

THAUMATOPSYLLUS PARADOXUS

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A REMARKABLE COPEPOD
FROM THE NORWEGIAN COAST

APPARENTLY REFERABLE TO
THE MONSTRILLOID GROUP

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WITH 1 AUTOTYPIC PLATE.



ALB. CAMMERMEYERS FORLAG



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INTRODUCTION.

Many years ago, I got at Dröbak, Christiania Fjord, by the aid of a plankton-net lowered to about 60 fathoms, a single female specimen of a most peculiar Copepod, which at that time I was quite unable to refer to any of the known groups of that order. The same remarkable form was met with again several years afterwards in another locality, viz., in the Throindhjem Fjord, at Selven, where 2 specimens, likewise of the female sex, were taken from about the same depth, the one carrying large lateral ovisacs, the other provided with strongly developed ovaria.

The characters of this Copepod are so highly remarkable, that I find it right at once to publish the results of the closer examination which I have recently instituted of the animal, though I hope in one of the succeeding Volumes of my great work on the Crustacea of Norway to be enabled to recur to this interesting form.

The most perplexing feature of the animal is unquestionably the total absence of both the posterior antennae and of any trace of oral parts, the mouth being even completely closed, and of the intestine only a very slight shrunk rudiment being left within the foremost part of the body. Of course the animal in this stage is quite incapable to feed in the ordinary manner, and may only subsist on the nourishing matter accumulated

within the body-cavity. I have little doubt that the life-history of this remarkable Copepod will turn out to be a similar one to that recently stated by Mr. Malaquin in the case of *Monstrilla* (Hæmatocera), the animal, probably spending the far greater part of its existence as a true endoparasite within the blood of some invertebrate host, whereas the adult, free-living stage is solely devoted to the propagation and in all probability is of very short duration. So far the present form may perhaps provisionally be placed within the group or suborder *Monstrilloida*, though I am inclined to believe, that in phylogenetical respect there is no closer connection between this form and the true *Monstrilloida*. In any case it must be regarded as the type of a quite particular section, to which I would propose the name *Monstrilloida cyclopimorpha*, the other known forms being comprised within the section *Monstrilloida genuina*.

In the succeeding pages I propose to give short generic and specific diagnoses of this Copepod, followed by a detailed description of the adult female, the male sex being still unknown. The plate accompanying this paper has been reproduced by the autotypic proceeding and will, I hope, be found more satisfactory than the ordinary autographic drawings.

Section

Monstrilloida cyclopimorpha.

Fam. *Thaumatopsyllidae*.

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

Generic Characters. — Body of adult form cyclopoid in shape, the anterior division being conspicuously dilated, the posterior slender and attenuated. Head coalesced with the 1st trunk-segment, and having the front produced below to an obtuse rostral prominence. The 2 succeeding trunk-segments normally developed, the 2 posterior ones, however, abruptly much narrower and firmly connected with the tail, the movable articulation between the anterior and posterior parts of the body being transferred to the junction of the penultimate and antepenultimate trunk-

segments. Tail proper consisting in female of only 3 segments, the last very slender and narrow, rood-like. Caudal rami lamellar, with the normal number of setæ. Anterior antennæ of moderate length and extended laterally, being composed of a limited number of joints clothed with scattered unequal setæ. Posterior antennæ and oral parts wholly absent. Three pairs only of true natatory legs present, the 2 posterior pairs of legs being rudimentary and of equal structure. Two ovisacs present in female.

Remarks. — In addition to the above mentioned total absence of both the posterior antennæ and any mouth-organs, in which respect this form agrees with the other *Monstrilloida*, another perplexing character may here be noted, whereby the present form differs conspicuously from the other *Monstrilloida*, as also from any of the hitherto known free-living Copepoda, viz., the peculiar reduction not only of the last trunk-segment, but also of the penultimate one, both these segments being firmly connected with the tail, and in reality partaking in the movements of the posterior part of the body in relation to the anterior. In accordance with the reduction of these 2 segments, also their respective appendages are reduced and in a quite similar manner, both pairs constituting simple stems of inconsiderable size. Of course, only three pairs of true natatory legs are present, whereas in all other free-living Copepoda at least 4 pairs of such appendage are found. Finally, the extremely slender and narrow, almost rood-like form of the last segment of the tail gives to that part a quite peculiar appearance.

Thaumatopsyllus paradoxus, G. O. Sars, n. sp.

(See accompanying Plate).

