POLSKA AKADEMIA NAUK
INSTYTUT ZOOLOGII

ANNALES ZOOLOGICI

Tom XXXI Warszawa, 15 I 1974 Nr 3

Halina KOMOSIŃSKA

Studies on the morphology of *Mytilaspis conchiformis* forma *conchiformis* (GMELIN) (*Homoptera, Coccoidea, Diaspididae*)

[With 17 Text-figures]

The author gives detailed morphological descriptions of all developmental stages of *Mytilaspis conchiformis* f. *conchiformis* (GMELIN). The paper also contains some notes on sexual dimorphism of the first larval stage in the *Coccoidea,* and on systematic position of the genus *Mytilaspis* TARGIONI-TOZZETTI.

Introduction

Mytilaspis conchiformis (GMELIN) shows a strong morphological variability. Two, morphologically different, forms which have been regarded as distinct species can be observed here. They are:

1. *Mytilaspis conchiformis* f. *conchiformis* (GMELIN, 1789).

   Coccus conchiformis GMELIN, 1789.
   Aspidiotus saliceti BOUCHÉ, 1851.
   Mytilaspis ficus SIGNORET, 1870.
   Lepidosaphes rubri THIEM, 1931.
   Lepidosaphes conchyformis f. *conchyformis:* BALACHOWSKY, 1954.

2. *Mytilaspis conchiformis* f. *minima* NEWSTEAD, 1897.

   Mytilaspis minima NEWSTEAD, 1897.
   Mytilaspis ficifoliae BERLESE, 1903.
   Lepidosaphes conchyformis f. *minima:* BALACHOWSKY, 1954.

It was LUPO (1943) who first noticed that *Mytilococcus ficifoliae* (BERLESE) constitues but a form of *M. conchiformis* (GMELIN). His work contains excellent drawings which very plainly illustrate morphological distinction between the forms "*ficifoliae*" and "*conchiformis*". The differences concern among other features, the shape of scale, the structure of pygidium e.g. the size and shape of the pygidial lobes, the number of glandular spines and the number of the tubular glandular ducts. STAFFORD and BARNES (1948) confirmed in their experiments the statement of LUPO'S work (1943). They found that the females of *Lepidosaphes ficus* (SIGN.), overwintering on branches produce a summer generation of females settling on leaves. The latter females resemble *Lepidosaphes ficifoliae* (BERLESE) in their morphology structure and their female offsprings which colonize branches and hibernate, shows characters corresponding to *Lepidosaphes ficus* (SIGN.). Thus it has been stated that *Lepidosaphes ficifoliae* (= f. *minima*) is a dimorphic summer form of *Lepidosaphes ficus* (= f. *conchiformis*). STAFFORD and BARNES (1948) carried out their investigation in California on *Ficus carica* L. on which the said species turned out to be a serious pest.

In Poland, France, German Democratic Republic and Federal Republic of Germany, as well in other countries, only f. *conchiformis* has so far been found. This form is fairly common in Poland although it has not been recorded here until very recently (KOMOSIŃSKA, 1969). It has been found on *Tilia* sp., *Syringa* sp., *Betula* sp. and *Carpinus* sp. A broader discussion of its geographic distribution and hosts plants will be dealt with in a subsequent paper devoted to the biology of the species in Poland.

Considering a great morphological plasticity of the species, which is born out by the existence of the two separate dimorphic forms, most probably under the influence of the different climatic and food conditions, an elaboration of all developmental stages of the form *conchiformis* seems indispensable. One should expect a great morphological variability in this form as well. A full elaboration of the morphology of the species seems all the more expedient as — apart from the morphology of females and particularly the pygidium structure (THIEM, 1931; LUPO, 1939, 1943; BALACHOWSKY, 1954; FERRIS, 1938; SCHMUTTERER, 1959) — the immature stages of this species were studied at most tentatively (THIEM, 1931; LUPO, 1939) and I was anable to find anything in the literature on the male morphology.

Material and method

The studies were carried out in Poland in 1968-1970, chiefly on a material taken in Warsaw on *Tilia* sp., from several localities. Part of the material was collected at Głogów and Przełazy (Zielona Góra province) and some other hosts plants were also involved. All these additional finding-sites are mentioned separately in the text. Measurements values are given in micrometres (μm). As the measurements of some characters were based on different number of individuals — some specimens proved unsuitable for some measurements but good for others — the number of measurements taken for average values are given frequently together with the description of particular features.

All microscopic slides used for measurements were done by the method of WILLIAMS and KOSZTARAB (1970) either from dry material, or after a prior fixing in a conserving fluid, which was made of four parts of alcohol 95 % and one part of the acetic glacial acid.

Notes on sexual dimorphism of the first stage larvae

In the first larval stage the sexual dimorphism is hardly noticeable. Some species, however, show it to a lesser or greater extent.

According to NEWSTEAD (1910) there is a distinct sexual dimorphism in the first stage larvae of *Stictococcus dimorphus* NEWST., and SILVESTRI (1914–1915) discovered it in *Stictococcus diversiseta* SILVESTRI. The sexual dimorphism is mainly showed in the different body shape and in strongly differing chaetotaxy. NEGI (1929) was the first who noticed the dimorphism of the first stage larvae in *Laccifer lacca* (KERR). It is expressed in the differentation of the body shape, the different location of the anus and in the differences in body colour. This dimorphism, however, is not so great as in the above mentioned species of *Stictococcus* COCKERELL. STICKNEY (1934) stated the regular presence of a spur on the outer edge of tibiae of all three legs of male larvae of *Parlatoria blanchardi* TARG. In the female larvae, in most cases, this spur was absent or it occurred only on some of legs. REALI (1954), after examination of the morphology of *Diaspis calyptroides* COSTA, noticed a sexual dimorphism in larvae of the first stage; this consisted in the presence of the two cephalic glandular ducts in the male larvae and their complete absence in the female larvae. TREMBLAY (1958) confirmed the results of the REALI'S investigations. She studied many species of the armored scale insects and discovered that the presence of the cephalic glandular ducts in male larvae and their absence in the female larvae is characteristic of only some of species, e.g. *Diaspis bromeliae* (KERR). In other species the cephalic glandular ducts occur in both sexes — for instance in *Diaspis pentagona* (TARG.) — but in still some others these ducts are absent altogether, e. g. in *Diaspis visci* (SCHR.) or in *Diaspis rosae* (BOUCHÉ). The possibility of the separation of the sexes in the first larval stage of *Pseudaulacaspis pentagona* (TARG.) upon their different colouring is considered by BENNETT and BROWN (1958). The male larvae have a pink-whitish colour and the female larvae show a "coral" colouring. This colour differentiation is visible also in the egg stage.

However, I did not find sexual dimorphism in the examined stage larvae of *Mytilaspis conchiformis* f. *conchiformis* (GMELIN). The presence or absence of the cephalic ducts proved useless characters for the determination in this species. The examination of 50 exuviae of the first stage larvae taken from the scales of adults, found in the four localities (two in Warsaw, one in Głogów, and one in Przełazy), and on two plant hosts (*Tilia* sp. and *Betula* sp.) yielded following results:

	cephalic ducts		number of exuviae
	present	lacking	
First exuviae of the male larvae	22	6	28
First exuviae of the female larvae	11	11	22

Egg

(Fig. 1)

Measurements: length 240.00 (225.00–275.00), width 113.00 (95.00–135.00), values from 30 measurements. Shape: oval. Colour: whitish-pink to dark shades of pink, to reddish-violet, shiny. Colouring of eggs with larvae inside showing a brighter posterior and postero-lateral parts. This is due to a gradual passing of the larvae towards the anterior part of the shell, the posterior part of the egg shell thus becoming gradually empty. It has been observed that the larvae can shift 30–40 micrometres from the terminal part of egg shell. For examination the eggs were placed on glass trays with hollows filled with conserving and clearing fluid, made of 15 g gummi arabicum, 10 g glycerinum, 25 g chloralhydrat, 25 g aqua destillata.

The egg shell (Fig. 2) is covered by a thin layer of the wax powder, and is of a whitish colour. During hatching the egg shell bursts in the antero-middle part of the ventral and dorsal sides and assumes after the emergence of the larva a shape of a flattened bowl.

First larval stage

(Figs. 3–4)

Body shape: oval, broadest in thoracic part. Anterior margin undulated, sclerotized. Dorsal side feebly convex. Colour: pale pink to dark pink. Measurements: body length 275.00 (250.00–295.00), width 149.50 (135.00–170.00). Measurements were taken from 40 specimens. Cuticle: membraneous on dorsal side except for a fairly well sclerotized head showing a peculiar epithelial pattern (Fig. 3a) and pygidium with a characteristic sculpture of longitudinal undulated grooves (Fig. 3b). Ventral side also membraneous except pygidium, showing a stripped type of sculpture (Fig. 3c). Antennae: (Fig. 3d) situated on ventral side of head, six-segmented, the fifth segment being the shortest, the sixth the longest, and the first one the broadest. Total length — 60.36 (49.87–74.38). Distance between the antennae — 33.67 (25.00–42.50).

