

## Concerning the Mouth-Parts of the Oribatids.

By

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In a recent paper<sup>1</sup> Dr. A. P. Jacot makes the following sweeping statement (l. c. p. 221): »I find no special reason for studying the mouth-parts and the legs (of the Phthiracarinae) at the present time. Trägårdh has made a special study of the mandibles of his specimens, but the results do not warrant the time thus spent.»

This is a very serious accusation against my methods of describing these mites. an accusation, which is, moreover, not substantiated by any evidence that these organs are of such a uniform shape that their examination is not likely to contribute towards a better definition of the species but is merely a waste of time.

Before entering into a discussion as to whether it is safe to neglect certain organs, merely because it is somewhat difficult to dissect and to examine them, I must avow that I am not quite sure how to interpret Jacot's statement. If the words »his specimens» refer only to the *Phthiracarinae* then Jacot is wrong because I have hitherto only described one species of that family, *Phthiracarus borealis*. Assuming, on the other hand, that Jacot's statement is really as sweeping as to include all the Oribatei, I am at a loss to understand why he only mentions the mandibles, because whenever I have had the opportunity of examining the mouth-parts of the mites I have also investigated the maxillae and the palps.

Moreover Jacot has himself delineated the mouth-parts of other Oribatei f. i. the *Galumnidae*.

However, whether his charge is delivered only against the taxonomic value of the mouth-parts of the *Phthiracarinae* or against the Oribatids I will endeavour to refute it. As a matter of fact the mouth-parts especially of the Oribatids have not received the

<sup>1</sup> Oribatid mites of the subfamily Phthiracarinae of the N. E. United States. Proc. Boston Soc. Nat. Hist. vol. 39, no. 8. 1930.

attention they undoubtedly deserve. A more detailed investigation of them will without the slightest doubt enable us to solve many as yet unsettled questions regarding the relationship of many forms.

I may be allowed to state, at once, that if Jacot lodges against me the complaint of doing superfluous work, I, on my part, think it is a serious omission of him not to pay any attention at all to the mouth-parts of the *Phthiracarinae*. Surely a short description at least of the leading features of these organs ought to find a place in a paper which pays so close an attention to other structures as to put a number on every bristle of the hysterosoma! I hasten to say that I quite agree with him about the necessity of numbering these bristles. Because I fully agree with Oudemans that we have as yet only *started* the study of the acarina and know very little, indeed, about their natural system and the affinities of the many genera and families.

As a matter of fact the mouth-parts of the *Phthiracarinae* are so little known that there seems to be some uncertainty as to the exact number of the joints of the palps. Nicolet says that they consist of four joints only, whereas Claparède and Berlese delineate five joints. Michael, on the other hand, supports Nicolet's view and thinks that Berlese has mistaken the insertion point of a hair on a small shoulder near the middle of the terminal joint as a suture between two joints.

Fig. 1. Right half of hypostome and maxillæ, with palp of *Phthiracarus maculatus* Trägårdh.

As pointed out by the author (1931, p. 554) there are only three free joints. It is true that at the base of the first joint there is a ridge, which may possibly be regarded as indicating that the basal joint has been fused with the maxilla. It is evidently this basal portion which Michael and Nicolet interpret as the first joint.

Most of the Oribatei have, however, five joints on the palps and it is, therefore, of considerable interest to know in which way the reduction has been brought about. A comparison between

the *Phthiracarinae* and *Eulohmannia ribagai* seems to show that the three free joints of the former correspond to the three distal joints of the latter and also indicates an evident relationship between both (comp. Trägårdh 1910, fig. 343, p. 545).

But the mouth-parts of the *Phthiracarinae* also present at least one other feature which seems to me to be very significant, viz. the presence of four pairs of hairs on the hypostome and the maxillæ (fig. 1).

As a rule there are only three pairs situated as follows (fig. 2). The floor of the so-called camerostomum is generally formed by a large, more or less semicircular plate, the so-called hypos-

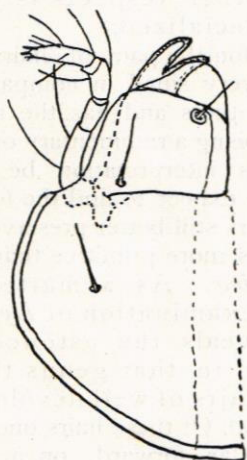


Fig. 2. Right half of hypostome and maxillæ, with palp of *Otocephus pacificus* Trägårdh.

