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Larval description of two species of *Mycetina* Mulsant, 1846 (Coleoptera: Endomychidae: Lycoperdininae) from Russian Far East

Описание личинок двух видов *Mycetina* Mulsant, 1846 (Coleoptera: Endomychidae: Lycoperdininae) с Дальнего Востока России

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KEY WORDS: Coleoptera, larva, Endomychidae, Lycoperdininae

КЛЮЧЕВЫЕ СЛОВА: жесткокрылые, личинка, Endomychidae, Lycoperdininae

ABSTRACT. All larval instars of *Mycetina rufipennis* Motschulsky, 1861 and last-instar larva of *M. marginalis* Gebler, 1830 are described. The key to known last-instar larvae of *Mycetina*, occurring in Russia is provided.

РЕЗЮМЕ. Описаны личинки всех возрастов *Mycetina rufipennis* Motschulsky, 1861 и последний возраст *M. marginalis* Gebler, 1830. Приводится определительный ключ личинок последнего возраста видов *Mycetina,* известных с территории России.

Introduction

This paper continues the study of larval Lycoperdininae Redtenbacher, 1844 occuring in Russian Federation [Zaitsev, 2022]. According to Shockley et al. [2009] three genera are known from the territory of Russia: *Dapsa* Latreille, 1829, *Lycoperdina* Latreille, 1807 and *Mycetina* Mulsant, 1846 with six, five and four species respectively. The state of knowledge of larval *Lycoperdina* have been reviewed in the previous paper [Zaitsev, 2022]; *Dapsa* larvae are still undescribed even on genus level.

The present study focuses on genus *Mycetina* with 68 species worldwide [Schockley et al., 2009], four of which are known from Russia. *M. cruciata* Schaller, 1783 is the only species from European part; three other occur in Far East region: *M. marginalis* Gebler, 1830, *M. rufipennis rufipennis* Motschulsky, 1861 and *M. stackelbergi* Kryzhanovskij, 1976. Although larvae of this genus are frequently collected, detailed descriptions are few and data on first-instar larvae are completely lacking (see Discussion).

Material and methods

During the study of beetles' fauna of Lazovsky and Kurilsky Nature Reserves, larvae of *Mycetina* were collected and subsequently reared to adults. Upon determination, they appear to be of *M. rufipennis rufipennis* and *M. marginalis* (Figs 1–2).

Habitus photographs were taken with a Canon EOS 40D camera with a MP-E 65 mm macro lens. Photos of slide mounts were taken with a Canon EOS6D camera attached to a Carl Zeiss AXIO Scope.A1microscope. All photos were processed using Helicon Focus 7.0 software. Line drawings were made in CorelDRAW 12. The measurements were taken with an ocular-micrometer mounted on a MBS–1 (Lomo) stereo microscope. The specimens were preserved in 70% ethanol or on slides with Faure's Berlese media and are deposited in Moscow Pedagogical State University, Moscow, Russia (MSPU).

The following abbreviations were used:

body sclerites: FR — frontal sclerite, PA — parietal sclerite, Pga — paragular area, CS — cervicosternum, PR — pronotum, TE — dorsal tergite, DLT — dorsolateral tergite, LT — laterotergite, ES — episternum, EM — epimeron, HY — hypopleurite, PS — prosternite, MS — mesosternite;

head appendages and their parts: Dma — dorsal mandibular articulation, Am — antennal membrane, Mm — mandibular membrane, Mxa — maxillary articulating area, Prxcdo — proxicardo, Dstcdo — disticardo, Stp — stipes, Ma — mala, Mnt — mentum, Pmnt — prementum, Smnt — submentum, Lg — ligula;

endoskeletal structures of the head: Epr — epistomal ridge, Hypstr — hypostomal ridge, Hypstrd — hypo-

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Figs 1–2. *Mycetina* spp., adult male, dorsal: 1 — *M. rufipennis rufipennis*; 2 — *M. marginalis*.
Рис. 1–2. *Mycetina* spp., самец, сверху; 1 — *M. rufipennis rufipennis*; 2 — *M. marginalis*.

stomal rod, Hypbr — hypopharyngeal bracon; Hypsc — hypopharyngeal sclerome, R — hypopharyngeal rod, Tc — transverse curvation, Prap — cardo promotor apodeme;

other abbreviations: Sp — spiracle, Spd — spiracular disk, Sa — sensorial appendage, Ph — pharynx, UR — urogomphi.

Sclerites nomenclature mostly follows Lawrence [1991]; some minor suggestions were made concerning tergal sclerites of larval Endomychidae. When discussing these structures, in the majority of papers such terms as «verruca», «process» or «lobe» are used, sometimes with topology indication, e.g. "dorsal verrucae lateral to terga", or "lateral lobe" [Burakowski, 1997; Tomaszewska, 2005; McHugh, Pakaluk, 1997]. Such designations adequately describe the shape and position of the sclerite, but not its origin. So, in the present paper terms "dorsolateral tergite" and "laterotergite" are used instead.

Results and discussion

Mycetina rufipennis rufipennis Motschulsky, 1861

MATERIAL. 6 first-instar larvae, 8 second-instar larvae, 10 third-instar larvae (two reared to adult): Russia, Kunashir Island, Kurilsky Nature Reserve, near Saratovsky cordon, 44°15′550″N 146°06′270″E on trunk of *Abies*, covered in mold fungi, 4.IX.2009, leg. A. Zaitsev, adult determined by K. Makarov.