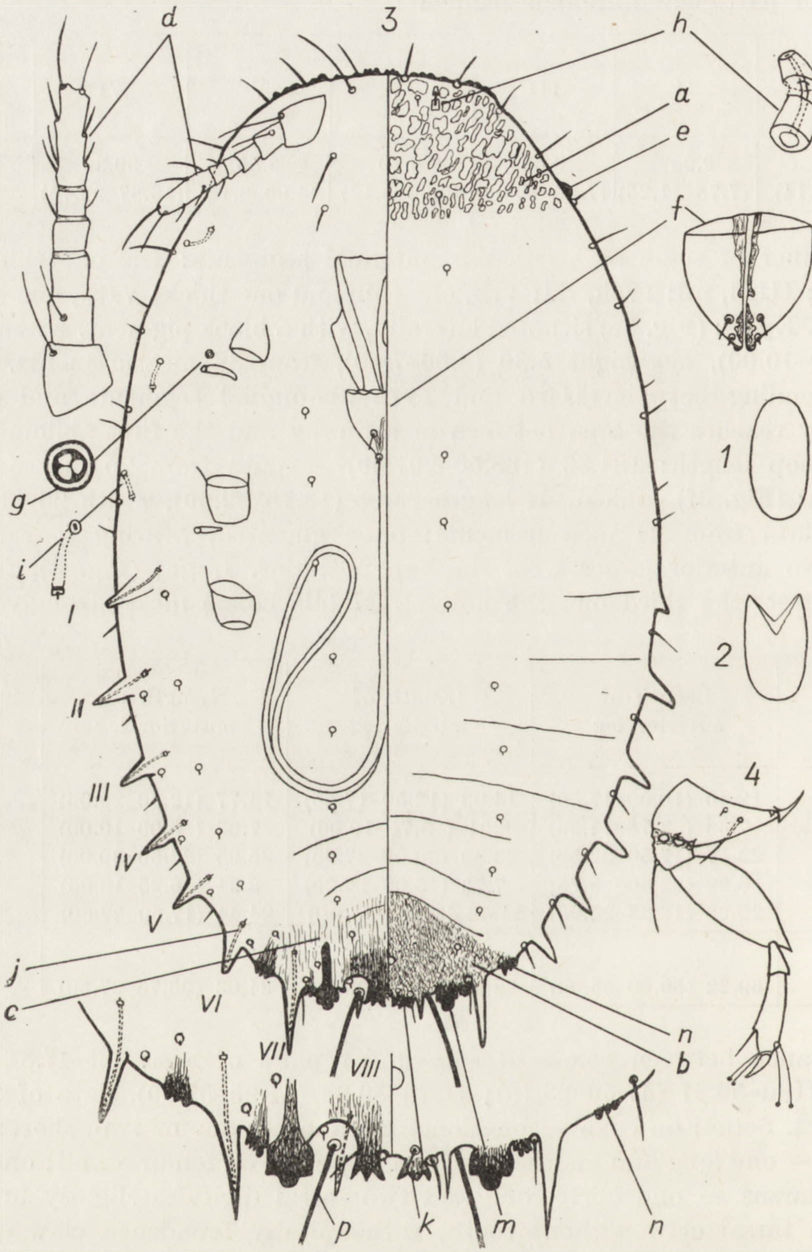
Length of particular antennal segments:

I	II	III	IV	V	VI	Measurements number
10.65 (8.75–13.14)	9.28 (7.75–11.25)	8.40 (7.50–10.00)	6.10 (5.00–8.12)	5.55 (4.00–8.12)	20.38 (16.87–23.75)	46

Number of setae on particular antennal segments: Ist, one thin; IInd, one thin; IIIrd, nil; IVth, nil; Vth, one thin and one thick; VIth, one thin and six thick. Eyes: (Fig. 3e) situated laterally, with a black pigment. Eye diameter 8.42(5.00–10.00), eye hight 5.30 (2.50–7.50), from 36 measurements. Stylet loop: bending between IIIrd and IVth abdominal segments and directed anteriorly reaches the area between metathorax and the first abdominal segment. Loop length: 184.35 (168.50–201.00) – data from 25 measurements. Labium: (Fig. 3f) conical, its length 25.93 (18.75–32.50), width 28.02 (25.00–31.00), data from 24 measurements; one-segmented, bearing four setae of which two anterior larger than the two posterior. Legs: (Fig. 4), first pair the shortest, the third one the longest. Middle coxae most strongly spaced.

Leg part	Length of anterior leg	Length of middle leg	Length of posterior leg	Measurements number
coxa	12.40 (10.00–17.50)	14.03 (12.50–17.50)	14.77 (12.50–20.00)	28
trochanter	7.38 (3.75–11.25)	6.91 (3.75–10.00)	7.63 (5.00–10.00)	28
femur	22.17 (17.50–32.50)	23.89 (20.00–27.50)	25.65 (22.50–30.00)	28
tibia	6.99 (2.50– 8.75)	7.73 (5.00–10.00)	8.54 (6.25–10.00)	28
tarsus	20.28 (16.25–25.00)	21.42 (20.00–25.00)	24.44 (17.50–27.50)	28
Total length	69.22 (50.00–95.00)	73.98 (61.25–90.00)	81.03 (63.75–97.50)	28

Distance between coxae of subsequent pairs of legs: Ist–47.81 (38.75–52.50); IInd–56.87 (47.50–63.75); IIIrd–50.63 (41.25–57.50), data of 25 measurements. Setae: on coxa – one long and another one or two, short; on trochanter – one long and another one or two short; on femur – nil; on coxa – nil; on tarsus – one fairly long and two tarsal digitules slightly broadened at apex; tarsal claw without tooth, with apically broadened claw digitules. Trochanter with transversely oval sensilla, two at each side. Spiracles: two pairs on ventral side of thorax. Length of anterior spiracle: 10.45 (8.75–15.00); length of posterior spiracle: 11.04 (8.75–15.00), values from 18 measurements. Anterior spiracle situated below a trilocular pore; diameter of the latter 3.15 (2.50–3.75), data from 22 measurements. No pore above the posterior spiracle. Tubular glandular ducts: of three types – 1) cephalic ducts (Fig. 3h) (one



Figs. 1 – 4. 1 – egg; 2 – egg shell; 3 – first larval stage: 3a – head with epithelial pattern, 3b – cuticular sculpture on dorsal side of pygydium, 3c – cuticular sculpture on ventral side of pygidium, 3d – antenna. 3e – eye. 3f – labium, 3g – trilocular pore above anterior spiracle, 3h – cephalic duct, 3i – microduct, 3j – microduct opening on apex of abdominal glandular spine, 3k – L_1, 3m – L_2, 3n – L_3, 3p – marginal seta of VIII abdominal segment; 4 – leg.

pair) situated below the anterior margin of head, sometimes missing (see p. 346). Its anterior and posterior parts broadened and sclerotized; middle part narrowed; length 9.77 (8.75–12.50) data based on 12 measurements. 2) microducts (Fig. 3i), opening with broad pores on ventral side laterally: in number of three pairs – the first situated below eyes, the second on the level of the anterior coxae and the third on the level of middle coxae, their length 11.12 (10.00–12.50), data from 10 measurements. 3) microducts opening on apices of abdominal glandular spines (Fig. 3j) in number of 8 pairs. Glandular spines: 8 abdominal pairs; the first situated on the Ist segment – on flattened slides it is visibly shifted to ventral side – the remaining spines situated laterally. Seventh spine the longest, its length 12.91 (10.00–15.00), while the eight one the shortest – its length 6.40 (5.00–7.50), values based on 15 measurements. Pygidium: fairly well sclerotized (see p. 346, cuticle), consisting of posterior part of VIth segment as well as of VIIth and VIIIth segments. Pygidial lobes: in number of three pairs, fairly well sclerotized, with quite long apophyses directed to the ventral side of pygidium. L_1 (Fig. 3k), fan-shaped and with tridentate margin – distinctly shorter than L_2. Apex of L_1 situated in line of lateral notch of the inner lobe of L_2. Width of L_1 – 5.14 (4.00–6.50), values from 12 measurements. L_2 bilobed (Fig. 3m) Inner lobe of L_2 symmetrical, spatular with two lateral notches and with rounded apex – the largest of pygidial lobes, its width 7.35 (6.25–7.50), data from 10 measurements. Outer lobe of L_2 asymmetrical, very short, narrow, with rounded apex, situated almost at base of large inner lobe; inner notch considerably narrower than the serrated outer one. L_3 – strongly reduced, tridentate (Fig. 3n). Anus: its diameter roughly the same as that of spiracular pore, distance between it and the base of L_1 roughly equalling three times its diameter. Setae: these on dorsum in two longitudinal rows – marginal and submedial one. Marginal row in head part consisting usually of 5 or 6 setae distinctly longer than three thoracic setae; abdomen bearing 9 setae of which the 8th and 9th situated at base of L_1. Submedial row with three setae in cephalic part, three in thoratic and with 6 setae on II–VII abdominal segments. Setae of submedial row very short, particularly those on thorax and abdomen. Their length equalling roughly their width at base. Ventral setae: in marginal row three thoracic setae present, forming together with dorsal ones three fairly well isolated pairs on particular thoracic segments. According to STICKNEY (1934) the marginal thoracic setae are distributed in pairs on ventral side in the first stage larva of *Parlatoria blanchardi* TARG. After examination of slides – particularly those with specimens in lateral position – and a comparison of the arrangement of the marginal thoracic setae with those of the dorsal side of abdomen, I came to the conclusion that thoracic pairs of setae in the species in question, might have originated from one dorsal and one ventral seta. In marginal row on abdomen there are 8 setae – one on each of II–VIII segments and one between L_1. Marginal seta of VIIIth segment (Fig. 3p) measuring 150 micrometres in length, which corresponds to body width of the first larval stage, while the length of remaining setae roughly equalling diameter of their base. Submarginal row of abdomen with 8 setae, one on each of I–VIII segments. Submedial row with 3 long setae in cephalic part, 3 short setae on thorax and with 6 short ones on abdomen – one on each of abdominal II–VII segments.

The above description deals solely with the first stage of crawler larva. In order to investigate occurring changes in the body measurements during the whole first larval stage, both measurements of body length and width, as well as the length of antennae of the moulting larvae which are already devoid the mouth stylets, have been taken. Below I give comparative results of the measurements of mentioned characters.

	Body length	Body width	Measurements number
Moulting first stage larva	345.00 (325.00–370.00)	174.40 (160.00–195.00)	27
First stage larva of the crawler	275.00 (250.00–295.00)	149.50 (135.00–170.00)	20
Difference obtained	70.00	25.00	

The difference in the antennae length between the moulting first stage larvae and those of the crawler was found to be only 0,61 micrometres, the former ones having longer antennae than the latter.

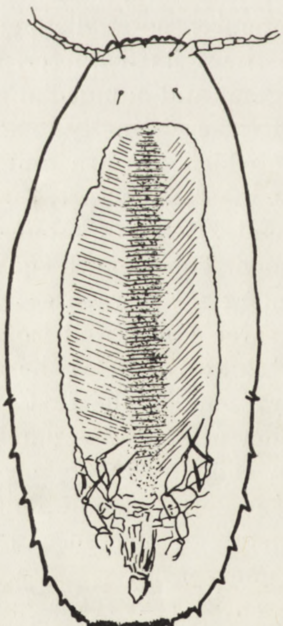


Fig. 5 – first larval exuvium.