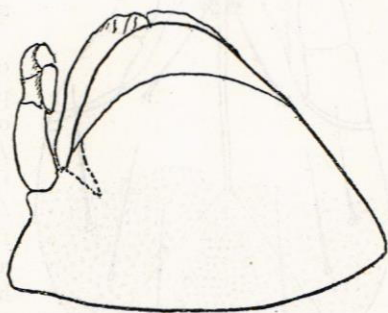


Fig. 3. Hypostome, right palp and part of right maxilla of *Galumna pacifica* Trägårdh (hairs not delineated).

tome which generally occupies at least the posterior half of the floor, as f. i. in *Otocephus pacificus* Tgdh (fig. 2) and sometimes, as in *Galumna* (fig. 3), occupies the whole floor, the maxillæ having as a consequence been pushed forwards and upwards so that they become inserted on the dorsal side of the hypostome. But these modifications do not influence the number of hairs which is always three pairs. One of these pairs is always inserted on the hypostome, in some genera near the anterior margin, in some near the lateral margin. The other two hairs are always to be found on the basal joint of the maxillæ.

In the *Phthiracarinae*, on the other hand, there are not less than four pairs of hairs (fig. 1). Of these one pair is situated on the hypostome, which in this group is a rather small, triangular

plate, the other three pairs are to be found on the maxillæ, the accessory pair being inserted near their posterolateral angle on the exterior side of the base of the palps, which sometimes, as f. i. in *Phthiracarus borealis* Tgdh completely conceales it (comp. Trägårdh 1910, fig. 351, p. 548).

To the occurrence of four pairs of hairs in the Phthiracarinæ a quite special significance must be attached when we recall the fact that in the Parasitidæ there are always four pairs of hypostomatic hairs. This feature must therefore be looked upon as a very primitive feature in the Phthiracarinæ and the more remarkable as this group in most other respects is very highly specialized.

The fourth pair of hairs is, however, very small in comparison with the others and has the appearance of being a rudimentary organ.

If this interpretation be true one would expect to find the fourth pair of hairs still better preserved in other forms more primitive than the Phthiracarinæ. As a matter of fact the examination of *Hypochthonius* reveals the astounding fact, that in that genus there are four pairs of well developed hairs (fig. 4). Of these hairs one pair is placed far forward, on a level with the base of the palps; the remaining three form two straight longitudinal rows converging backwards. It is not easy to determine how they correspond to the hairs of the Phthiracarinæ, because hairs are apt to move rather considerably, hence no safe conclusions can be drawn from their position.

The suture between the hypostome and the maxillæ, so conspicuous in other Oribatids seems at first to be absent in *Hypochthonius*, but an examination with oil-immersion reveals its existence. The whole surface is sculptured by small, circular depressions, but from the bottom of the long median fissure between the maxillæ two narrow bands of smooth chitin are running backwards at the same time widening and diverging towards the posterior margin, thus surrounding a triangular plate which is undoubtedly homologous to the hypostome. On this plate we find the posterior pair of hairs, this leaving the question unsolved which of the remaining

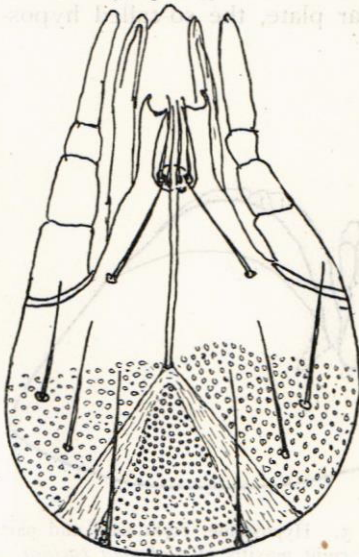


Fig. 4. Hypostome, maxillæ and palps of *Hypochthonius rufulus* C. L. Koch.

two pairs is homologous to the rudimentary pair of the *Phthiracarinae*.

It is in this connexion of great interest to find that the position and size of these hairs sometimes is a generic characteristic. Thus in *Hermannia* (fig. 5) and the closely related *Phyllhermannia* (comp. Trägårdh 1931, fig. 47, p. 579) the anterior pair of maxillar hairs is very small, curved and inserted far forwards, near the anteriomedian angles of the maxillæ, whereas in *Nothrus* (fig. 6) they are straight, as big as, or bigger than the posterolateral hairs and inserted behind the middle of the maxillæ.

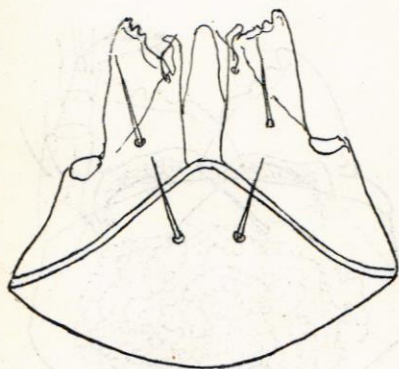


Fig. 5. Hypostome, maxillæ and lingula of *Hermannia* sp.

