III. Internationaler Entomologen-Kongreß
Zürich, Juli 1925
Band II

Stanislaw Minkiewicz

A study in the Morphology and Biology of Psylla mali Schmidb.

Weimar 1926
Buchdruckerei G. Uschmann, Karlstraße 3

Szanownemu Panu
Drowi Kazimierzowi Gajlowi
z podziękowaniem za pamiątkę
i serdecznem pozdrowieniem
Petersburg 5 1916 Schmidberg.

Stanislaw Minkiewicz

A study in the Morphology and Biology of Psylla mali Schmidb.

Dr. Kazimierz Gajl

A study in the Morphology and Biology of Psylla mali Schmidb.

By Dr. Stanislaw Minkiewicz, Pulawy (Poland).

(With Plate 12 and 13.)

The author gives a short description of certain characteristics of the structure of the mouth parts, particularly of the labium, in *Psylla mali* larvae and discusses their function. Taking no notice of the internal parts of the mouth organs of the larvae, which do not differ in general from those of adult forms lately described by Grove (2) and Brittain (1), the characters are as follows:

A prominent semicircular clypeus occupies the middle part of the lower surface of the head and with its narrowed portion reaches the sternite of the 1st thoracic segment. Its top (i. e. the labrum and epipharynx) is covered by the walls of the 1st labial segment ~~(which is deeply inserted in its groove)~~ and is invisible from outwards. The 1st segment of the labium is long, oval, prominent and situated between the coxae of the 1st pair of legs (fig. 1, 2, 3, 4 and 6); the groove of the labium is deep and the walls are closely clasped together. The setae coming out from the tentorium extend downwards and avoiding the epipharynx pass to the groove of the 2nd and 3rd labial segment, sharply bending downwards, according to the downward flexion of these labial segments (fig. 5). The diagrammatic figure 5 demonstrates the relations of the particular parts of the labium and the course of the setae. The 2nd labial segment is short, stout, almost quadrangular; its base lies deeply in the cavity of the middle part of the sternite of the 1st thoracic segment (fig. 1, 2, 3, 4).

Finally the 3rd segment, long and somewhat flattened, is heavily chitinised, black, and sharp towards the end. The 2nd and 3rd labial segments are curved downwards almost vertically.

One can observe the function of the labium in the larvae when laid on their dorsal side on a slide. One can usually see the withdrawal of the setae, but very rarely their protraction from the labium.

If the larvae taken off from the bud and immediately laid on the slide have not withdrawn the setae (fig. 1), we see them moving

their setae quickly. One can thus observe on the surface of the clypeus at first a small setae loop (fig. 2), which slowly increases and moves further forward till it reaches the circumference of the clypeus (fig. 3 and 4). When the end of the labium is a little bent towards the thorax from its natural, almost vertical, position, one can see that the withdrawal of the setae does not proceed continuously, but with some intervals.

If the setae loop is straightened with a needle, the setae stick up vertically with the base at the end of the 1st labial segment (fig. 6). In such condition the withdrawal of the setae and the new formation of a loop cannot take place. Only when the larva introduces its setae by particular movements into the labial groove, the withdrawal of the setae and the formation of a loop can happen anew. The introduction into the groove is generally attained by the retraction of the base of the raised part of the labium (2nd and 3rd segments) more deeply into its cavity and by the flexion of the 2nd and 3rd labial segments (fig. 4) to the front (to a vertical position) towards the setae, which are directed vertically downward and which afterwards enter into the labial groove.

It often happens that the setae, after the straightening of the loop, pass before the 1st labial segment and are not directed vertically downwards, but lie hozirontally on the clypeus with their ends coming beyond the head (fig. 7). Then the larva bends the labium forwards and tries to bring its 2nd segment near to the bent base of the setae (fig. 7, b. st.), appressing it finally to the latter and fixing them into the groove. Now takes place the withdrawal of the horizontally lying setae by means of the 2nd labial segment and the loop forms itself simultaneously. The 3rd labial segment takes no part in this proceeding, for it cannot come into contact with the setae. The setae loop forms itself from their bent base in the labial groove of the extreme part of the 1st labial segment (fig. 5). It would take a position vertical to the ventral surface of the larva, but the walls of the 1st labial segment, clasped together, hinder it to take this position, so that the loop lays itself horizontally in the groove of this segment and moves forward on to the clypeus. One can notice, however, at the parting of the walls of the 1st labial segment, the formation of the loop: it takes a vertical position, increases gradually in proportion to the withdrawal of the setae and keeps vertical towards the surface of the clypeus all the time till the complete withdrawal of the setae (fig. 3). From the above description of the retraction of the setae one may draw the two following conclusions:

1. The 2nd and 3rd labial segments undoubtedly take a part in this function;

2. The action of pro- and retractor muscles of the mandibles and of the maxillae is not sufficient (cf. Grove 2) for the retraction and protraction of the setae and the formation of the setae loop.