First-instar larva
Figs 3–23, 32–37.

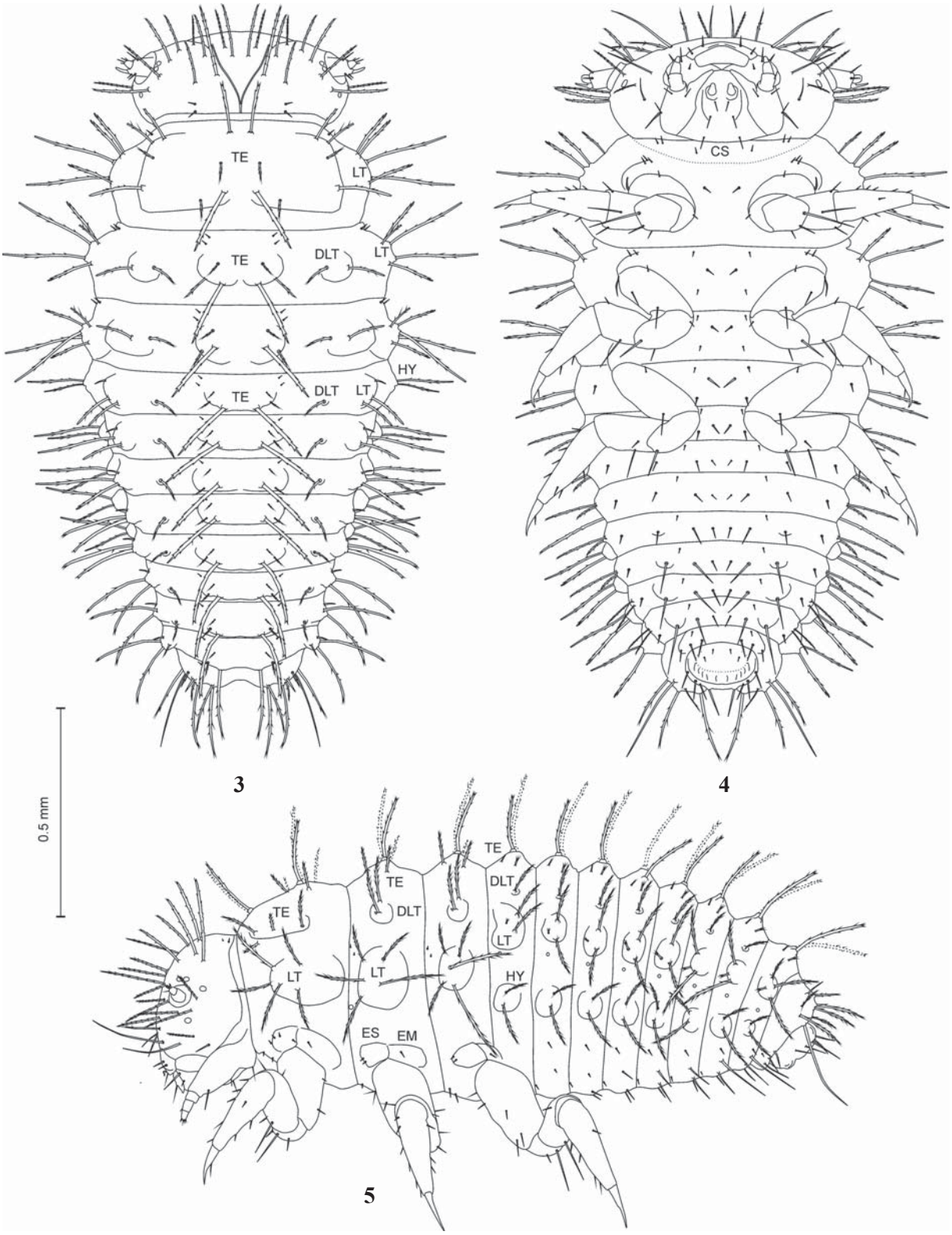
Maximum body length (from anterior margin of frontal sclerite to the apex of abdominal segment IX) 1.6 mm; head length (from the base of epicranial suture to the apex of labrum) 0.3 mm; head width 0.5 mm; maximum width of thorax 0.6 mm; maximum width of abdomen 0.6 mm. Head 0.8 as wide as prothorax; body elongate, cylindrical; widest across metathorax, then tapering posterad; urogomphi present (Figs 3–5). Head greyish-yellow, antennae lighter, mandibles and maxillae brownish, stemmata transparent. Edge of head capsule at the base of mandibles strongly pigmented. Body light-gray, sclerites slightly stronger pigmented. Legs greyish-yellow, tibiotarsus a little lighter than others joints.

Head capsule as well as tergites and pleurites are covered mostly with frayed setae of various length; ventral surfaces membranous, covered with simple, mostly short setae.

Head (Figs 6–15, 32) hypognathous, triangular, about 0.6 as long as wide. Epicranial suture short; frontal sutures U-shaped, long, reaching the level of anterior stemma (Figs 6, 8). Frontoclypeal suture and epistomal ridge distinct. Stemmata four on each side, not pigmented, partly surrounding antennal insertion: a pair located posteriorly, one anterior, and one ventral (Fig. 5).