The way of the casting of the first exuvium (Fig. 5) Initially the cuticle rips on the ventral side transversely in the area situated above anterior part of head skeleton. From this original slit in the subsequent process the middle and lateral (but not marginal) part of the ventral side of the exuvium, as well as the head skeleton and adjoining legs is push back to the IIIrd or even IVth segment. The dorsal side of the exuvium is thus untouched and remains incorporated in the scale of the second stage larva.

Second larval stage

(Figs. 6–7)

The sexual dimorphism is characteristic of this larval stage and is a general feature of the *Coccoidea*. Of more comprehensive works devoted to this phenomenon in *Diaspididae* the paper by BORATYŃSKI (1953) should be mentioned here.

Sexual dimorphism in the examined species is manifested mainly in the distribution and number of the tubular glandular ducts, as well as in the size of the middle pygidial lobes, in the general body shape, size, and the degree of the sclerotization of the cuticle.

The below presented measurements and number values of particular characters were obtained from 20–25 specimens of each sex. If measurements were based on different number of individuals they bear a special adnotation in the text. When no differences between sexes were stared, the character description applied to both.

Body shape: male larva (Fig. 6) strongly elongate almost parallel-sided, anterior and posterior body part slightly tapering; female larva (Fig. 7) elongate, first abdominal segment markedly broadened, anterior and posterior parts of body distinctly narrowed. Colouring: pale pink. Body measurements refer to moulting specimens. Male larva: length 542.00 (514.50–567.00), width 216.56 (199.50–231.00), data based on 8 specimens. Female larva: length 656.60 (630.00–714.00), width 347.80 (294.00–399.00). Cuticle: unsclerotized in male larvae, except pygidium; female larvae with feebly sclerotized dorsal side, membraneous ventral side and strongly sclerotized pygidium. During ecdysis, dorsal side remains membraneous in male larvae, but strongly sclerotized in female larvae. Segmentation: fairly well marked; less distinct in male larvae than in the female ones. Eyes: not observed in male larvae, mostly not present in female larvae: one eye only in the form of a small dark bulging area present (Fig. 7a). Spiracles: two pairs, length of anterior spiracles 17.20 (12.50–20.00), length of posterior ones 17.45 (15.00–20.00). Trilocular pores present above the anterior spiracles (Fig. 7c), their number in male larvae 1.3 (1–3) in female larvae 1.8 (1–2). Diameter of spiracular pores 2.24 (1.25–2.50). No pores present near posterior spiracles. Antennae: (Fig. 7d), tuber — like with three thick setae of which two long, one shorter, and with one short thin seta. Labium: (Fig. 7e), conical, its length 33.33 (30.00–35.00), width 37.50 (30.00–40.00), values from 10 measurements; one segmented with four setae of which two anterior are longer.

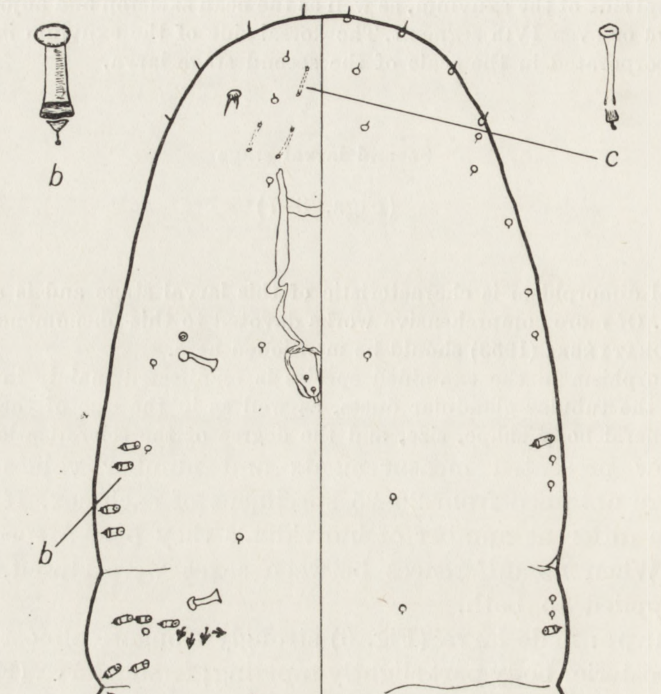


Fig. 6 – second stage of male larva: 6a – macroduct, 6b – mesoduct, 6c – microduct, 6d – glandular spine with microduct.

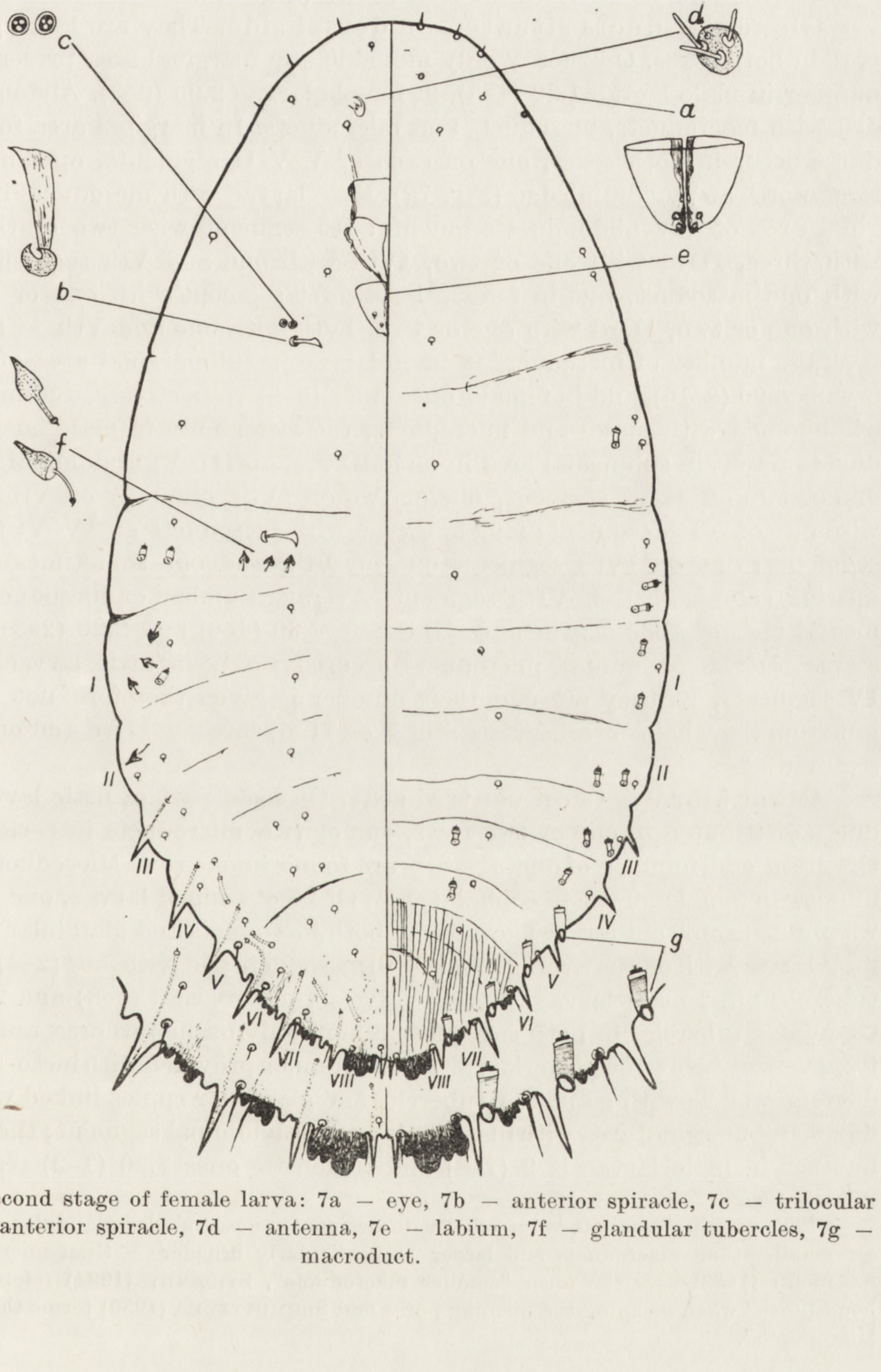


Fig. 7 — second stage of female larva: 7a — eye, 7b — anterior spiracle, 7c — trilocular pore above anterior spiracle, 7d — antenna, 7e — labium, 7f — glandular tubercles, 7g — macroduct.

Glandular ducts: of several types: macroducts (Fig. 6a), mesoducts[1] (Fig. 6b), microducts (Fig. 6c); in addition glandular tubercles (Fig. 7f) and glandular spines connected with microducts (Fig. 6d).

Glandular ducts situated on dorsal side. They are lacking on head part in both sexes. On thorax only mesoducts in marginal area present — their number in male larvae 1.30 (1–3), in female larvae 2.95 (2–3). Abdomen provided with macroducts, mesoducts and microducts. In marginal area four macroducts occur in both sexes, one on each of V–VIII segments, opening through large pores at pygidium edge (Fig. 7g). Male larvae with mesoducts in submarginal area of I–V abdominal segments: Ist segment with two or three, IInd with three, IIIrd with one or two, IVth with one and Vth segment likewise with one mesoduct, but in female larvae Ist segment with one or two, IInd with one or two, IIIrd with one or two, IVth with one and Vth — nil or one. Average number of mesoducts in male larvae in submarginal area of abdomen is thus 8.90 (8–10), and in female ones 6.55 (5–8) respectively. Submedial area of abdomen with meso- and microducts, the latter only in male larvae; mesoducts present in submedial area in male larvae, on III–VI abdominal segments: one or two on IIIrd segment, one or two on IVth, one only on Vth, and likewise one on VIth segment; female larvae with mesoducts on IV–VI abdominal segments: one on IVth segment, one on Vth, and one sometimes (otherwise missing completely) on VIth segment. Average number of mesoducts in submedial area of abdomen in male larvae — 4.60 (4–6) and 2.20 (2–3) in female larvae. Dorsal abdominal microducts occurring only in male larvae, on II to IV segments, as they are odd their number is given therefore not from half but from the whole dorsal surface: three on IInd, three on IIIrd and one on IVth segment.