As to the biology of *Psylla mali*, the author considers here two problems which, according to his view, have not been completely solved, namely: the variability of the seasonal colouring in the imagines and the phenomena in reproduction. The former observers of the *Psyllidae* — the author of the species, Schmidberger himself, Taschenberg and others —, considered the autumnal bright colouring as „a nuptial garment" (Schmidberger's „hochzeitliches Kleid"). Mating and oviposition take place during this period — in September — according to the two above mentioned authors (and others). This question of the colouring was no further discussed later. However, as the author of the present paper was able to ascertain, the mating takes place in *Psylla mali* soon after the appearance of the imagines (in May, June), when there is as yet no change in colouring. Later, at the beginning of September, when more specimens are mating, the variability of colouring does not yet reach the climax of its intensity. There must consequently exist other factors inducing the variability of colouring towards autumn not connected with reproduction. One may suppose this variability of colouring to be a seasonal phenomenon in connection with the colder season, the change taking place in order to protect ovipositing specimens against unfavourable conditions of temperature. The appearance of the red and dark tints (black on the abdomen) as absorbing the sun's rays best renders the above supposition probable. The phenomenon of such variability in the colouring would be similar in this respect to the appearance (in some aquatic organisms, e. g. in Crustaceans) of a red tint towards winter, as well as to the fact that many species of Crustaceans living in highly situated mountain lakes have a reddish tint.

The second problem in the biology of *Psylla mali* refers to the period of reproduction, its duration and the number of generations.

From the author's observations made, with intervals, from 1920 it results that the first copulating specimens can be met with soon after the appearance of the imagines, i. e. at the end of May and the beginning of June. However, in the course of June, July and August few mating specimens are noticed. At the end of August and especially during September more and more copulating couples are found, and

only at this period begins the oviposition, which lasts nearly till the end of October. The author did not notice any oviposition before the end of August.

From earlier observations Schreiner's data published in 1913 (4) deserve to be mentioned. Schreiner found the first mating specimens in spring (May 24, 1906); the ♀♀ had already eggs. What is most important, this author found on the 31st May and the 11th June of the same year several nymphs from which imagines soon developed. From this observation Schreiner concludes that „*Psylla mali* has in the course of a year 2 generations, the second of which is partical[1]) and consists of a relatively small number of specimens." „It is possible that the specimens of this 2nd generation may pass the winter and be designed to preserve the species in the case of the destruction of the winter eggs caused by unfavourable conditions."

The author found nowhere in literature data referring to the 2nd generation of *Psylla mali*, and during his observations he never found any estival eggs of this species.

From Schreiner's observations and also from the fact that spring mating occurs in few specimens of *Psylla mali*, one may conclude that this mating period is secondarily reduced and that *Psylla mali* may previously have had 2 generations (the 2nd partial generation found by Schreiner) of which one has been lost.

However, from the fact (stated by Brittain, 1.) that the ♀♀ of *Psylla mali* become mature later (only at the end of August), whereas the ♂♂ are mature soon after reaching the instar of imagines (at the end of May), one can conclude that here occurs copulation with immature females, which, till the time of the maturity of their ovaries, keep the sperma in the receptaculum seminis and begin oviposition only afterwards.

Literature.

1. Brittain, W. H. — The Morphology and Synonymy of *Psylla mali* Schmidberger. Proceedings of the Acadian Entomological Society, No. 8. Fredericton, N. B. April 1923.
2. Grove, A. J. — The anatomy of the head and mouth parts of *Psylla mali*, the apple sucker, with some remarks on the function of the labium. Parasitology, vol. XI, Nos. 3 and 4, 1919. Cambridge.
3. Korolkov, D. M. — Vreditieli sada (Pests of orchards). Matierialy po izuczeniju vrednyh nasiekomyh Moskowskoj gubernii.

[1]) The second partial generation was also observed by Korolkov (3).

(Materials for the study of the injurious insects of the Gouv. of Moscow.) Moscow, V, 1914.

4. Schreiner, J. Th. — Gruszevaja i jablonnaja miedianicy (Pear and apple suckers [*Psylla*] and their control). Zaszczita rastienij ot vreditielej N. N. 1—2 (13—14). (Protection of plants against injurious insects, Nos. 1—2 (13—14). St. Petersburg, 1913.