Clypeus transverse, with rounded lateral margins; bearing two simple mesosetae on each side (Figs 6–7). Clypeolabral suture distinct. Labrum (Fig. 9) about 0.5 as long as basal wide; its anterior margin serrate, with 15 pointed denticles; dorsally with five simple setae and single pore on each side: one micro- and one mesoseta on anterior margin, one meso- and one macroseta on lateral edge, one mesoseta closer to posterior margin and one pore located anteriorly to it. Moreover, unpaired medial pore present between posterior mesosetae. Entire surface of frontal sclerite with numerous small granules (Fig. 32); each side with eight macrosetae: three simple setae located in the anterior part and five frayed setae posteriorly; single pore situated close to the anterior end of frontal suture (Fig. 6). Parietal sclerites dorsally (Figs 6, 8) covered with the same granulae; each sclerite with 14 frayed

macrosetae and two simple microsetae located close to the postoccipital ridge; three pores present: one rather close to the antennal insertion, another near the anterior microseta and the third located near anterior stemma. Ventral surface of parietal sclerites smooth, each sclerite with single simple anterior mesoseta and single frayed macroseta located close



Figs 3–5. *M. rufipennis rufipennis*, first-instar larva, habitus: 3 — dorsal; 4 — ventral; 5 — lateral.
Рис. 3–5. *M. rufipennis rufipennis*, личинка первого возраста, габитус: 3 — сверху; 4 — снизу; 5 — сбоку.

Figs 6–15. *M. rufipennis rufipennis*, first-instar larva: 6–8 — head; 9 — labrum and epipharynx; 10 — antenna; 11 — left mandible; 12 — labio-maxillar complex; 13–14 — mala; 15 — hypopharynx. 6, 9 — left — dorsal view, right — ventral view; 7 — lateral view; 8 — posterior view; 11, 14 — dorsal view; 10, 12–13, 15 — ventral view.

Рис. 6–15. *M. rufipennis rufipennis*, личинка первого возраста: 6–8 — голова; 9 — верхняя губа и эпифаринкс; 10 — антенна; 11 — левая мандибула; 12 — лабио-максиллярный комплекс; 13–14 — мала; 15 — гипофаринкс. 6, 9 — слева — сверху, справа — снизу; 7 — сбоку; 8 — сзади; 11, 14 — сверху; 10, 12–13, 15 — снизу.

to ventral stemma (Figs 6–7). Hypostomal ridge with transverse curvation below cardo; hypostomal rods diverging posteriorly, rather short, far from reaching posterior margin of the head capsule. Paragular area smooth, with two simple microsetae near the postoccipital ridge (Fig. 6).

Antenna (Fig. 10) short, with three antennomeres, 0.2 as long as head capsule length, with broad insertion area. Antennomere I very short, almost entirely sclerotized, 0.25 as long as wide, ventrally with two pores. Antennomere II slightly sclerotized, rectangular, 5.2 as long as antennomere I and 1.3 as long as wide, its apical part with two dorsal and single ventral simple mesosetae as well as elongated conical sensorial appendage, which is almost twice as long as antennomere III. Antennomere III also slightly sclerotized, 0.4 as long as antennomere II and 1.2 as long as wide; with two dorsal and single ventral simple microsetae; its apical part with three elongated sensilla and single shorter one.

Epipharynx (Fig. 9). Anterior part on each side with several microtrichia of various length, absent in central area, where two sensilla located; three mesosetae present laterally. Four sensilla located posteriorly, as well as numerous microtrichia and small tubercles.

Mandibles (Fig. 11) symmetrical, broad, almost as long as basal width, with well developed membranous area. Apex unidentate, incisor area with 7–8 acute teeth; prostheca with several microtrichia; mola well-developed, with numerous acute teeth; accessory ventral process distinct. Outer edge of each mandible with two simple setae: basal macroseta and microseta located anteriorly to it; single pore located between them. Dorsally each mandible with two basal pores.

Maxilla (Figs 12–14) with triangular cardo, which is "divided" by the internal sclerotization into proxicardo with smooth surface, and disticardo bearing single mesoseta; maxillary articulating area membranous. Stipes ventrally smooth, with two mesosetae. Dorsal side of stipes mostly membranous. Mala gradually narrowed anteriorly; its apex rounded. Ventral surface of mala (Fig. 13) with single basal microseta and one subapical mesoseta on inner margin; apical area with several heavy sclerotized unci. Dorsally (Fig. 14) mala with two microsetae near inner margin; apical area covered in numerous elongated spines, which makes certain difficulties in distinguishing of setae.

Maxillary palps three-jointed, palpifer with two ventral mesosetae (Fig. 12). Palpomere I 0.5 as long as wide; ventrally with single apical pore, dorsally with several small asperities. Palpomere II 1.1 as long as palpomere I and 0.7 as long as wide; with single lateral mesoseta; ventrally with single apical pore. Palpomere III almost twice as long as palpomere II and 2.1 as long as wide; with microseta on inner margin; ventrally with single subapical pore, dorsally with medial digitiform sensillum. Apex of palpomere III with a group of six short conical sensilla.