Glandular ducts on ventral side. On head part of male larvae microducts distributed in one or two rows, one or two microducts in each of them. Often an odd number of ducts — 3 — are found in one row. Microducts as a rule missing in female larvae in cephalic area. Of 25 examined larvae, one microduct was found in only one larva. Thorax with both mesoducts and glandular tubercles: male larvae with on the average 7.7 (7–10) mesoducts and with 3.04 (2–4) glandular tubercles; in female larvae the respective numbers are 2 (1–3) and 2.90 (2–3). Glandular tubercles in both sexes found here only on metathorax and arranged transversely below the posterior spiracle. Abdomen provided with meso- and microducts as well as with glandular tubercles and glandular spines linked with microducts. Submarginal area with mesoducts on Ist abdominal segment; their average number in male larvae is 2 (1–3) and in female ones 1.20 (1–2) respectively.

---

[1] The term mesoducts is introduced to designate those tubular glandular ducts which are smaller than macroducts and larger — particularly broader — than microducts. Boratyński (1953) uses the term "smaller macroducts", Stickney (1934) refers to "mesal body pores" when meaning the opening pores and Schmutterer (1959) terms them "dorsale Microporen".

Submarginal area with microducts both in male and in female larvae on prepygidial segment and pygidial ones, one — sometimes two — on each of them. Microducts in submedial area in male larvae present on II–VII abdominal segments: IInd segment with only one — single — microduct, in the middle area, and remaining segments with two microducts, one on each side. Female larvae devoid of microducts in submedial area. Number of glandular tubercles in male larvae present on Ist abdominal segment — 2.83 (2–3), on IInd segment — 1; in female larvae respective figures are 2.93 (2–3) and 1. Glandular spines: 7 in number on margins (Fig. 6d) of III–VIII abdominal segments and one between the middle lobes of pygidium, (L_1), with microducts opening into each of spines. Pygidium: consisting of VI–VIII abdominal segments and differentiated markedly from the remaining abdomen part by its conspicuous sclerotization. Pygidial lobes: three pairs (L_1, L_2 and L_3), well sclerotized with apophyses directed to ventral side of pygidium. L_1 of almost the same length as glandular spines situated between them. Male larvae with L_1 of spatular shape with a narrow notch at each side and feebly rounded (almost flat) apices; measurements of L_1: length 7.95 (7.50–10.00), width 12.40 (10.00–15.00). L_1 in female larvae usually with two notches at outer and one at the inner side. Apex distinctly rounded; measurements — length 9.33 (7.50–12.50), width — 14.23 (12.50–17.50). L_2 — bilobed, by contrast to L_1 strongly reduced. Inner lobe larger than the outer and with a narrow, rounded apex and two notches on the outer margin; its outer lobe is conical and acuminate. L_3 strongly reduced, rudimentary with a serrated apex. Anus situated in the anterior part of pygidium on dorsal side. Length to width ratio 7.3:8.7 (6.25–10.00:7.50–10.00). Distance from anus to L_1 52.60 (50.00–57.50) thus exceeding on the average seven times anus length.

Setae on dorsal side. 1) On prosoma (head+thorax) situated in marginal and submedial areas. Marginal area in anterior part of body usually with three or four setae; part of prosoma corresponding to thorax, usually with six setae, in three distinctly separated pairs, one on each of thoracic segments. Medial area usually with five setae, two of which occurring above edge of head skeleton, and three below — they correspond to three thoracic segments. Aside from these setae — arranged in distinct rows — several more irregularly arranged ones may occur in the anterior part of prosoma. 2) Abdomen with setae in marginal and submedial area. Marginal area with nine setae, one on each of I–VIII abdominal segments, and one between L_1. Some of them (on VI–VIII abdominal segments, and between L_1) are the longest of all body setae. Submedial area with seven setae, one on each of I–VII abdominal segments.

Setae on ventral side. Prosoma with setae in marginal and submedial area. Marginal area of the head part with several setae; thorax with three setae. Submedial area with two setae above anterior margin of skeleton head and two or three below it. 2) Setae on abdomen: occurring in marginal, submarginal and submedial areas. Marginal area of abdominal II–VIII segments, with one seta on each segment and one between L_1. Seta between L_1 very small and visible only on slides with feebly stained pygidium. Submarginal area with one seta on each of I–VII segments. Submedial area of each abdominal I–III segments bearing one seta, whereas each of IV–VI segments provided with two of them; VIIth segment with only one seta.

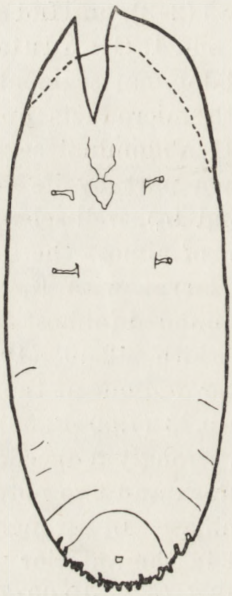


Fig. 8 – initial stage of moulting of the second stage male larva.

The way of casting of exuvium. The cuticle of the second stage male larva (Fig. 8), rips about the middle of anterior part of body, and then it is gradually shed backwards and either forced outside scale or it remains under it at the edge of scale. The exuvium of the second stage of female larva is cast in a similar way as that of first stage larva (Fig. 5). It becomes incorporated in the scale.

Pronymph

(Fig. 9)

Body shape: strongly elongate, almost parallel-sided, broadly rounded in anterior and posterior parts. Colour: pale pink. Cuticle: membraneous. Body measurements: length 529.20 (483.00–577.50); width 192.15 (178.50–210.00). Segmentation: feebly marked. Developing antennae: length 94.40 (77.50–105.00), width 33.90 (30.00–37.50), reaching up to the base of developing anterior legs. Eyes: missing. Spiracles: two pairs. First pair 15.50 (12.50–17.50), the second 16.90 (15.00–20.00) in length. Pores near spiracles absent. Length of developing legs: anterior, 48.30 (37.50–62.50), middle 66.40 (62.50–87.50) and of posterior ones 77.77 (75.00–87.50). Anus: in posterior part of body, its length 7.5.

Setae on dorsal side: present in marginal and submedial areas. Marginal area of head with one seta, that of thorax with five and sometimes six setae, then two on each segment, most usually however mesothorax with only one seta; marginal area of abdomen with 9 setae. Submedial area of head with three, that of thorax with likewise three setae and submedial area of abdomen with eight setae.

Setae on ventral side: present in marginal and submedial areas. Marginal area with two setae on VIIth and VIIIth abdominal segments. Submedial area fo head with three, and abdominal segments IIIrd, IVth and VIth each with one seta; Vth abdominal segment with two setae.

Ten specimens have been investigated.

Nymph

(Fig. 10)

Body shape: elongate, rounded in anterior part, posterior part of body terminated with a narrow style (IXth abdominal segment). Body colour: pale pink. Cuticle: membraneous. Eyes: wanting. Body measurements: length 617.50 (572.50–651.00), width in mesothoracic area 158.55 (136.50–178.50). Abdomen segmentation fairly well marked. Developing antennae: length 202.50 (175.00–220.00), width 24.00 (20.00–30.00); reaching well below the anterior spiracles. Spiracles: first pair 18.50 (15.00–20.00) in length, the second pair 20.00 (15.00–25.00) in length. Developing legs: length of anterior pair 136.50 (125.00–165.00), of the middle pair 172.50 (155.00–195.00), and of the posterior pair 211.00 (190.00–225.00) Distance from anal sclerotic area (Fig. 10a) to the end of style 100 (85.00–105.00).

Setae on dorsal side: present in both marginal and submedial areas. Marginal area: head with one seta; thoracic segments with two setae each; abdominal I–V segments with one seta, and segments (VI–VIII with two setae each. Submedial area of head with three setae, that of thorax with likewise three setae; submedial area of I–VII abdominal segments with one seta each, that of IXth segment with only one seta.

Setae on ventral side present in marginal and submedial areas as well, marginal area with setae on abdomen only: one on VIIth, and one on VIIIth segment. Submedial area of head with two setae, that of abdomen with one or nil seta on IIIrd segment, one seta on IVth, one-two setae on Vth, two setae on VIth, and one on VIIth segment.

Ten specimens were examined.

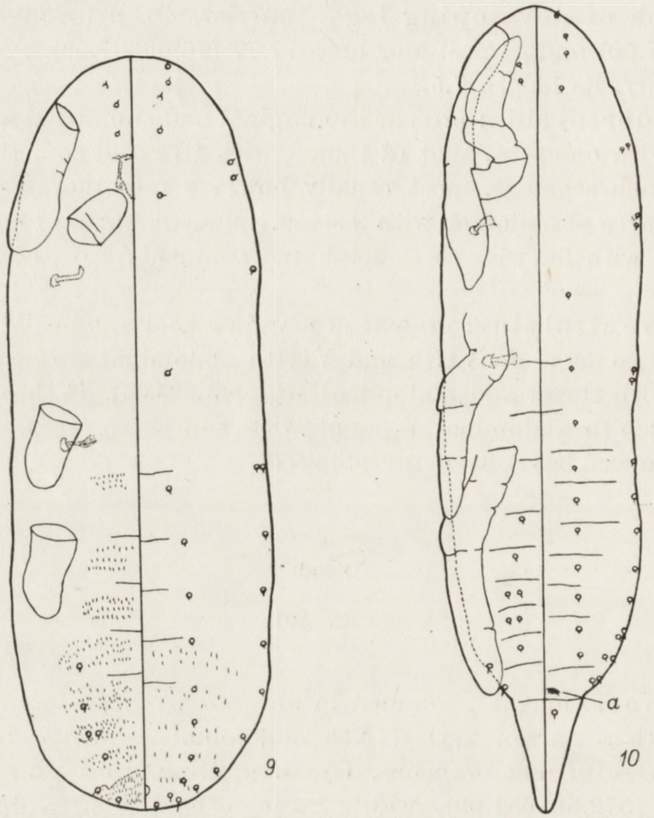


Fig. 9 — 10. 9 — pronymph; 10 — nymph: 10a — anal sclerotization.

Female

(Fig. 12–13)

Scale: (Fig. 11) brown, with yellow first larval exuvium and pale brown second exuvium; scale very frequently strongly curved. Length 1775 (1625–2250), width 430 (375–625).