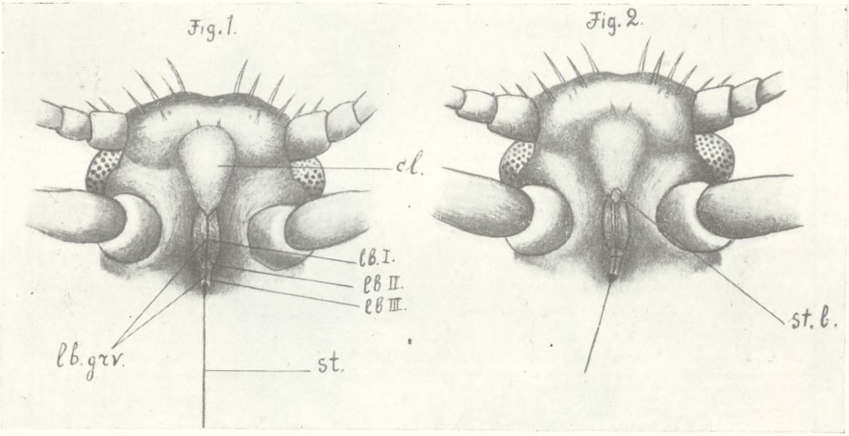
Explanation of figures.

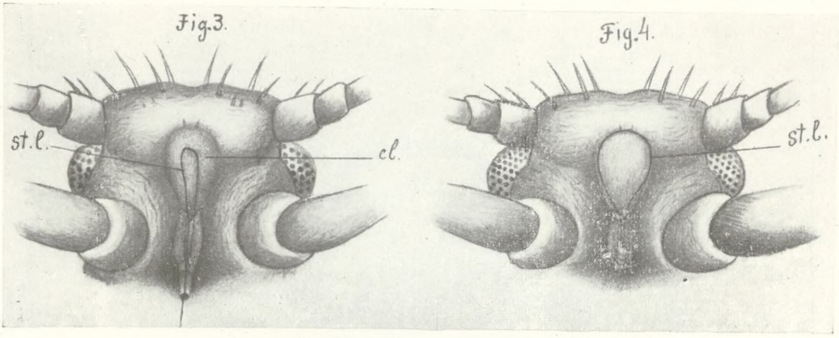
Fig. 1, 2, 3, 4 and 6: the head and the 1st thoracic segment of *Psylla mali* larva (before the last moult); ventral view; fig. 1, 2 and 6×56; fig. 3 and 4×63.

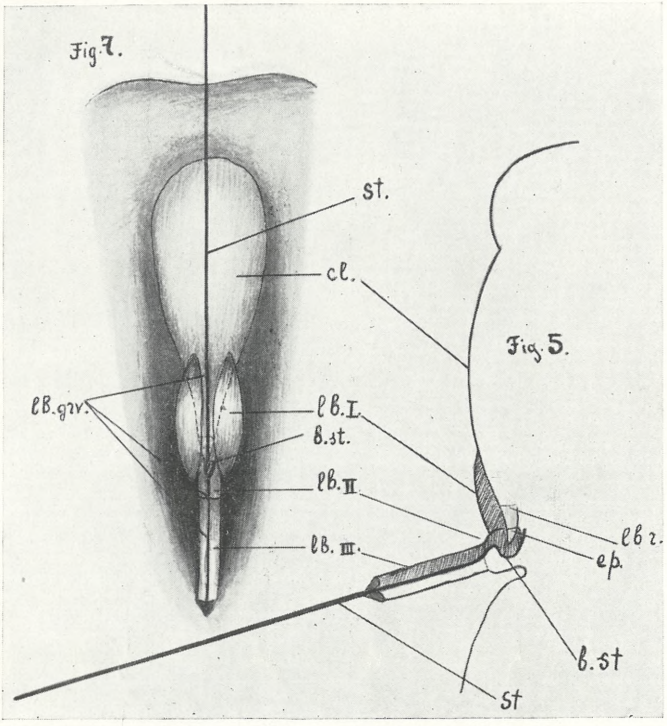
Fig. 5. Clypeus and labium of *Psylla mali* larva (before the last moult); ×190. The walls of the groove of the 1st labial segment parted.

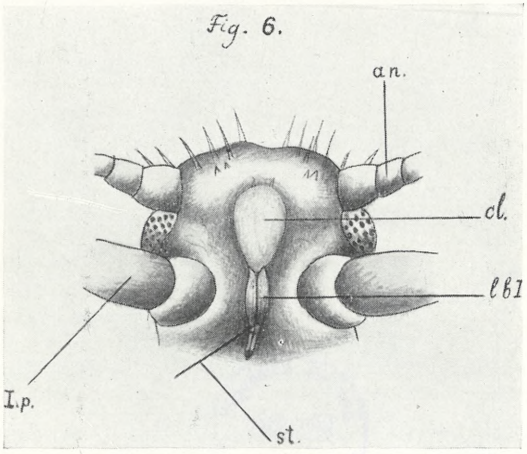
Fig. 7. The same; lateral view (diagrammatical); ×190.

an. — antenna; *b. st.* — the base of the setae; *cl.* — clypeus; *ep.* — epipharynx; *lb. I* — 1st labial segment; *lb. I, lb. II, lb. III* — three labial segments; *lb. grv.* —labial groove; *lbr.* — labrum; *st.* — setae, *st. l.* — setae loop; I. p. — 1st pair of legs.









Stanislaw Minkiewicz: A study in the Morphology and Biology of *Psylla mali* Schmidb.