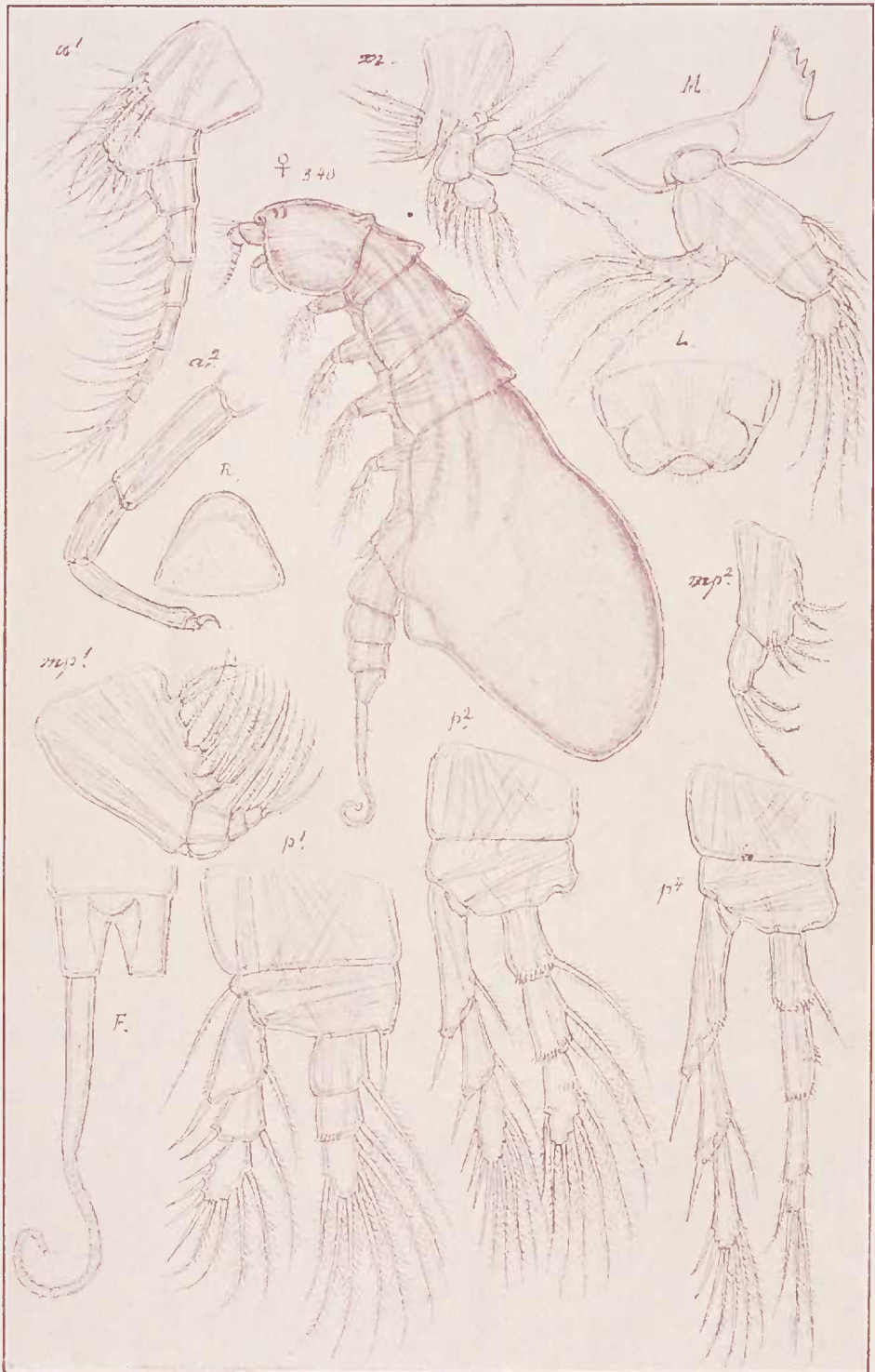


# Copepoda

Doropygidæ

Notodelphyoida

Pl. XXII



G. O. Sars del.