Labium (Figs 12, 15). Ligula broad, rounded apically; anterior margin with numerous small microtrichia, ventrally with single mesoseta and pore on each side. Prementum ventrally on each side with one micro- and one macroseta. Labial palps with single palpomere, which is 1.6 as long as basal wide; ventrally with basal microseta on outer margin and two pores: one subapical and other near inner margin; also single microseta present on inner margin; apex with a group of five short conical sensilla. Mentum distinct, trapezoidal, membranous, each side with single macro- and microseta. Submentum with single anterior macroseta on each side. Hypopharynx (Fig. 15) with numerous microtrichia; hypopharyngeal sclerotisation consists of well-defined sclerome, bracon and a pair of parallel rods.

Thorax (Figs 3–5, 16–18, 33). Cervicosternum membranous, with three microsetae on each side (Fig. 4). Thorax about 0.4 as long as total body length, widest across metathorax. Prothorax is 0.4 as long as wide, 1.4 as long as mesothorax and 1.5 as long as metathorax.

Prothorax with a pair of large pronotal sclerites, covered in numerous small tubercles (Fig. 30) except invaginated areas of muscles attachment, and well developed, lobe-like laterotergites; ecdysial line not distinct. Each pronotal plate (Fig. 16) with eight frayed setae (three macro- and five mesosetae) as well as five pores; moreover two microsetae located on membranous area anterior to each sclerite. Membranous area surrounding pronotal plates with numerous small microasperities. Each laterotergite bearing five frayed macrosetae (Fig. 16).

Meso- and metathorax with each notal plate divided in two sclerites: larger dorsal tergite and smaller dorsolateral tergite (Fig. 16). Each tergite covered in numerous small tubercles and bearing three frayed setae (one macro- and two mesosetae) and single pore; two simple microsetae located anterior on membranous area. Each dorsolateral tergite with two frayed macrosetae and single pore. Membranous area with the same microasperities as on prothorax. Meso- and metathoracic laterotergites similar to those on prothorax, however there are two simple microsetae located on membranous area anterior to each lobe (Fig. 16).

Mesothoracic spiracle annular, with two nearby structures of uncertain function (Fig. 17), being possibly clusters of sensilla, mentioned for Epipocinae [McHugh, Pakaluk, 1997] or gland openings; they are temporary named as "spiracular disks". Metathoracic spiracle rudimentary, barely visible.

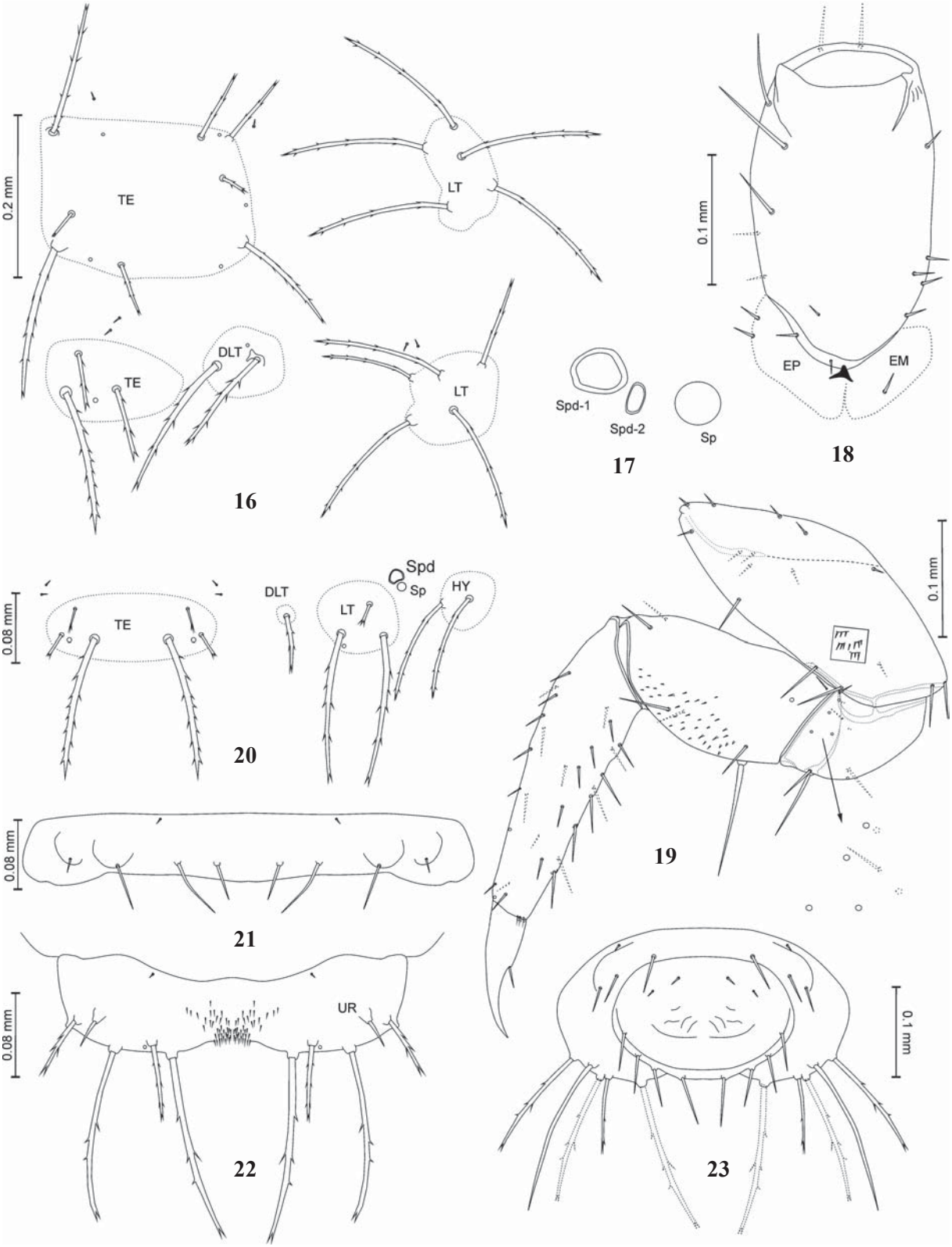
Prothoracic episternum with four simple microsetae; epimeron with single simple microseta (Fig. 5). Prosternite faintly sclerotized with single simple medial microseta on each side (Fig. 4).