Body shape: strongly elongate almost parallel-sided, anterior part of the body broadly rounded, pygidium slightly tapering posteriorly. Body broadest at the Ist abdominal segment. Colour: from pale pink to reddish violet. Body measurements: length and width of a) not fertilized females 1178.66 (1039.50–1344.00) and 515.16 (441.00–577.50), b) females after oviposition 1078.00 (978.50–1239.00) and 502.26 (462.00–614.50), measurements values from 15 unfertilized females and from equal number of females after oviposition. Cuticle: usually membraneous except for pygidium, which is strongly sclerotized. Segmentation: prosoma with usually well marked two last thoracic segments; abdomen segmentation fairly distinct. Eyes: eye of spure type, well developed (Fig. 12a). Spiracles: length of anterior 23.43 (20.00–27.50) trilocular pores present above them (Fig. 12b), their number 5.61 (4–7) and diameter 4.68 (2.50–6.25); length of posterior spiracles 22.07 (17.50–25.00), no pores near the latter; values based on 10 measurements. Antennae: tubercular with three or four thick setae of which one distinctly shorter than the remaining ones (Fig. 12c). Schmutterer (1959) refers to two antennal setae. Labium: one-segmented, its length 50.00 (45.00–60.00), width 51.00 (45.00–60.00). Number and arrangement of setae similar as in labium of the first and second stage larvae (Figs. 3f, 7e), data based on 10 measurements.

Tubular glandular ducts: of several types: macroducts (Fig. 12d), mesoducts (Fig. 12e), and microducts (Fig. 12f); in additional small glandular tubercles (Fid. 12g) and large ones (Fig. 12h), and glandular spines communicating with microducts are also present.

Glandular ducts on dorsal side: 1) on head and prothorax no glandular ducts present; 2) mesothorax with 6 (5–7) and metathorax with 10.70 (8–12) mesoducts; 3) abdomen with 6 sometimes 5 macroducts: Vth abdominal segment with one, VIth with two, VIIth with two and VIIIth abdominal segment with one macroduct. Abdominal mesoducts occurring on I–VI abdominal segments: their number on subsequent segments are 14.70 (10–18), 15.40 (11–18), 16.00 (13–19), 14 (8–18), 5.60(4–7), 4.10 (3–5) respectively, values obtained from 15 specimens.

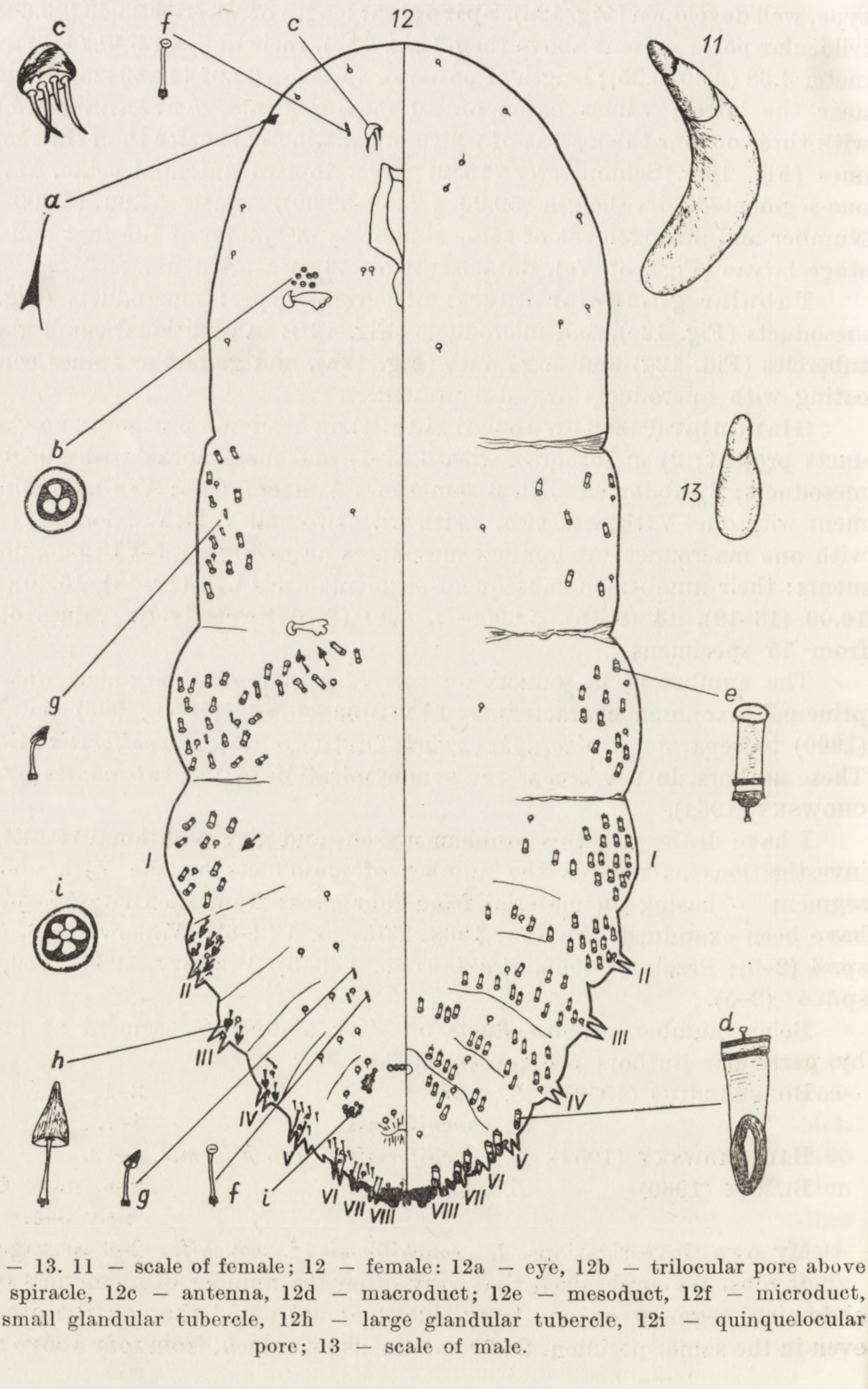
The number of mesoducts on the VIth abdominal segment was one of principal taxonomic characters used by Borchsenius (1950, 1966) and Buščik (1960) to separate *Lepidosaphes rubri* Thiem from *L. conchiformis* (Gmelin). These authors do not accept the synonymization of the two names by Balachowsky (1954).

I have dealt with this problem myself, and give additional results of my investigations as regards the number of mesoducts on the VIth abdominal segment — basing on material from four sites; from each site 15 specimens have been examined: Warsaw, 1968, *Tilia* sp. 4 (2–6); Warsaw, 1968, *Syringa* sp. 4 (2–6); Przełazy, 1968, *Fraxinus* sp. 4 (3–5); Przełazy, 1968, 1969, *Betula* sp. 4 (2–5).

Below numbers of mesoducts on VIth abdominal segment as indicated by particular authors are presented:

Borchsenius (1950),	*L. rubri*	2–4.
	L. conchiformis	4–7.
Balachowsky (1954),	*L. conchiformis* f. *conchiformis*	4–12.
Buščik (1960)	*L. rubri*	2–6, more frequently 3–4.
My own investigations	*L. conchiformis* f. *conchif.*	2–6, average 4.

It must be emphasized that very often the number of mesoducts on VIth abdominal segment on one body side does not equal that on the other side, even in the same specimen. Of 60 specimens examined, from four above mentio-



Figs. 11 – 13. 11 – scale of female; 12 – female: 12a – eye, 12b – trilocular pore above anterior spiracle, 12c – antenna, 12d – macroduct; 12e – mesoduct, 12f – microduct, 12g – small glandular tubercle, 12h – large glandular tubercle, 12i – quinquelocular pore; 13 – scale of male.

ned sites, 40–67 $^0/_0$ showed asymmetrically arranged mesoducts: sometimes one body half bore 4 or less, and the other 5 or more, e.g. 4–5, 4–6 and 2–5. These data justify in my opinion, the placing of *Mytilaspis rubri* (THIEM) by BALACHOWSKY (1954) among synonyms of *Mytilaspis conchiformis* f. *conchiformis* (GMELIN). As early as 1936, LINDINGER regarded *Lepidosaphes rubri* (THIEM) as a synonym of *Mytilococcus saliceti* (BCHÉ).

Glandular ducts on ventral side: 1) cephalic part of prosoma with one or two microducts (Fig. 12 f), 2) prothoracic part is devoid of glandular ducts, mesothorax with 8.50 (5–13) mesoducts and 4 (2–6) small glandular tubercles (Fig. 12g); metathorax with 25.10 (18–28) mesoducts, 2.40 (2–3) small glandular tubercles and 2.5 (2–3) large glandular tubercles situated beneath posterior spiracles; 3) on the abdomen, according to my own data from four sites, four different hosts and 50 specimens (sites and hosts similar as in description of mesoducts number on dorsal side of VIth abdominal segment), mesoducts on the ventral side occur only on Ist abdominal segment: their number being 11.60 (4–19). BALACHOWSKY (1954) and SCHMUTTERER (1959), report mesoducts situated on ventral side of I–III segments and BORCHSENIUS (1963) on I–IV abdominal segments (which can be seen in appended diagram). Microducts (Fig. 12f) in submedial area found on IVth abdominal segment, usually in number of one pair, and in submarginal area on IV–VII segments. Their subsequent numbers (from IV to VII) are 0.7 (0–2), 5.0 (4–6), 3.4 (3–6), 2.10 (2–3); values based on 15 measurements. Glandular tubercles large (Fig. 12h), present on I–IV abdominal segments; their subsequent numbers (from I to IV) are 2.10 (1–7), 7.0 (5–11), 2.4 (1–5), 1.50 (0–2). Glandular tubercles small (Fig. 12g), distributed irregularly in numbers 1–3 in submedial area of IIIrd and IVth abdominal segments. Glandular spines situated at abdomen edge, one pair on each segment from IInd but most usually from the IIIrd to VIIIth and one glandular spine present between middle lobes of pygidium (L_1). Pygidium: (Fig. 14) consisting of V–VIII abdominal segments, distinctly differentiated by its strong sclerotization from the remaining part of abdomen. Dorsal side with a characteristic, striped cuticular sculpture. Pygidial lobes: three or four pairs, well sclerotized with long apophyses directed to ventral side of pygidium. L_1 slightly longer than glandular spines situated between them, asymmetric, with inner notch smaller than double notch of outer side, apex broadly rounded. Length of L_1 14.50, width 19.12, data from 10 measurements. L_2 bilobed, the inner lobe larger than the outer, usually with one narrow lateral notch and with a rounded apex. Outer lobe of a triangular shape. L_3 broad, short with three or four teeth. In some specimens L_4 present – similar in shape to L_3, only slightly smaller. Anus: situated in anterior part of pygidium, transversely oval. Length: width ratio 10.87:14.01, range of variability 7.5–12.5: 10.0–15.0. Distance from anus to base of L_1 133 (110–145.0), thus on thee average exceeding about 12 times the length of anus. Perivulvar pores: round, quinquelocular (Fig. 12i) arranged in five groups, two anterior, two posterior and one median single. Average number of pores in particular groups: 8,10, 5 respectively in specimens from *Tilia* sp.; 9,9,5, in those from *Syringa* sp.; 9,8,5 in specimens from *Betula* sp.; 8, 8, 5 in specimens from *Fraxinus* sp. These numbers are based on 15 specimens taken on each host. Vulva situated below a pair of submedian setae of VIIth segment. Paraphyses missing.