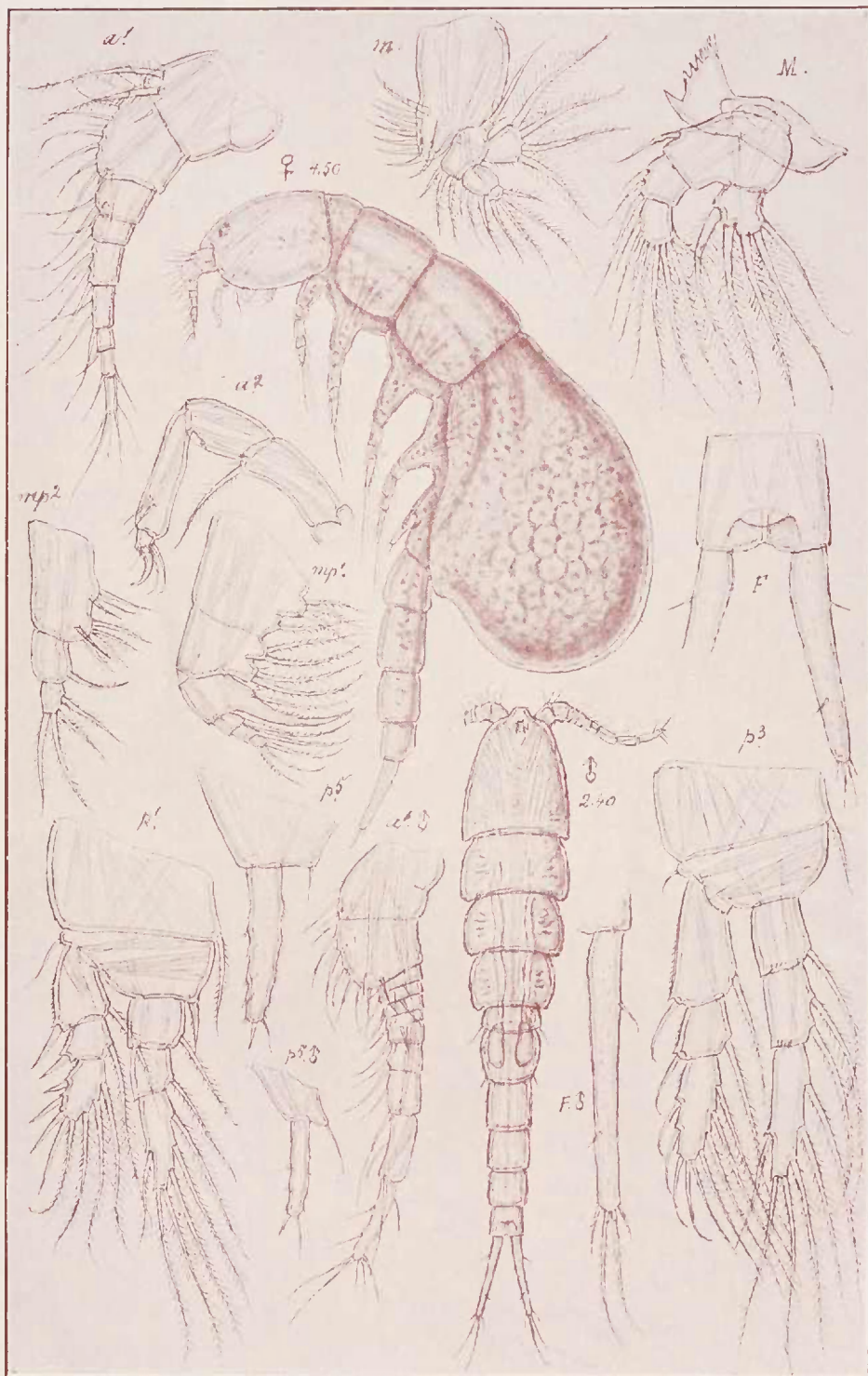
*Doropygus porcicauda*, Brady





## Notodelphyoida

Pl. XXIII



*Doropygopsis longicauda*, (Auriv.)