Specific Characters. — *Female.* Body comparatively slender, with the anterior division oblong oval in outline. Cephalic segment very large and somewhat contracted anteriorly, frontal part narrowly rounded. The 2 succeeding segments well developed, with the lateral parts not extant and evenly rounded behind. Penultimate trunk-segment scarcely more than half as broad as the preceding one, and having the lateral parts slightly produced behind; last segment very small and quite simple. Tail exceedingly slender, almost attaining the length of the anterior

division; genital segment slightly contracted in the middle, 2nd segment quite short, with the posterior edge angularly produced dorsally; 3rd segment more than twice as long as the other 2 combined, and extremely narrow, rood-like, with the slightly dilated extremity transversely truncated. Caudal lamellæ oblong quadrangular in form, about 4 times as long as they are broad, and a little widening distally; seta of outer edge placed about in the middle; apical setæ densely ciliated, the outermost one shorter than the other 3, which are nearly equal-sized and about twice as long as the corresponding lamella. Antennæ much shorter than the cephalic segment and only slightly tapered, being composed of 9 joints, the 3rd of which is much the largest and nearly equalling in length the 6 remaining joints combined. The 3 pairs of natatory legs normally developed and of essentially same structure, both rami being distinctly 3-articulate and nearly equal-sized, The last 2 pairs of legs very unlike the former, each forming simple small 3-articulate stems of much the same appearance in the 2 pairs, middle joint very small, last rounded with 2 unequal apical spines. Ovisacs very large, rounded oval in form.

Remarks. — The above-characterised species being the only one as yet known, it is somewhat difficult to draw up precisely the specific characters. I have however attempted to do so in the above diagnosis, which perhaps may be liable to some alterations in the case that new species of the genus should be detected.

Description of the adult Female.

The length of the animal, measured from the front to the end of the caudal lamellæ, is about 1.68 mm.

The general form of the body (see fig. 1) is very unlike that in the genuine *Monstrilloida* and much more approaches to that generally met with in the *Cylopoidea*, the anterior division being conspicuously dilated and oblong oval in outline, whereas the posterior division is very slender and attenuated. The limit between the two divisions apparently occurs at the end of the 2nd free trunk-segment, the 2 succeeding segments being abruptly much narrowed, so as having the appearance of belonging to

the tail, though they undoubtedly represent the last 2 trunk-segments. The head is coalesced with the 1st trunk-segment, no limit between them being visible dorsally. On viewing the animal from below (fig. 2), however, a well marked arched suture is seen crossing the ventral face in about the middle of the cephalic segment, and evidently indicating the boundary between head and trunk. The anterior part of the head is somewhat contracted and narrowly rounded in front, forming below and obtusely rounded rostral prominence (see fig. 2—3). The 2 free segments following the cephalic segment are well developed, and have the lateral parts not extant and evenly rounded behind. The succeeding segment is abruptly narrowed, being scarcely more than half as broad as the preceding one, with which it forms a very movable articulation. Its lateral parts project behind in a small nodiform process. The last trunk-segment is quite simple and firmly connected with the penultimate one, as also with the genital segment.

The tail is very slender, almost equalling in length the anterior division, and is only composed of 3 segments. The 1st of these, the genital segment, is somewhat dilated in its anterior part, and exhibits in the middle a slight constriction. The 2nd segment is quite short, and has the posterior edge angularly produced in the middle dorsally. The 3rd segment is extremely slender and narrow, almost rood-like, and is more than twice as long as the other 2 combined. It is transversely truncated at the slightly dilated extremity, and does not exhibit any trace of an anal orifice, though a small arched chitinous stripe indicates the place where this orifice generally occurs.

The caudal rami (see fig. 11) have the form of 2 slightly diverging lamellæ of oblong quadangular shape and gradually somewhat widening distally. They are about 4 times as long as they are broad, and carry the normal number of setæ. That of the outer edge is attached about in the middle, and is of moderate length. Of the apical setæ the outermost one is the shortest, the other 3 being nearly equal-sized and about twice as long as the corresponding ramus. The dorsal seta, which is attached near the inner distal corner of the ramus, is very thin and apparently naked, whereas the other setæ are rather coarse and densely clothed with long cilia.

The anterior antennæ (fig. 4), which are movably attached within hollow spaces on each side of the rostral prominence (see fig. 2 & 3), are generally extended laterally, as in most other Copepoda, whereas in the genuine Monstrilloida these appendages extend straight forwards. They only slightly exceed half the length of the cephalic segment, and are composed of 9 joints clothed with scattered unequal setæ. Of the joints the 1st is, as usual, somewhat broader than the others and about twice as long as the 2nd. The 3rd joint is much the largest, being nearly as long as the 6 remaining joints combined. These joints are nearly equal-sized, and do not taper distally. The setæ issuing from the last 3 joints form together a dense apical fascicle.