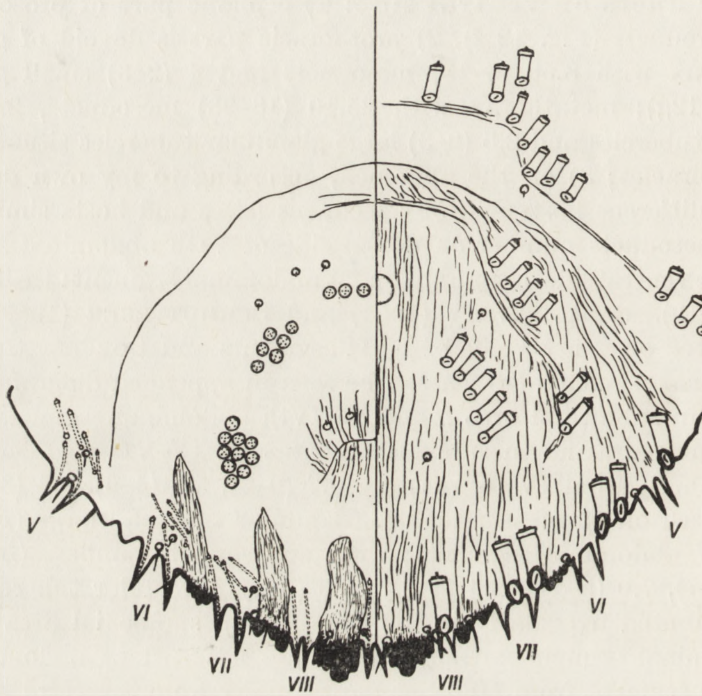


Fig. 14 – pygidium of female

S e t a e o n d o r s a l s i d e: number and arrangement of setae on thoracic part of prosoma and abdomen — both in marginal and submedial areas the same as in larvae of the IInd stage.

S e t a e o n v e n t r a l s i d e: in females more numerous than in II stage larvae, differences most prominent being: 1) in the number of setae of meso- and metathorax marginal area in females with two setae, whereas in II stage larvae only with single setae, 2) on the Ist abdominal segment in marginal area, females have one seta, whereas II stage larvae, lacking any seta on that area, 3) in submedial area of abdominal segments, females provided with two setae on the IIIrd segment, with three on IVth, three on Vth, three on VIth and two on VIIth segment, the respective number in II stage larvae being 1, 2, 2, 2, 1. I failed to notice the seta in the submedial area of female on Ist abdominal segment, which is present in the larvae of the II stage.

Male

(Figs. 15-17)

During my investigations (observations were carried out in 1968–1971) only apterous males were observed.

Altogether 25 specimens have been examined. In morphological description I have relied on the work by GHAURI (1962).

Scale of male (Fig. 13) whitish yellow or pale brown with a yellow first larval exuvium. Length of scale 742 (625–812), width 221 (212–250), data based on 10 measurements.

Body colour: pink, after placing in caustic soda yellowish green. Body length: 779.50 (693.00–819.00) including genital style. Width: (at mesothorax) 155.80 (147.00–168.00). Head: (Figs. 16, 17) conical, length from apex to postoccipital ridge (*por*) 51.40 (45.00–55.00), width across genae 96.60 (85.00–110.00). Midcranial ridge (*mcr*): ventral median ridge as well as dorsal branches (*lmcr*) weakly developed; midcranial setae: 3 pairs on the dorsal lateral branches and one apical seta; on ventral median ridge there are two pairs of longer setae than those on dorsum: the first pair situated at the posterior part of median ridge, the second one apically (one above the other). Median crest (*mc*) prominent. Postoccipital ridge (*por*) well developed. Anterior arms very short, triangular, with one minute seta near the apex, often seta absent from one arm. Posterior arms slightly thinner than the median body, their length a little longer than the width of median body; diverging about 120°. The genal suture separating the gena, absent. Each gena on dorsum with two genal setae (*gs*). Eyes: dorsal eyes (*dse*), separated from each other 29.40 (25.00–45.00), cornae round, 13.00 (10.00–15.00) in diameter, height of dorsal eyes 5.83 (5.00–7.50). Ventral eyes (*vse*), apart from each other 19.10 (15.00–25.00), cornae round, 11.30 (10.00–15.00) in diameter, height of the ventral eyes 5.64 (5.00–6.25). Preocular ridge (*procr*), strongly extended dorsally beyond the articulating process with antenna, ventrally much shorter. Postocular ridge (*pocr*) dorsally very thin, weakly sclerotized, ventrally relatively thick, strongly sclerotized, considerably extended toward the cranial apophysis. Cranial apophysis (*ca*), 21.40 (15.00–25.00) long, apically clubshaped, extending up a little beyond the posterior edge of ventral eyes. Preoral ridge absent. Mouth opening (*mo*) situated well behind the posterior end of cranial apophysis. Ventral plate (*vp*) represented by two sclerites showing small rudimentary tentorial pit at each end: anterior tentorial pit (*atp*) and posterior tentorial pit (*ptp*).

Antennae: 10-segmented, frequently number of segments reduced to nine, occasionally to eight, 276 (215–385) long. The length of particular segments on the average as follows: Ist–17.6 (15.00–25.0), IInd – 13.2 (10.0–15.0), IIIrd – 35.0 (25.0–45.0), IVth – 30.0 (25.0–40.0), Vth – 30.2 (15.0–55.0), VIth – 29.3 (25.0–45.0), VIIth – 32.1 (25.0–40.0), VIIIth – 32.4 (25.0–50.0), IXth – 30.2 (25.0–40.0), Xth – 25.7 (25.0–30.0). Setae and sensilla: Ist seg-

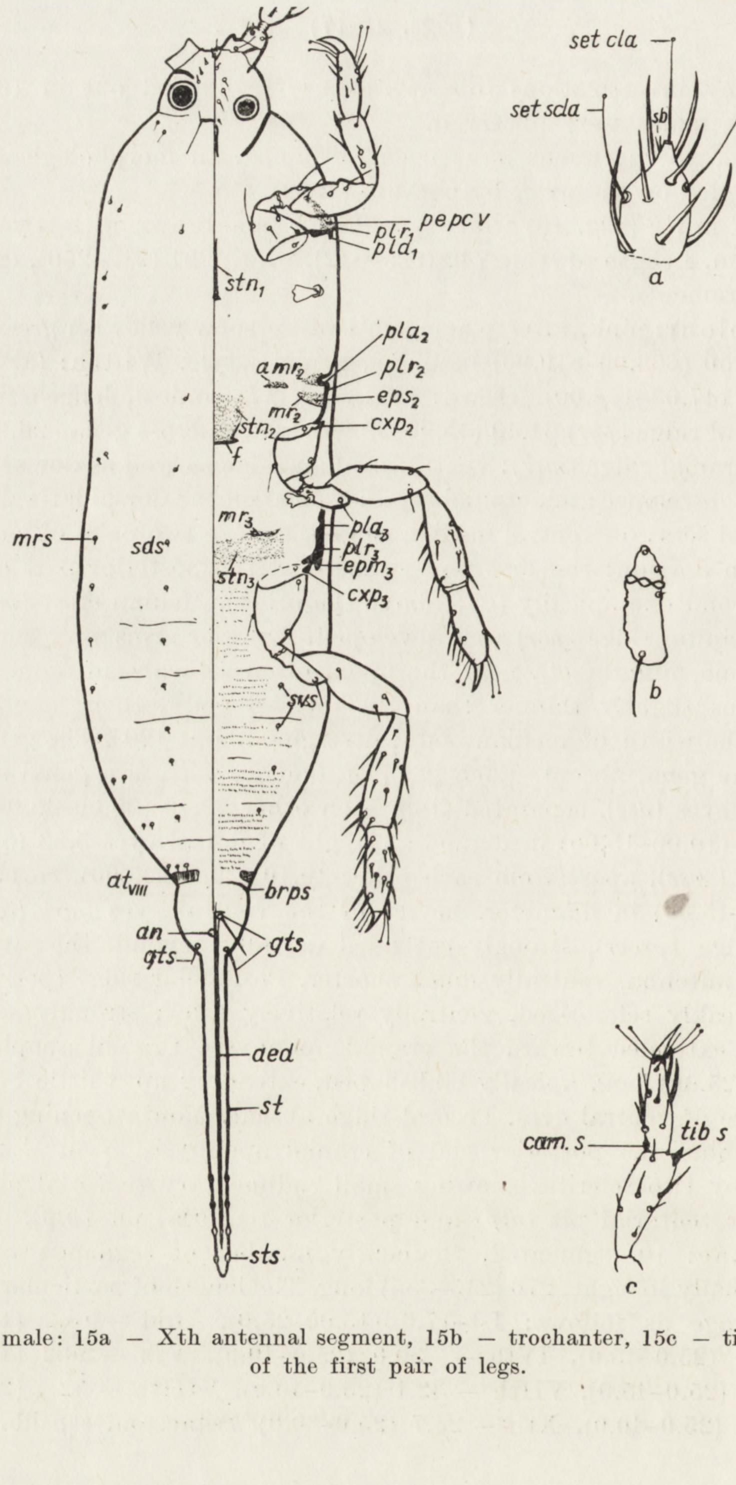
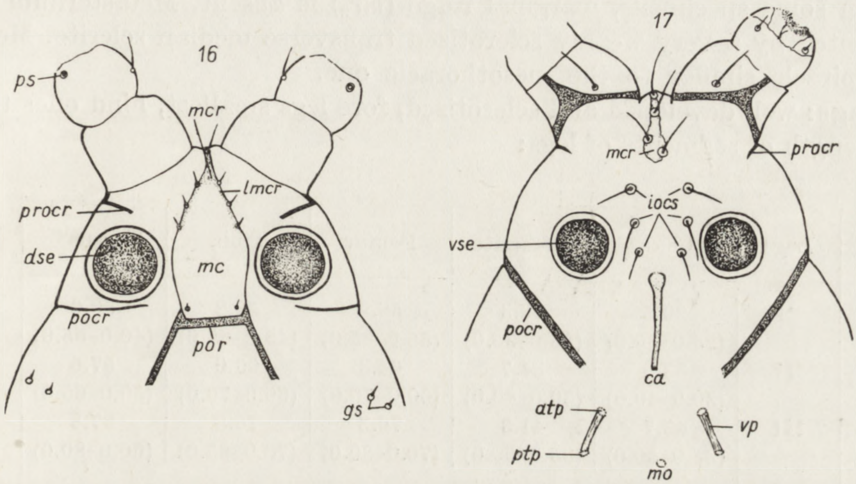