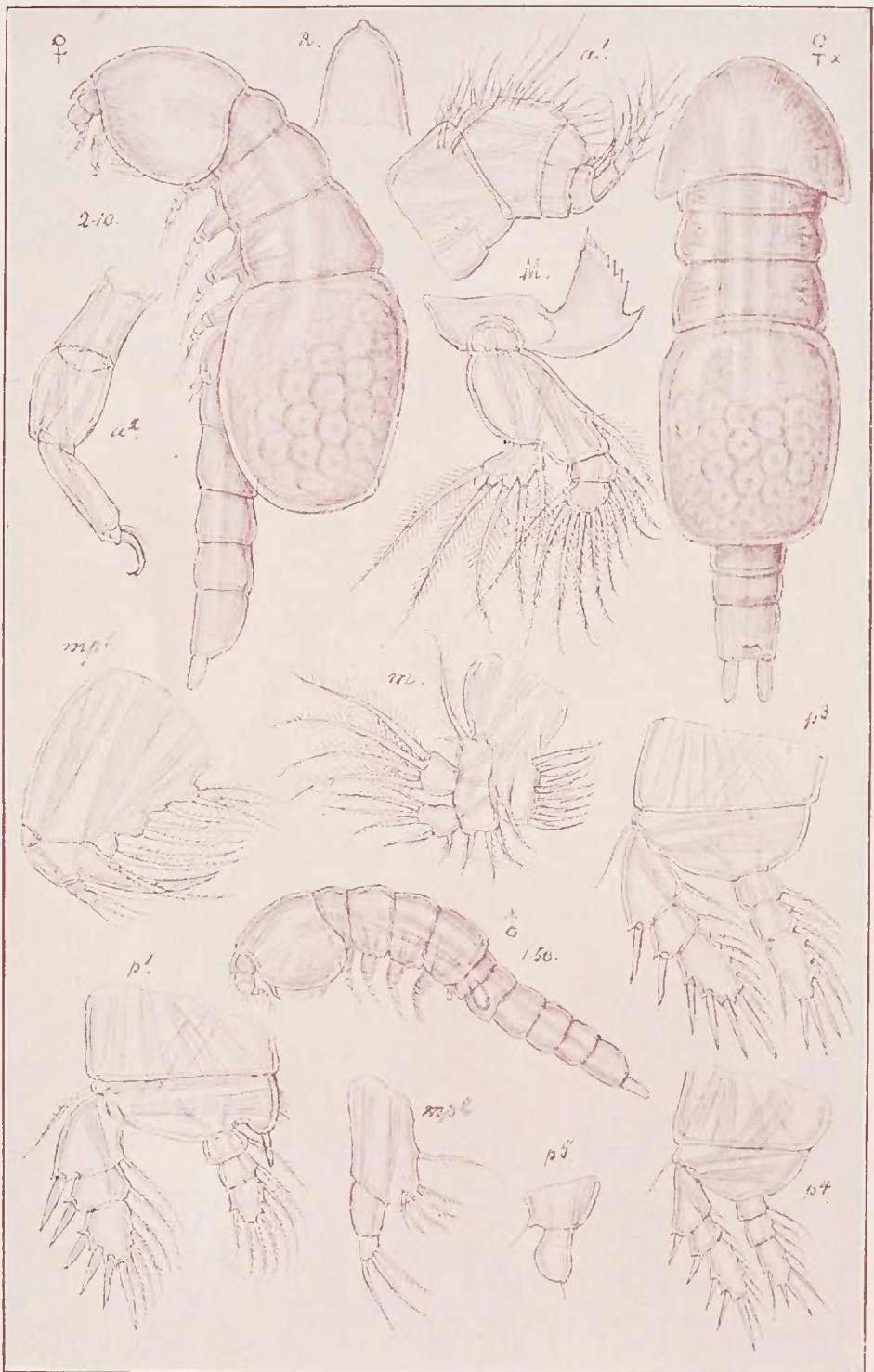


# Copepoda

Doropygidæ

Notodelphyoida

Pl. XXIV



G. O. Sars del.

*Doropygella Thorelli*, (Auriv.)



## Copepoda

Doropygidæ

## Notodelphyoida

Pl. XXV

G. O. Sars del.

*Pachypygus gibber*, (Thorell)