Immediately behind the rostral prominence and inside the insertions of the anterior antennæ a short quadrangular area, the antennal area, is marked off by an angular stripe (see fig. 2). At the distal corners of this area the posterior antennæ should have been attached. But no such appendages occur in the present form; nor are any traces of oral appendages to be detected. In the place where the mouth should have occurred, a slight obtuse prominence of the ventral face is seen (see also fig. 3) bounded behind by a cordiform lamella, apparently answering to the posterior lip; but no orifice is found in front of this lamella and the mouth is accordingly completely closed. In the genuine Monstrilloida, on the other hand, though likewise wanting any oral appendages, a small oral orifice is always found, placed on the tip of a conical process or proboscis.

Of natatory legs only 3 pairs are present, one of them attached to the posterior part of the cephalic segment, the other two to the 2 succeeding free trunk-segments. All 3 pairs are well developed and nearly alike in structure, exhibiting a quite normal appearance (see figs. 5, 6, 7). Each leg consists of a broad flattened basal part and 2 rami. The basal part is divided into 2 well defined segments, the 1st of which carries at the inner corner a strong plumose seta. The 2nd segment has outside a slender bristle and forms inside a broad rounded expansion. Both rami are 3-articulate and comparatively broad with the last joint the largest. The outer ramus is a little longer than the inner, and has outside 4 slender lancet-shaped spines, 2 of which belong to the terminal joint. At the end of this

joint another much longer spine is attached accompanied inside by a well-developed natatory seta. Similar setæ also occur inside the ramus, viz., one on each of the first 2 joints and 2 or 3 on the terminal joint. The inner ramus has no spines, but in all 3 pairs 8 strong natatory setæ, 6 of which belong to the terminal joint, one of them being attached outside the joint, 2 inside, and 3 at the end. The 1st pair of legs (fig. 5) are a little smaller than the other 2, and moreover differ in having only 2 setæ inside the terminal joint of the outer ramus, whereas 3 such setæ are found on this joint in the other 2 pairs.

The 2 posterior pairs of legs (see figs. 8, 9, 10) look very different from the 3 preceding pairs and are not natatory, being reduced to comparatively small and simple 3-articulate stems, which seem to be quite immobile. The two pairs exhibit a much similar appearance, both as to size and structure, though the posterior pair are attached somewhat nearer the median line than the anterior (see fig. 8). Of the joints the 1st is the largest, and seems to answer to the basal part in the natatory legs, whereas the other 2 joints may represent the outer ramus, the inner ramus being accordingly wholly absent. The 1st joint carries in the anterior pair (fig. 9), at some distance from the end outside, a slender bristle, which is wanting on the posterior pair (fig. 10). The middle joint is on both pairs very small and quite unarmed. The last joint is rounded and somewhat lamellar, with a slender apical seta accompanied inside by a short spine. This spine is on the posterior pair (fig. 10) much reduced in size, whereas inside the joint a short seta is attached, not observed in the anterior pair.

The ovisacs were only present in one of the specimens examined (see fig. 1). They are, as in the Cyclopoida, attached laterally to the genital segment, and are of comparatively large size and rounded oval in form, each containing a great number of dark green ova. In the genuine Monstrilloida, as is well known, there is no true ovisac at all, the ova being attached in a single irregular mass to 2 very long rood-like spines proceeding from the ventral face of the genital segment and extending far beyond the body.

In the living state of the animal, the body is highly transparent and nearly colourless, with only a few scattered patches

of a reddish orange pigment. In one of the specimens examined, however, the anterior part of the body was filled up with an opaque dark green mass constituting the greatly developed ovaria. In the 2 other specimens this matter had been pured off, to form the ovisacs, and in the body-cavity only remained a number of clear oil-bubbles of unequal size and partly of a light orange colour. In all specimens a large transverse patch of a bright red pigment was observed within the frontal part of the head, exhibiting a somewhat irregular quadrangular form. According to its place, this pigmentary mass probably represents a kind of imperfect visual organ. No lenses or other refracting bodies could however be detected in combination with the pigment, and in the preserved specimens every trace of this patch had disappeared.

The animal was seen moving through the water in a somewhat jumping manner, propelling itself partly by the aid of the natatory legs partly by that of the tail. It was however by no means particularly agile in its movements.

EXPLANATION OF THE PLATE.

- Fig. 1. Adult ovigerous female, dorsal view, magnified about 60 diameters.
- » 2. Anterior part of body viewed from the ventral face, more highly magnified (antennæ somewhat reflexed).
 - » 3. Same part viewed from left side (antennæ not fully drawn).
 - » 4. Antenna.
 - » 5. Leg of 1st pair.
 - » 6. do. of 2nd pair.
 - » 7. do. of 3rd pair.
 - » 8. Last 2 trunk-segments together with the genital segment, viewed from the ventral face, and exhibiting the 2 posterior pairs of rudimentary legs in their natural position.
 - » 9. Leg of penultimate pair.
 - » 10. do. of last pair.
 - « 11. Extremity of tail, with the caudal rami; dorsal view.
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