Meso- and metathoracic episternum differs from that on prothorax by having only two simple microsetae; epimeron also with single simple microseta (Fig. 18). Meso- and metasternite with three simple microsetae on each side (Fig. 4).

Thoracic endoskeleton is of the same structure as was described earlier for *M. marginalis* [Tomaszewska, Zaitsev, 2012].

Legs (Figs 18–19) five-jointed, rather long and slender, slightly increasing in size posteriorly; all three pairs similar in structure and chaetotaxy, covered in simple setae of various length; length ratio of its joints to coxa is 0.5 : 0.9 : 1 : 0.3. Coxa covered in asperities arranged in short transverse rows; with 16 setae: five dorsal (three macro- and two microsetae), three ventral (two macro- and one microseta), three anterior microsetae and five posterior microsetae. Trochanter with five setae: two anterior (one meso- and one microseta), one posterior microseta and two ventral (one macro- and one mesoseta); seven pores present: five anterior and two posterior. Femur partly covered in short asperities, with seven setae: one dorsal microseta, one ventral macroseta, three anterior and two posterior mesosetae; one anterior pore present. Tibiotarsus elongated, with 27 setae: six anterior microsetae, six posterior (four micro- and two mesosetae), eight ventral mesosetae and seven dorsal microsetae; two dorsal pores present. Apical part of tibiotarsus with several ventral spines. Pretarsus with single elongated claw bearing single microseta.

Abdomen (Figs 3–5, 20–23, 34–37). About 0.5 as long as total body length, widest across abdominal segment I, then narrowing posteriorly. Each abdominal segment (AS) I–VIII with undivided dorsal tergite, covered in small tubercules (Fig. 34), as well as paired minute dorsolateral tergites and



Figs 16–23. *M. rufipennis rufipennis*, first-instar larva: 16 — pro- and mesothoracic tergites; 17 — mesothoracic spiracle and «spiracular disks», schematically; 18 — middle leg, coxa; 19 — middle leg; 20 — abdominal segment II; 21 — abdominal segment VI; 22 — abdominal segment IX; 23 — abdominal segments IX-X. 16, 18, 20, 22 — dorsal view; 21, 23 — ventral view; 19 — anterior view.

Рис. 16–23. *M. rufipennis rufipennis*, личинка первого возраста: 16 — тергиты передне- и среднегруди; 17 — грудное дыхальце и «spiracular disks», схематично; 18 — тазик ноги второй пары; 19 — нога второй пары; 20 —II брюшной сегмент; 21 — VI брюшной сегмент; 22 — IX брюшной сегмент; 23 — IX-X брюшные сегменты. 16, 18, 20, 22 — сверху; 21, 23 — снизу; 19 — спереди.

well-developed convex laterotergites (Figs 3, 20). Tergites of AS I–VIII with three frayed setae (one macro- and two mesosetae) and single pore, as well as two simple anterior microsetae on each side (Fig. 20). Each dorsolateral tergite of AS I-VII with single frayed mesoseta; each laterotergite of AS I–VII with three frayed setae (two macro- and one mesoseta) and single pore (Fig. 20); laterotergite of AS VIII with additional mesoseta as a result of fusing with corresponding dorsolateral tergite (Fig. 5). Membranous area surrounding sclerites with numerous small simple asperities.

Each hypopleurite of AS I–VIII with two frayed macrosetae (Fig. 20). Abdominal sternites I–VIII faintly sclerotised, covered in numerous microasperities (Fig. 35); on each side with one anterior microseta as well as two medial and two lateral setae, most of which increasing in size on subsequent segments (Figs 4, 21). Abdominal spiracles annular, significantly lesser than on thorax, with single spiracular disk located nearby each spiracle (Fig. 36).

AS IX with tergite, laterotergites and hypopleurites fused, forming two large convex lobes with weak emargination between them, covered in numerous microasperities (Fig. 22). Each lobe dorsally with single simple anterior microseta, four frayed posterior setae (two meso- and two macrosetae) and single pore; also true urogomphi [see Zaitsev, 2022] present as small, but distinct, heavy sclerotized medial projections, each with single simple seta (Figs 22, 37). Ventrally (Fig. 23) each lobe with three setae (one simple macroseta and two frayed setae: one meso- and one macroseta). Sternite IX (Fig. 23) on each side with four simple setae: one anterior microseta and three posterior mesosetae. Pygopod (abdominal segment X) about 0.7 as long as abdominal segment IX, membranous except well-sclerotized protuberances from which setae arise; dorsally each side with four simple mesosetae, ventrally with 2 simple microsetae (Fig. 23).