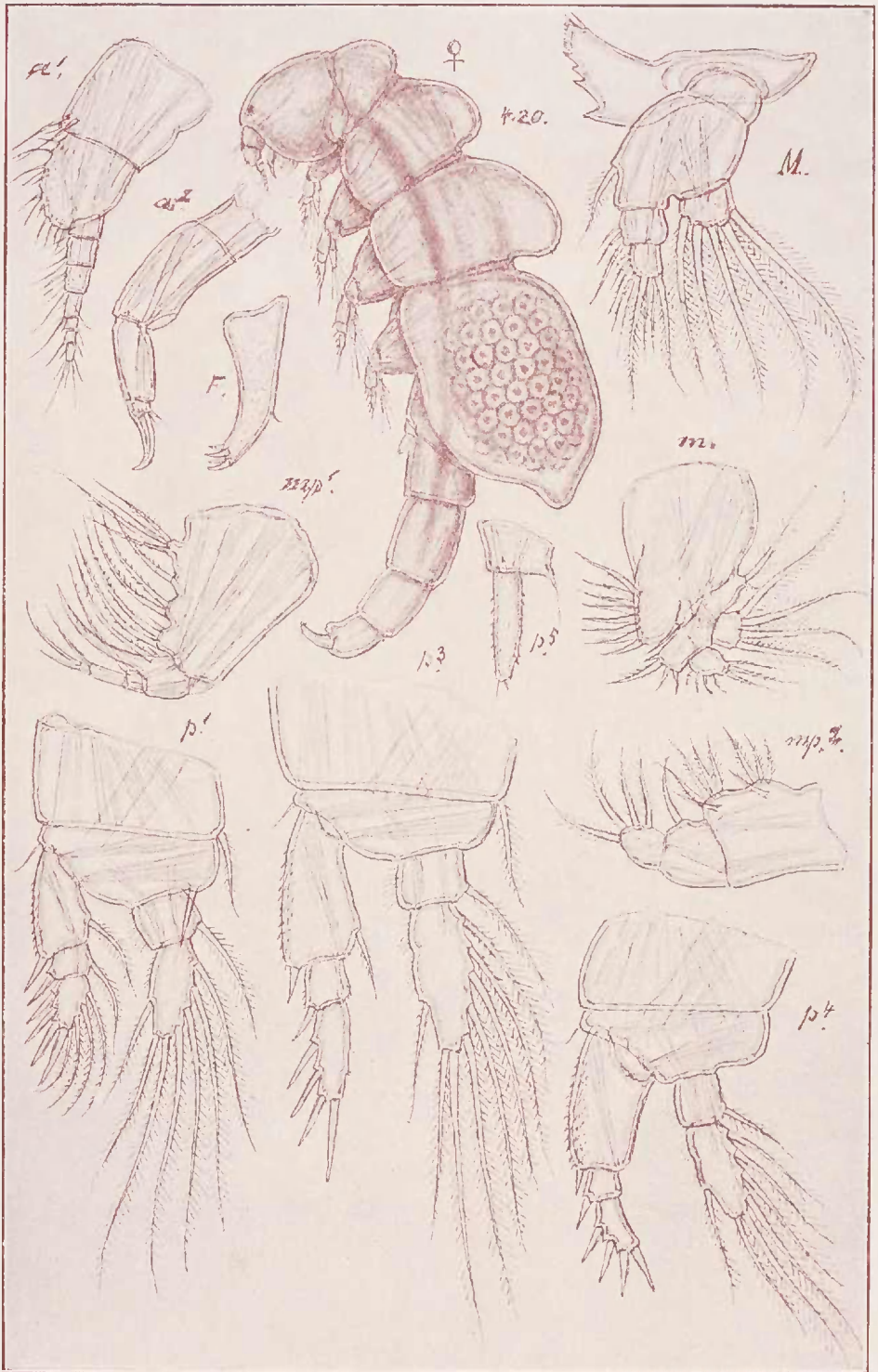


# Copepoda

Doropygidæ

Notodelphyoida

Pl. XXVI



G. O. Sars del.

*Notopterophorus auritus*, (Thorell)