Fig. 15 – male: 15a – Xth antennal segment, 15b – trochanter, 15c – tibia and tarsus of the first pair of legs.

ment with a long hair-like seta; IInd segment with 3 short hair-like setae and one placoid sensillum (*ps*), located distally on the dorsal surface; IIIrd segment with one hair-like seta, 5.3 (4–7) fleshy ones, and one deeply invaginated coeloconic sensillum. Segments IV–IX with fleshy setae only, on the average 5, 7, 8, 9, 9 and 12 in number on subsequent segments: those setae a little shorter



Figs. 16 – 17. 16 – head of male, dorsal side; 17 – head of male, ventral side.

than the width of segments. The terminal segment (X), (Fig. 15a) with 9 (6–11) fleshy setae, one claviformes apical sensory seta (*set cla.*) and two long, apically knobbed subapical sensory seta (*setscla*) and a pair of small sensilla of basiconic type (*sb*), near the base of apical sensory seta.

Thorax, with extremely reduced structures. Prothorax: proepisternum + cervical sclerite (*pepcv*) weakly sclerotized, wide, anteriorly narrowing. Pleural ridge (plr_1) strongly sclerotized with rudimentary pleural apophysis (pla_1). Sternum (stn_1) well sclerotized with longitudinal median ridge 42.20 (30.00–50.00) long, sometimes with small triangular sclerite. Pronotal ridge, lateral pronotal sclerite, posttergite and proepimeron absent.

Mesothorax. Mesonotum and mesopostnotum show a complete degeneration. Mesopleuron: pleural ridge (plr_2) well sclerotized, arching anterodorsally. Pleural apophysis (pla_2) well developed and sclerotized, episternum (eps_2) triangular, weakly sclerotized, coxal process (cxp_2), small, strongly sclerotized. Mesosternum: basisternum (stn_2) without defined margins. Marginal ridge (mr_2) rudimental, very thin, articulating with the posterior side of episternum (eps_2) and not fused with the anterior part of the marginal ridge (amr_2); the latter in the form of a short and wide sclerotized plate at each side of the body. Precoxal ridge absent. Furca (*f*) with well sclerotized base, 29.20 (25.00–30.00) wide and two short anterolateral arms. Mesothoracic spiracle with well developed peritreme.

Metathorax. On metanotum sclerotic structures absent. Mesopleuron: represented by well sclerotized pleural ridge (*plr*$_3$), small pleural apophysis (*pla*$_3$), epimeron (*epm*$_3$) in form of a triangular sclerite and a short, strongly sclerotized metathoracic coxal process (*cxp*$_3$). Marginal ridge (*mr*$_3$) thin, rudimentary, fading away medially and laterally so that it does not join with pleural area. In some specimens, marginal ridge (*mr*$_3$) is absent. Metasternum (*stn*$_3$): represented by a very weakly sclerotized transverse median sclerite. Metathoracic spiracle similar to the mesothoracic one.

Legs: well developed and sclerotized, fore legs smallest, hind ones the largest. Length of segments of legs:

Legs	Coxa	Trochanter	Femur	Tibia	Tarsus+
I	29.5 (25.0–35.0)	29.3 (25.0–35.0)	58.9 (55.0–65.0)	53.2 (45.0–65.0)	50.0 (40.0–55.0)
II	33.9 (30.0–40.0)	34.7 (30.0–40.0)	64.3 (60.0–70.0)	66.0 (60.0–70.0)	57.6 (50.0–65.0)
III	43.7 (35.0–50.0)	41.3 (35.0–50.0)	76.3 (70.0–80.0)	75.8 (70.0–85.0)	67.8 (60.0–80.0)

+ together with the tarsal claw

Coxae: (*cx*) conical, with basal and apical ridges and articulating processes well developed. Setae: 5 hair-like on fore, 4.7 (4–5) on middle, and 5 on hind coxa. Fleshy setae absent. Trochanters; comparatively robust, without teeth on all three legs. Setae: 4 on all legs (3 minute and 1 long apical). Fleshy setae absent. Chain of 6 diamond-shaped sensilla present (Fig. 15b). Femora: setae — 4.7 (3–5) on fore, 4.1 (3–5) on middle, and 4.6 (4–5) on hind femur. Fleshy setae absent. Tibiae: only fore tibia with a strong apical spur (*tibs*), Fig. 15c. Setae: 5.2 (3–7) hair-like and 2 (1–3) fleshy on fore tibiae; 5.3 (5–6) hair-like and 3.6 (2–5) fleshy on middle tibiae; 6 (4–8) hair-like and 4.2 (3–5) fleshy setae on hind tibiae. Tarsi: well developed, one segmented, always with a campaniform sensillum (*cams*), Fig. 15c, situated near the base on the dorsal surface. Setae: 5.8 (4–7) hair-like and 3.1 (2–5) fleshy on fore tarsus; 5.6 (4–9) hair-like and 5.5 (4–6) fleshy on middle tarsus; 6 (4–8) hair-like and 14.4 (9–18) fleshy setae on hind tarsus. Fleshy setae on the ventral surface not bifurcated. Tarsal digitules well developed, base without notch, longer than claws. Clows: strong, apically curved, ungual digitules well developed, exceeding the claws.

Abdomen: there are eight pregenital and one (IX) genital segment. Length from the first dorsal segment to the base ridge of penial sheath (*brps*) 230.00–270.00. Width at the level of II and III segments 145 (135–150). Tergite present only on the VIII segment (*at-VIII*). Setae: submarginal dorsal setae (*sds*) one on I–VII segments, marginal dorsal (*mrs*) one on I–V, two on VI–VII and three on VIII segment, last setae being the longest. Submarginal ventral setae (*svs*) present only on IV–VII segments, one on each segment. Genital segment conical with a long and narrow style (*st*), its total length 250.00 (235.00–270.00); anus (*an*) situated on the dorsal surface of the base; basal ridge of penial sheath (*brps*) ventrally well developed; aedeagus (*aed*) thin and almost as long as the style. Internally located basal rod of aedeagus well developed and strongly sclerotized, processes of penial sheat in form of long, triangular plates, well developed and sclerotized. Sensilla on the style (*sts*) small 4–6.

Notes on the value of male characters for the systematic position of the genus *Mytilaspis* Targioni-Tozzetti

When examining relationships within the tribe *Diaspidini*, according to systematic classification accepted by Ghauri (1962) – particularly taxonomic characters used by him – one becomes aware that the position of *Mytilaspis*, within the subtribe *Lepidosaphidina* sensu Borchsenius (1965), based on male characters is entirely justified. Borchsenius (1965) in his classification of *Diaspididae* into subfamilies, tribes and subtribes used morphological characters of female as well as the scale of both sexes.

Ghauri (1962) accepted the Balachowsky's classification (1954) deviding the tribe *Diaspidini* into subtribe *Diaspidina* with two groups of species – *Diaspiformes* and *Chionaspiformes* – and the subtribe *Lepidosaphidina*. Of 48 characters listed by Ghauri (1962) used in separation of four tribes and five subtribes, I have analysed only 37 and found that only 30 characters turned out to be common for *Mytilaspis conchiformis* f. *conchiformis* with species of the subtribe *Lepidosaphidina*, while 7 characters proved to be different. The relationship with the subtribe *Diaspidina*, however, turned out to be much weaker: the group *Diaspiformes* proved to have only 25 common characters with the species in question and 12 different ones, whereas in the group *Chionaspiformes* 20 common characters and 17 different ones have been found. Despite of relatively numerous common characters with the subtribe *Lepidosaphidina*, the species in question turned out to possess only one common character of four exclusive ones found in the said subtribe i.e. two pairs of tentorial pits. In the group *Chionaspiformes* among 7 exclusive features, one – the absence of preoral ridge or sclerite – is found in the species investigated. With *Diaspiformes* group no exclusive character is shared.

For the moment only few species have been sufficiently investigated in the genus *Lepidosaphes* Shimer and *Mytilaspis* Targioni-Tozzetti and it is difficult to designate generic characters here. It seems however that the stucture of the postoccipital ridge may be one of the criteria separating these two genera. Apart from the two species of the genus *Lepidosaphes*, described by Ghauri (1962), the descriptions and drawings of the postoccipital ridge in six species of the said genus are given by Buščik (1958). Species of *Lepidosaphes* described by both of mentioned authors are characterized by a compact and robust median part of the postoccipital ridge, as well as by a close position of bases of the anterior arms of the said ridge (they reach one another), whereas in *Mytilaspis conchiformis* f. *conchiformis* the postoccipital ridge is delicate, slender and the bases of anterior arms of the ridge are wide apart. Further suggestions as regards the degree of morphological dissimilarity between these two closely related genera are possible only after the morphology of the species of the genus *Mytilaspis* – with winged males – were known.