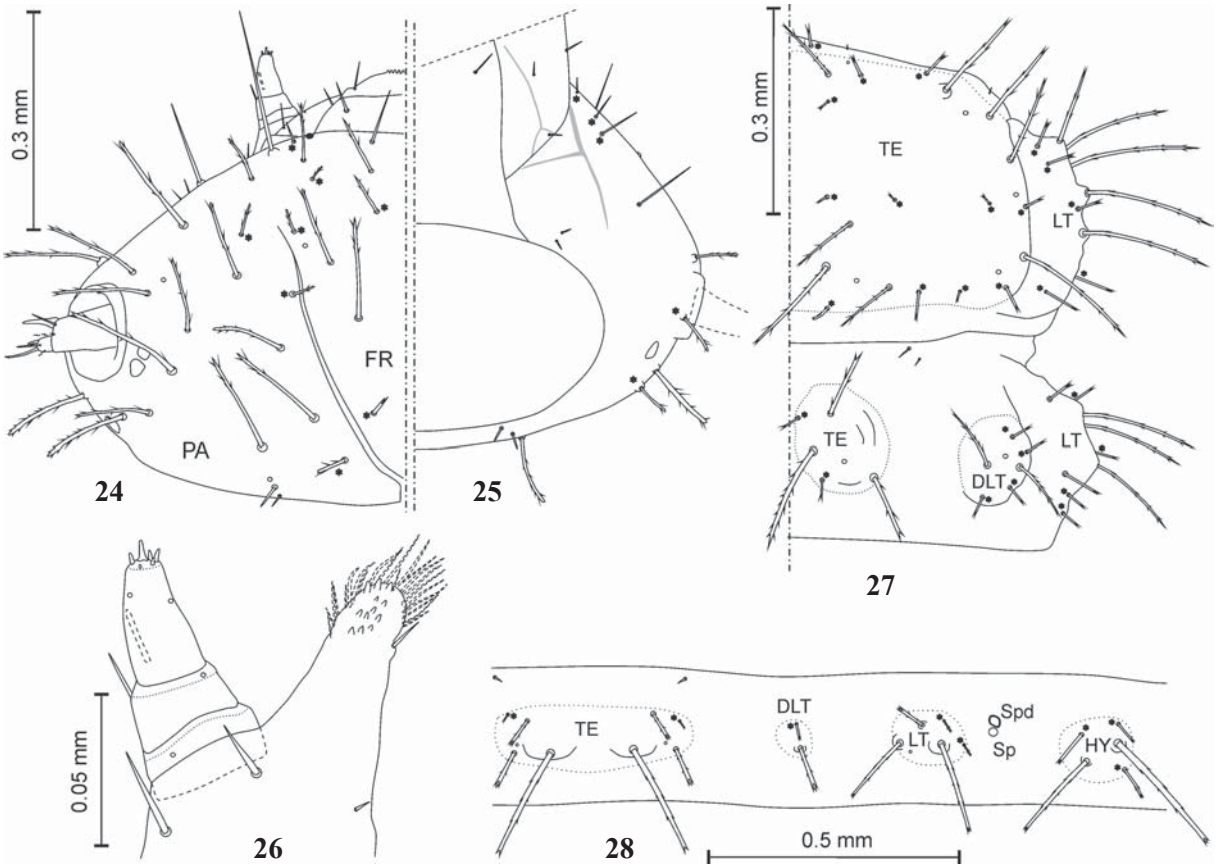
*S*econd-instar larva
Figs 24–28, 38–39.

Maximum body length 2.9 mm; head length 0.6 mm; head width 0.9 mm; maximum width of thorax 1.3 mm; maximum width of abdomen 1.2 mm. Similar to first instar in body shape and coloration, major differences mainly relate to chaetotaxy and consist in appearance of additional micro- and mesosetae, mostly frayed (Table, Figs 24–25, 27–28).

Other differences related to tubercles on thoracic and abdominal tergites, which are more prominent (Figs 38–39), and subapical area of mala with small but distinct unci ventrally (Fig. 26), which are absent in first-instar larva.

Third-instar larva
Figs 29–31, 40–57, 67–77.

Differences from second-instar larva are the following. Maximum body length 5.8 mm; head length 0.8 mm; head width 1.2 mm; maximum width of thorax 2 mm; maximum width of abdomen 2.1 mm. Head 0.6 as wide as prothorax;



Figs 24–28. *M. rufipennis rufipennis*, second-instar larva: 24–25 — head; 26 — distal part of maxilla; 27 — pro- and mesothorax; 28 — abdominal segment II. 24, 27–28 — dorsal view; 25–26 — ventral view. Additional setae are marked with *.

Рис. 24–28. *M. rufipennis rufipennis*, личинка второго возраста: 24–25 — голова; 26 — дистальная часть максиллы; 27 — передне- и среднегрудь; 28 — II брюшной сегмент. 24, 27–28 — сверху; 25–26 — снизу. Дополнительные хеты обозначены *.

Table. Distribution of additional setae in second-instar larva.
Таблица. Распределение дополнительных щетинок у личинки второго возраста.