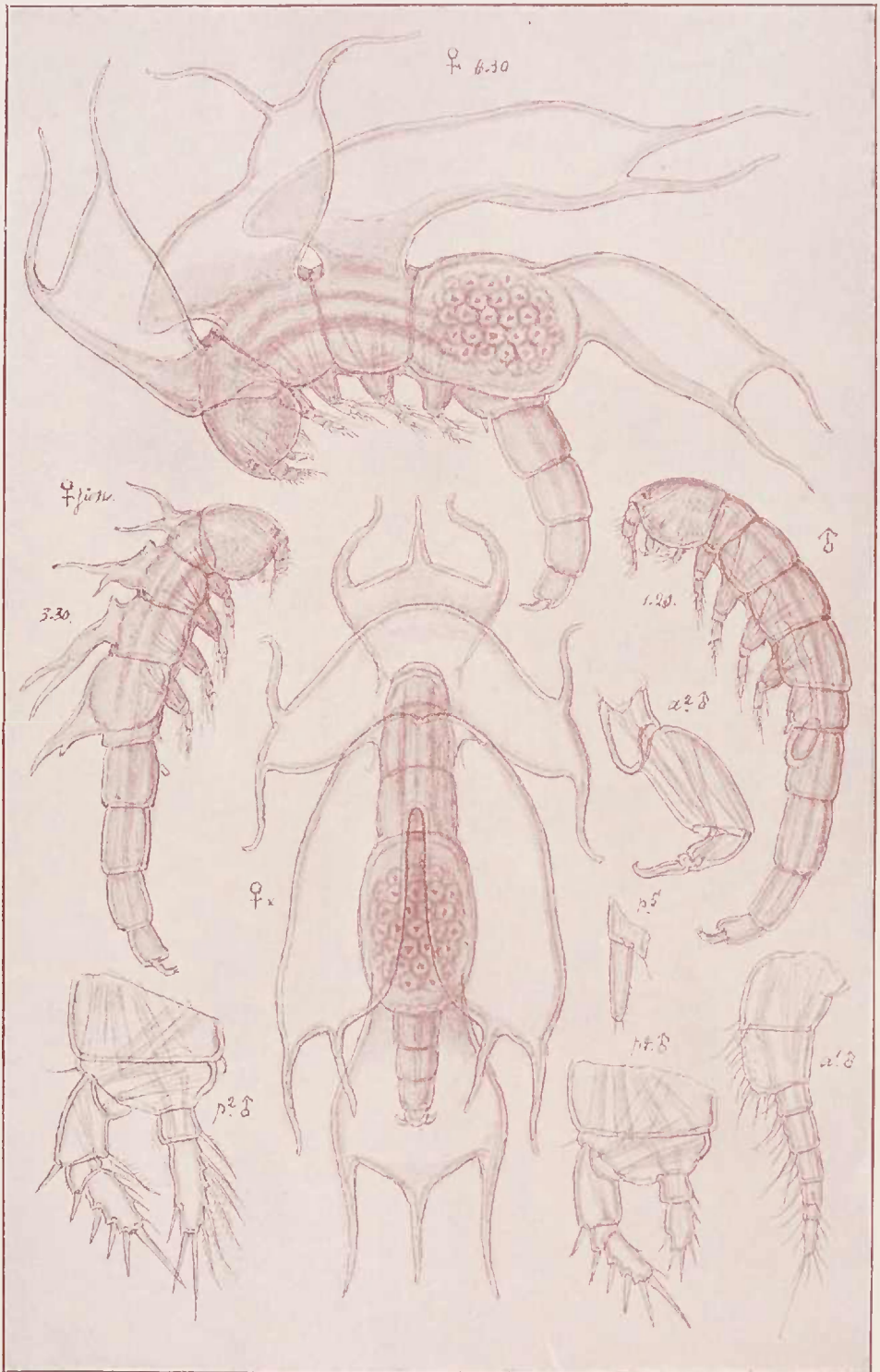


# Copepoda

## Notodelphyoida

Doropygidæ

Pl. XXVII



G. O. Sars del.

*Notopterophorus papilio*, Hesse



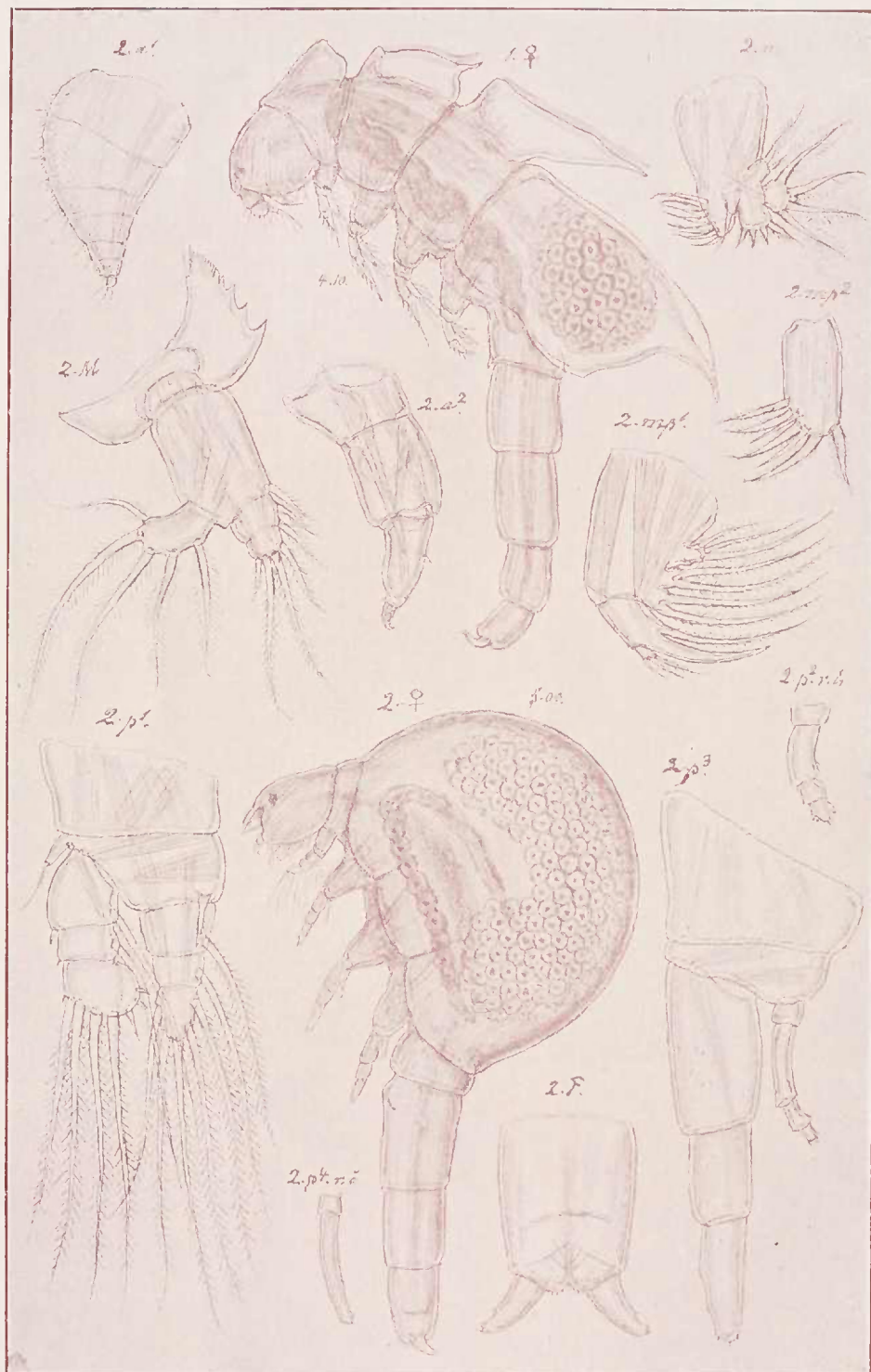


# Copepoda

Doropygidæ