By contrast to apterous males of *Parlatoria blanchardi* (Targ.) and *Chionaspis salicis* (L.) described by Ghauri (1962) – in which winged specimens also occur – apterous males of *Mytilaspis conchiformis* f. *conchiformis* possess strongly reduced thoracic sclerites. This may suggest that in the latter species males occur only in wingless form, which seems all the more probable as Schmutterer (1952) refers only to apterous males in mentioned work.

Address of the author:
The Agricultural University.
Rakowiecka 26/30.
02-528 Warszawa, Poland.

REFERENCES

Balachowsky A. S. 1954. Les cochenilles Paléarctiques de la tribu des *Diaspidini*. Paris, 450 pp.

Bennett F. D., Brown S. W. 1958. Life history and sex determination in the diaspine scale *Pseudaulacaspis pentagona* (Targ.) *Coccoidea*. Canad. Ent., Toronto, **90**: 317–324.

Boratyński K. L. 1953. Sexual dimorphism in the second instar of some *Diaspididae* (*Homoptera*: *Coccoidea*). Trans. ent. Soc. London, **104**: 451–479.

Borchsenius N. S. 1950. Červiecy i ščitovki SSSR, Moskva-Leningrad, 249 pp.

Borchsenius N. S. 1963. O revizii roda *Lepidosaphes* Shimer (*Coccoidea, Homoptera, Insecta*). Zool. Ž., Moskva, **42**: 1161–1174.

Borchsenius N. S. 1966. Katalog ščitovok (*Diaspidoidea*) mirovoj fauny. Moskva-Leningrad, 449 pp.

Borchsenius N. S. 1965. Osnovy klassifikacii ščitovok (*Homoptera, Coccoidea, Diaspididae*). Ent. Obozr., Leningrad-Moskva, **44**: 362–376.

Buščik T.N. 1958. K sravnitel'noj morfologii samcov ščitovok (*Homoptera, Coccoidea, Diaspididae*). Trudy vsesojuzn.ènt. Obšč., Moskva, **46**: 162–269.

Buščik T. N. 1960. K faune kokcid (*Homoptera, Coccoidea*) Zapadnogo Kopet-Daga. Trudy Zool. Inst. Akad. Nauk SSSR, Moskva-Leningrad, 27: 167–182.

Ferris G. F. 1938. Atlas of the scale insects of North America S II–144, Stanford, Ca.

Ghauri M. S. 1962. The morphology and taxonomy of male scale insects (*Homoptera* : *Coccoidea*). London, 221 pp.

Komosińska H. 1969. Badania nad tarcznikami (*Homoptera, Coccoidea*; *Diaspididae*) Polski I., Fragm. faun., Warszawa, **15** : 267–271.

Lindinger L. 1936. Neue Beiträge zur Kenntnis der Schildläuse (*Coccidae*). Ent. Jb., Leipzig, Frankfurt a. M. **45** : 148–167.

Lupo V. 1939. Revisione delle Cocciniglie italiane III. Boll. Lab. Zool. Portici, **31** : 69–136.

Lupo V. 1943. Il *Mytilococcus ficifoliae* (Berlese) è una forma estiva del *M. conchiformis* (Gmelin). Boll. Lab. Ent. agr., Portici, **5** : 196–205.

Negi P. S. 1929. A contribution to the life history of the lac insects. Bull. ent. Res., London, **19** : 327–341.

Newstead R. 1897. New *Coccidae* collected in Algeria by the Rev. Alfred E. Eaton. Trans. ent. Soc., London, **1897**: 93–103.

Newstead R. 1910. On scale insects (*Coccoidea*) from the Uganda Protectorate. Bull. ent. Res., London, **1** : 63–69.

Reali G. 1954. Studio morfologico su *Diaspis calyptroides* Costa. Bool. Zool. agrar. Bachic., Parma, **20** : 27–49.

Schmutterer H. 1952. Die Ökologie der Cocciden (*Homoptera, Coccoidea*) Frankens. Z. angew. Ent., Berlin, Hamburg, **33** : 544–584.

Schmutterer H. 1959. Schildläuse oder *Coccoidea* I. Deckelschildläuse oder *Diaspididae*. Die Tierwelt Deutschlands und der angrenzenden Meeresteile, Jena, **45** : 260 pp.

Signoret V. 1870. Essai sur les cochenilles ou gallinsectes (Homoptères – Coccides). Ann. Soc. ent. France., Paris, ser. 4, **10** : 91–110.

Silvestri F. 1914–1915. Contribuzione alla conoscenza del genere *Stictococcus* Cockerell (*Hemiptera*; *Coccoidea*). Boll. Lab. Zool. Portici, **9** : 379–388.

Stafford E. N., Barnes D. F. 1948. Biology of the fig scale in California. Hilgardia, Berkeley, Ca., **18** : 567–598.

Stickney F. S. 1934. The external anatomy of the Parlatoria date scale, *Parlatoria blanchardi* Targioni-Tozzetti, with studies of the head skeleton and associated parts. Tech. Bull. U. S. Dep. Agric., Washington D. C. No **421**, 67 pp.

Tremblay E. 1958. Ovoviparita, comporamento delle femmine vergini, sesso delle larve e ghiandole cefaliche larvali della *Diaspis pentagona* Targ., Boll. Labor. Ent Portici. Napoli, **16**: 215–246.

Thiem H. 1931. Eine rote Kommaschildlaus der deutschen Coccidenfauna (*Lepidosaphes rubri* n. sp.). Die Gartenbauwissenschaft, Berlin, **5** : 557–567.

Williams M. L., Kosztarab M., 1970. A morphological and systematic study on the first instar nymphs of the genus *Lecanodiaspis* (*Homoptera* : *Coccoidea* : *Lecanodiaspididae*). Research Div. Bull. Virg. Polytech. Inst., Blacksburg, Va., **52** : 96 pp.

LIST OF ABBREVIATIONS

aed	=	aedeagus
amr_2	=	anterior part of marginal ridge
an	=	anus
at–VIII	=	VIII abdominal rudimentary tergite
atp	=	anterior tentorial pit
brps	=	basal ridge of penial sheat
ca	=	cranial apophysis
cams	=	campaniform sensillum
cxp_2	=	mesothoracic coxal process
cxp_3	=	metathoracic coxal process
dse	=	dorsal simple eye

epm_3 = metaepimeron
eps_2 = mesoepisternum
f = mesofurca
gts = setae on genital segment
gs = genal seta
iocs = interocular seta
L_1, L_2, L_3 = lobes of pygidium
lmcr = dorsal lateral branches of midcranial ridge
mc = median crest
mcr = midcranial ridge
mo = mouth opening
mr_2 = marginal ridge of mesosternum
mr_3 = marginal ridge of metasternum
mrs = marginal setae on abdominal segments
pepcv = proepisternum + cervical sclerite
pla_1 = rudimentary propleural apophysis
pla_2 = mesopleural apophysis
pla_3 = rudimentary metapleural apophysis
plr_1 = propleural ridge
plr_2 = mesopleural ridge
plr_3 = metapleural ridge
pocr = postocular ridge
por = postoccipital ridge
procr = preocular ridge
ptp = posterior tentorial pit
ps = placoid sensillum
sb = sensilla basiconic
setcla = apical sensory seta "seta claviformis"
setscla = subapical sensory seta "seta semiclaviformis"
stn_1 = prosternum
stn_2 = mesosternum
stn_3 = metasternum
st = genital style
sts = sensilla on genital style
svs = submarginal ventral setae on abdominal segments
tibs = tibial spur
vp = ventral plate

STRESZCZENIE

[Tytuł: Badania nad morfologią *Mytilaspis conchiformis* forma *conchiformis* (Gmelin) (*Homoptera*, *Coccoidea*, *Diaspididae*)]

Pracę oparto na materiałach z Polski. Podano szczegółową morfologię wszystkich stadiów rozwojowych, których opisy zilustrowano rysunkami. Praca zawiera ogólne uwagi o dymorfizmie płciowym czerwców w stadium pierwszej larwy. U badanego gatunku nie stwierdzono dymorfizmu w tym stadium. Za najważniejszą cechę odróżniającą drugie stadium larwy męskiej od drugiego stadium larwy żeńskiej uznano brak mikroprzewodów w strefie medialnej odwłoka u larw żeńskich. Podano sposób linienia pierwszego stadium larwy oraz drugiego stadium larwy męskiej i żeńskiej. Na określenie przewodów gruczołowych mniejszych od makroprzewodów, a większych, zwłaszcza szerszych, od mikroprzewodów, wprowadzono termin mezoprzewody (mesoducts). Przy morfologii samicy zwrócono szczególną uwagę na liczbę mezoprzewodów VI segmentu odwłoka, mającą znaczenie taksonomiczne. Na podstawie morfologii samca podano uwagi o pozycji systematycznej rodzaju *Mytilaspis* TARGIONI-TOZZETTI.

РЕЗЮМЕ

[Заглавие: Исследования по морфологии *Mytilaspis conchiformis* forma *conchiformis* (GMELIN) (*Homoptera*, *Coccoidea*, *Diaspididae*)]

Работа основана на материалах из Польши. Приведена подробная морфология всех стадий развития, которых описания иллюстрированы рисунками.

В статьи даны общие примечания о половом диморфизме червецов в стадии первой личинки. В исследуемом виде не констатируется диморфизма в этой стадии.

Самым важным признаком, отличающим вторую стадию мужской личинки от второй стадии женской личинки, считается отсутствие микротрактов в средней части брюшка у женских личинок.

Приведен способ линьки первой стадии личинки, а также второй стадии мужской и женской личинок.

Для определения железовых трактов меньших чем макротракты и больших, особенно более широких чем микротракты; введен термин мезотракты (mesoducts).

При морфологии самки обращено особое внимание на количество мезотрактов VI-го сегмента брюшка, из-за таксономического значения этого признака.

На основании морфологии самца, приведены примечания о систематическом положении рода *Mytilaspis* TARGIONI-TOZZETTI.

Redaktor pracy – prof. dr J. Nast

Państwowe Wydawnictwo Naukowe – Warszawa 1974
Nakład 1105+90 egz. Ark. wyd. 2,25; druk. 1 7/8. Papier druk. sat. kl. III 80 g. Bl. Cena zł 12,–
Nr zam. 1055/73– Wrocławska Drukarnia Naukowa