Body part	Sclerite	Additional setae
Head capsule	Frontal	1 simple, 4 frayed
	Parietal	3 simple, 5 frayed
Prothorax	Pronotum	12 frayed
	Laterotergite	5 frayed
Meso- and metathorax	Tergite	2 frayed
	Dorsolateral tergite	4 frayed
	Laterotergite	4 frayed
Abdominal segments I–VII	Tergite	1 frayed
	Dorsolateral tergite	1 frayed
	Laterotergite	2 frayed
	Hypopleurite	3 frayed

Setae are counted for each sclerite if paired and for each side if solid
Щетинки подсчитываются для каждого склерита, если они парные, и для каждой стороны, если сплошные.

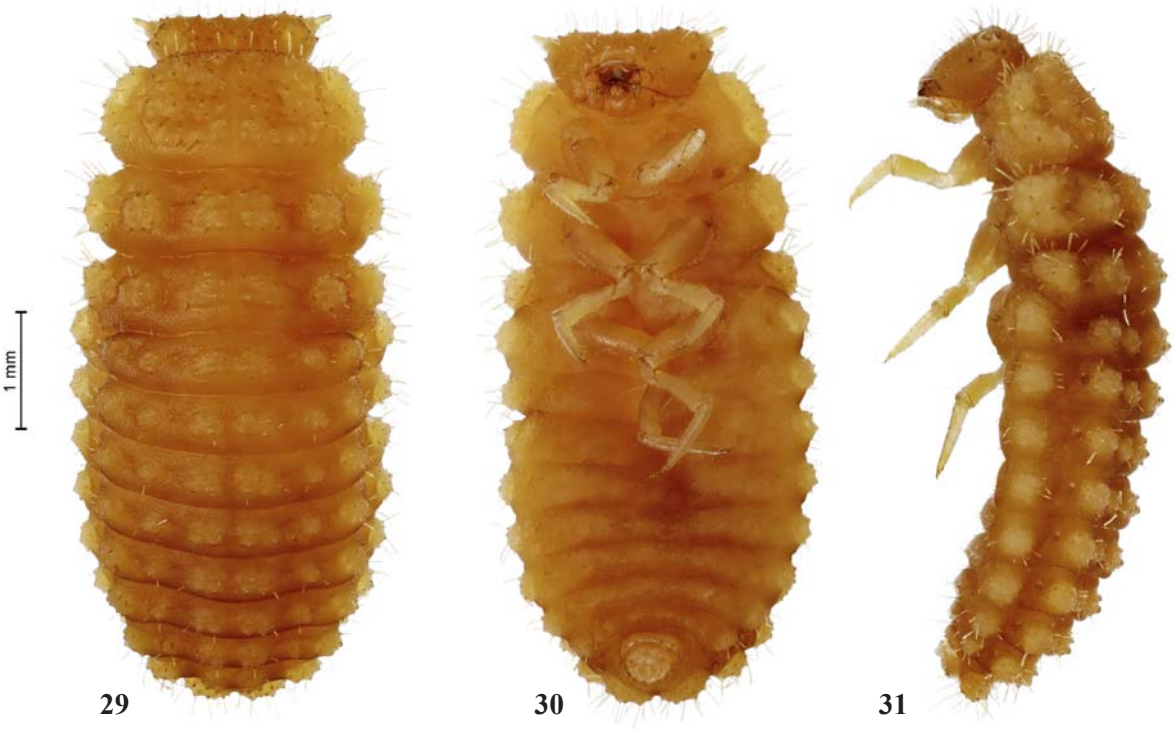
body distinctly broader, widest across AS I–III, then slightly tapering posteriad. Thoracic laterotergites as well as abdominal tergites and hypopleurites distinctly larger and more convex. Head yellowish-gray, with small darker spots, stemmata well-pigmented. Antennae lighter than head capsule, labrum light brown, clypeus a bit lighter. Mandibles brown, their apices darker. Edge of head capsule in the area of clypeus, mandibles and maxillae strongly pigmented. Maxillae and labium grayish-brown. Body grayish, dorsal side distinctly darker than ventral. Dorsolateral and laterotergites light, yellowish. Legs yellowish, apices of claws darkened (Figs 29–31).

Frayed setae on head capsule as well as on tergites and pleurites are relatively shorter.

Head (Figs 40–49, 68–69). Significantly more extended laterally; stemmata black-pigmented (Fig. 40). Denticles on anterior margin of labrum apically rounded (Fig. 41). Surface of frontal and parietal sclerites with distinctly more developed granules (Figs 68–69), also secondary micro- and mesosetae present, which number and topology varies in different specimens (Fig. 40).

Antenna (Fig. 45) with elongated antennomeres I–II. Antennomere I about 0.6 as long as wide; antennomere II 1.8 as long as wide and 3.3 as long as antennomere I; antennomere III 0.2 as long as antennomere II. Epipharynx (Fig. 42) with increased number of microtrichia in anterior part. Mandibles (Figs 43–44) with incisor area smooth, without teeth, which apparently worn down. Maxilla (Figs 46–48) with unci on apical area of mala distinctly larger. Dorsally mala with three microsetae near inner margin; anterior part of stipes with about 15 dorsal microtrichia of various length (Fig. 47). Maxillary palpomere I with single microseta on outer margin. Hypopharynx (Fig. 49) with increased number of microtrichia. Submentum with two anterior setae on outer edge (Fig. 46).