Notodelphyoida

Pl. XXVIII



G. O. Sars del.

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



## Copepoda

Doropygidæ

## Notodelphyoida

Pl. XXIX

G. O. Sars del.

*Botachus cylindratus*, Thorell



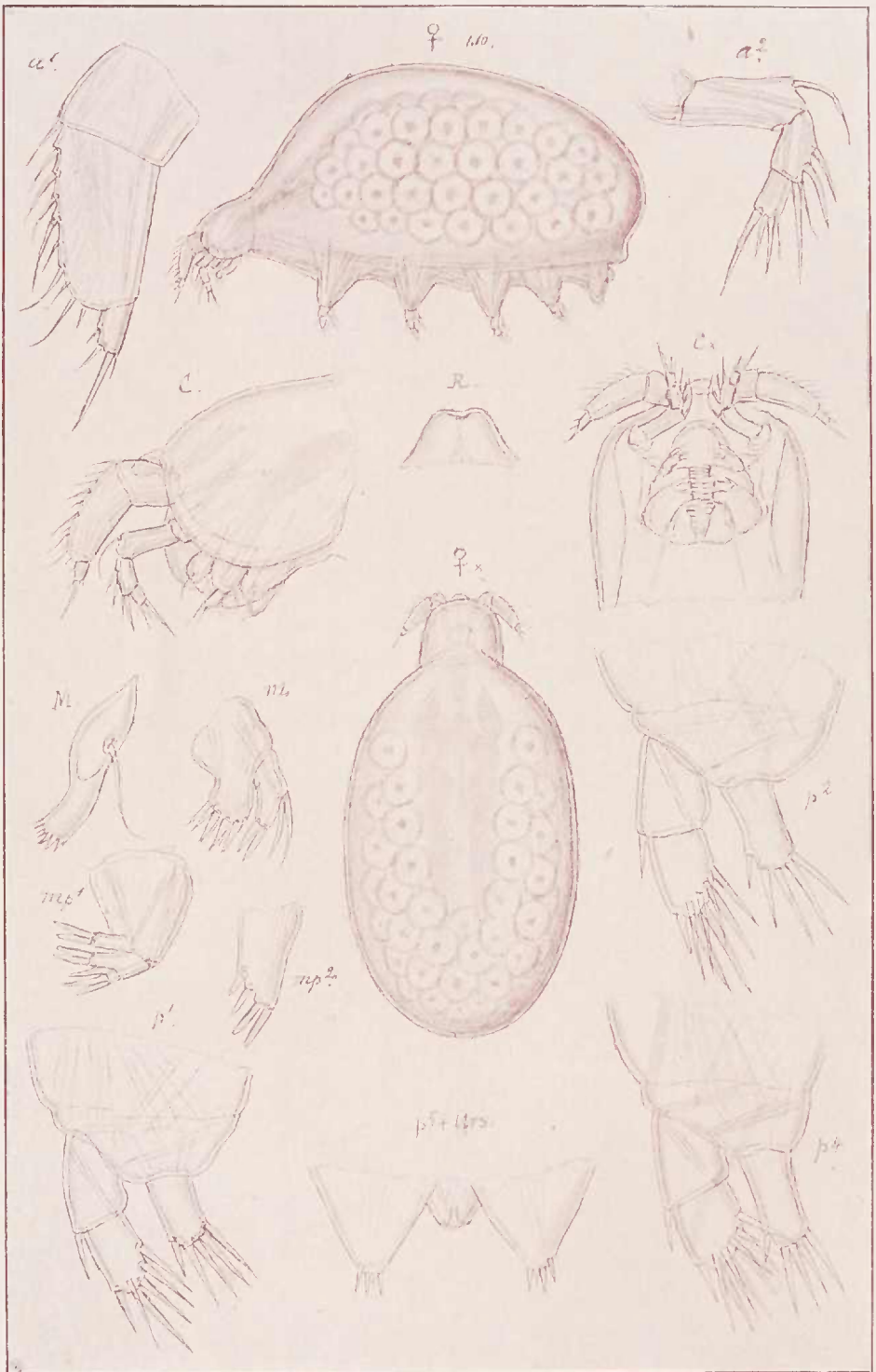


# Copepoda

Buproridæ

Notodelphyoida

Pl. XXX



G. O. Sars del.

*Buprorus Lovéni*, Thorell

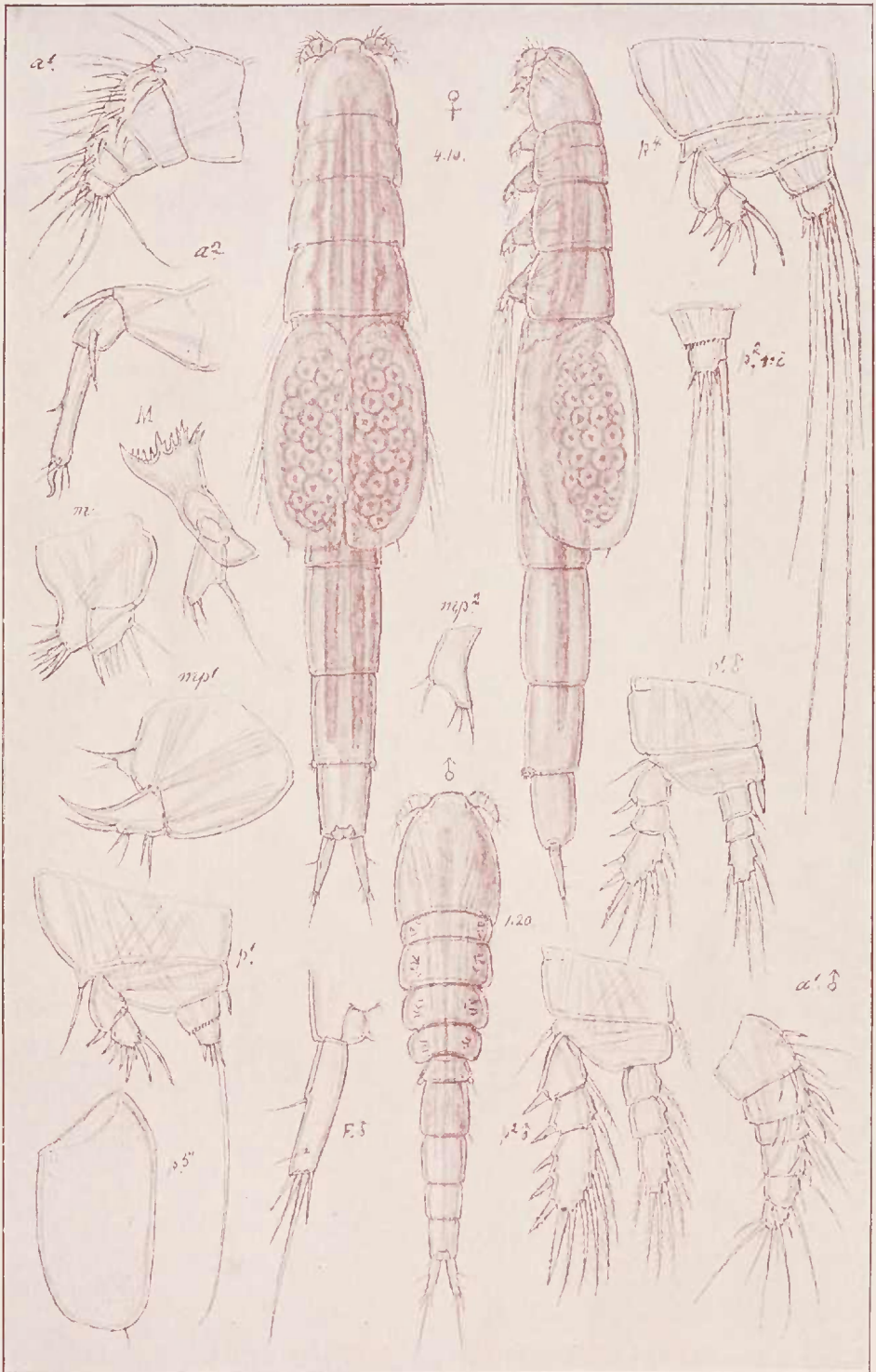


# Copepoda

Ascidicolidæ

Notodelphyoida