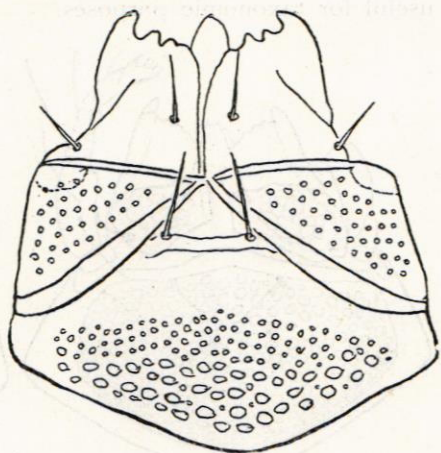


Fig. 6. Hypostome, maxillæ and lingula of *Nothrus* sp.

It will therefore in future be easy through an examination of these features to ascertain whether a form belongs to the fam. *Hermannidae* or to *Camisiidae*.

A comparison between *Galumna*, *Cepheus*, *Phthiracarus* and *Hypochthonius* also reveals the important fact that the development of the hypostome varies enormously in the different groups. The average development is undoubtedly represented by *Otocephus* (fig. 2), *Galumna* (fig. 3) representing the maximum development, while in *Phthiracarus* (fig. 1) and still more so in *Hypochthonius* (fig. 4) the maxillæ occupy by far the greater part of the floor of the mouth cavity.

In this connection another feature deserves to be mentioned, which has hitherto also been neglected. If we compare these structures in the genera *Plateremus* (fig. 7), *Nothrus* (fig. 6) and *Hermannia* (fig. 5) we notice, that in the former the hypostome is pentagonal with transverse, almost straight anterior edge, to which both palps and maxillæ are hinged.

In *Nothrus* (fig. 6), on the other hand, the antero-lateral parts are through narrow but very distinct strips of soft cuticle set off from the hypostome as large, triangular plates, extending backwards almost to the posterior margin of the hypostome and allowing the latter to reach the anterior margin only in the middle.

In *Hermannia* (fig. 5) the hypostome has almost the same triangular shape but the triangular plates are not separated from the maxillæ by an anterior transverse ridge but are completely fused with them. It is not easy to interpret these interesting structures which will, however, doubtless on closer examination prove very useful for taxonomic purposes.

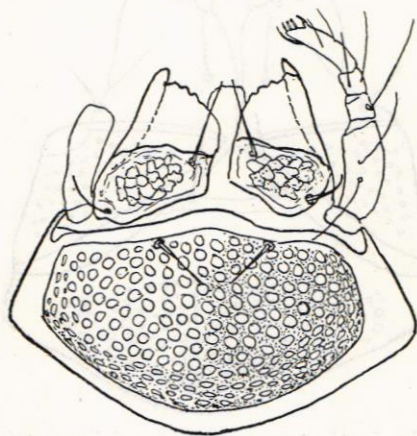


Fig. 7. Hypostome, maxillæ, lingula and left palp of *Plateremæus vestitus* Trägårdh.



Fig. 8. The same of *Neoliodes Bäckströmi* Trägårdh.

In *Hypochthonius* we find no similar structures but in *Plthiracarus* (fig. 1) the palps are hinged to a kind of plate which is almost entirely separated from the maxillæ by a ridge and, therefore, may be compared with the plates of *Nothrus*, to the antero-lateral angle of which the palps are attached. I am therefore inclined to consider these plates, which I propose to call basilar plates, not as a primitive structure but as a new departure, a development of that part of the maxillæ to which the palps are articulated. The basilar plates never carry any hairs.

A more detailed investigation of the maxillæ will doubtless also reveal many other structures which will enable us to define the genera more distinctly than is possible at the present time.

As an instance of this I may mention the genera *Plateremæus* Berlese, *Neoliodes* Berlese and *Cymbaremæus* Berlese.

*Plateremæus* was established by BERLESE in 1908 for two species previously recorded from Brazil and to this genus B. subsequently referred two more species, one from Chile, the other from Java. In 1931 the author described a species from Juan Fernandez (l. c. p. 565—570, figs. 20—31), gave a detailed diagnosis of the genus, which was previously only indicated by the type

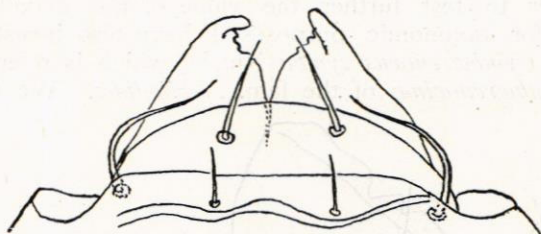


Fig. 9. Anterior part of hypostome and maxillæ of *Cymberemæus cymba* Nicolet.