Pl. XXXI



G. O. Sars del.

*Ascidicola rosea*, Thorell



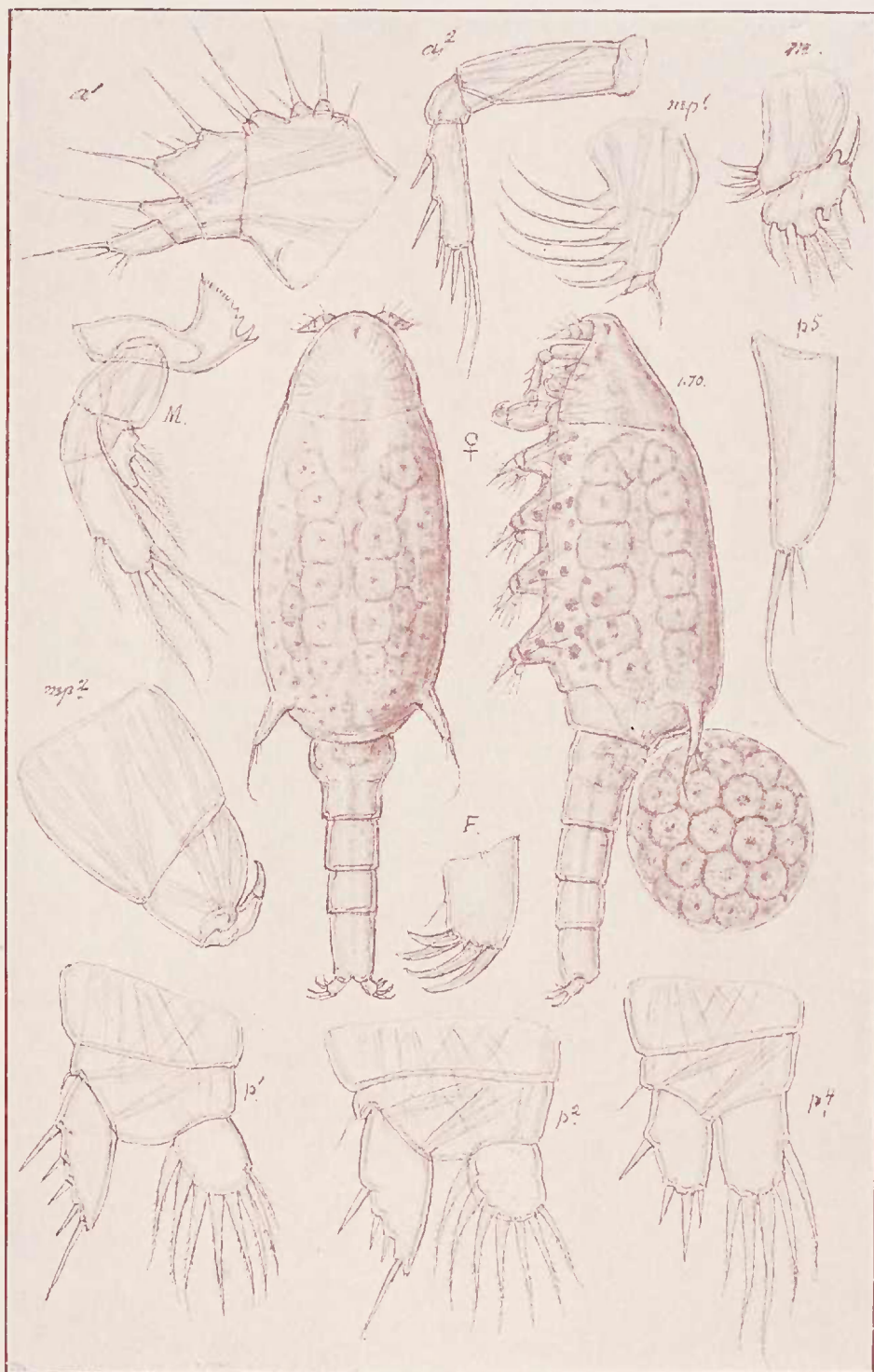


# Copepoda

Botryllophilidæ

Notodelphyoida

Pl. XXXII



G. O. Sars del.

*Botryllophilus brevipes*, G. O. Sars