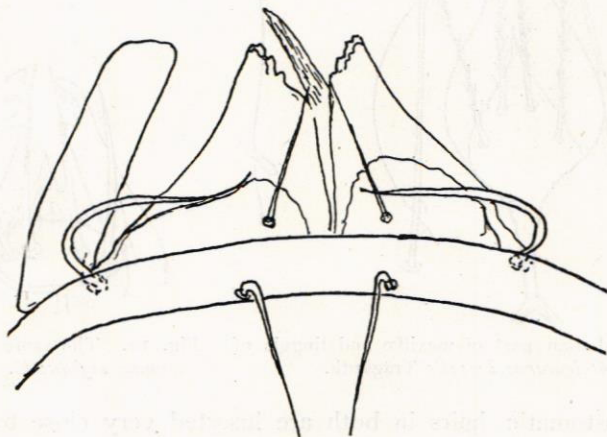


Fig. 10. The same of *Neoliodes farinosus* C. L. Koch.

species by Berlese, and raised it to the type of a new family, *Plateremæidae*, on account of the singular articulation of the legs.

When investigating the systematic position of the *Plateremæidae* it struck me that the maxillæ exhibit some features, which are common to *Neoliodes* (fig. 8). In both the basal part is set off from the rest as a pair of narrow transverse plates, the bases of which are concealed underneath the anterior edge of the hypostome. These plates have a sculptured surface and are obviously mere thickened portions of the maxillæ, the function of which is as yet obscure. The two pairs of hairs are inserted, one pair of curved

hairs at the postero-lateral angle so that their base is hidden by the projecting edge of the hypostome, the other pair being straight and inserted in the anteriomedian angle of the plate.

The presence of these structures in both *Plateremæus* and *Neoliodes* possibly indicates a relationship between them, as I have pointed out before (1931, p. 560).

In order to test further the value of the maxillæ and the hypostome for taxonomic purposes I have also investigated the maxillæ of *Cymbæremæus cymba* Nicolet which is referred to the subfam. *Cymbæremæinae* of the fam. *Neoliodidae*. We notice that

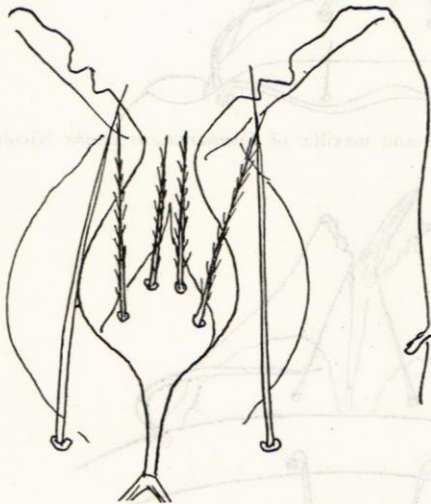


Fig. 11. Median part of maxillæ and lingula of *Phthiracarus borealis* Trägårdh.



Fig. 12. The same of *Hypochthonius rufulus* C. L. Koch.

the hypostomatic hairs in both are inserted very close to the anterior margin. In both the posterior maxillar hairs are very strong, inserted in the posterolateral angles of the maxillæ so that their base is hidden by the edge of the projecting edge of the hypostome, and curved sharply towards the median line. In both respects there is a great resemblance between the two genera. But in *Cymbæremæus* the basal parts of the maxillæ have coalesced as to form a thin plate (fig. 9).

Finally there is to be considered an organ called by Michael the lingula, which has hitherto been very much neglected by the acaridologists. It is also present in the *Parasitidae*, but nevertheless Berlese does not even mention it in his monograph of the genus »*Gamasus*» Latr. I have found a similar structure in *Speleorchestes formicorum* (1909, fig. 2, p. 5) amongst the *Prostigmata*.



It is a very delicate, membranous lanceolate appendage of which only the anterior tip is to be seen in front of the maxillæ (Figs. 5—7). But in some genera the median edge of the maxillæ is concave so as to leave a distinct opening to receive the top of the lingula, which as a consequence takes a part in the formation of the floor of the mouth-cavity (fig. 11).

This remarkable feature is a characteristic of the *Phthiracarina* (fig. 11) and we further notice that the lingula bears two pairs of feathered hairs. This feature it shares, however, with *Hypochthonius* (fig. 12). In this genus we find a similar concavity of the median edge of the maxillæ and the top of the lingula is shaped as an oval, transverse plate with an anterior triangular mucro and bearing the same number of hairs as *Phthiracarus*, thus confirming the validity of the opinion expressed above that these groups in spite of all the differences show a great affinity in some respects. A more detailed study of the lingula of the acarina will doubtless reveal many other important structures.

To conclude I venture to hope that I have succeeded in offering evidence enough to convince the acaridologists, that, contrary to the opinion of Dr. A. P. Jacot, it is of the utmost importance not to neglect the study of the mouth-parts of the Oribatids.

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### Literature.

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