Thorax (Figs 50–53, 70–73) with more developed tubercles (Fig. 70); ecdysial line distinct. Pronotal plates and laterotergites with 20–30 secondary setae each (Fig. 50). Microasperities on membranous area significantly larger and more sclerotized (Fig. 71). Each meso- and metathoracic tergite with 5–6 secondary setae, each dorsolateral tergite with 7–8 secondary setae, each laterotergite with 25–30 secondary setae (Fig. 51). Meso- and metathoracic episternites with 3–4 secondary setae (Fig. 53).



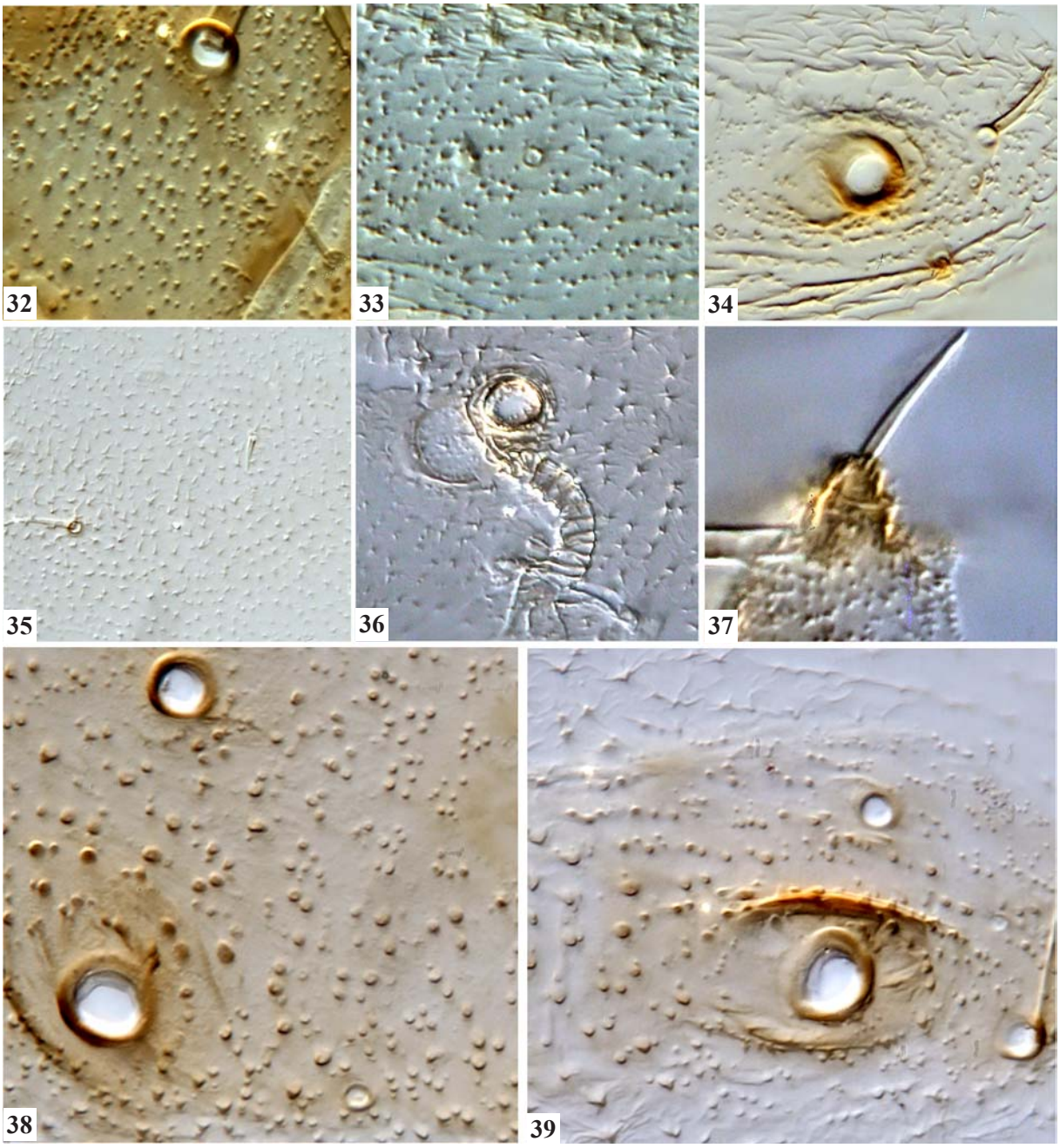
Figs 29–31. *M. rufipennis rufipennis*, third-instar larva, habitus: 29 — dorsal; 30 — ventral; 31 — lateral.
Рис. 29–31. *M. rufipennis rufipennis*, личинка третьего возраста, габитус: 29 — сверху; 30 — снизу; 31 — сбоку.

Legs (Fig. 53) more slender; length ratio of its joints to coxa is 0.4 : 0.9 : 1 : 0.2. Coxa with 8–10 secondary setae; trochanter with two secondary setae; femur with six secondary setae. Spines on apical part of tibiotarsus barely visible.

Abdomen (Figs 54–57, 74–77) widest across AS I–III, then gradually narrowing posteriorly. AS I–VIII with paired tergites, covered in more developed tubercules (Fig. 74); dorsolateral tergites and laterotergites more convex. Each tergite of AS I–VIII with three secondary setae; one of the pair of simple anterior microsetae reduced. Each dorsolateral tergite of AS I–VII with 4–5 secondary setae; each laterotergite with 5–6 secondary setae (Fig. 54). Membranous area surrounding sclerites with numerous heavy sclerotized asperities (Fig. 74).

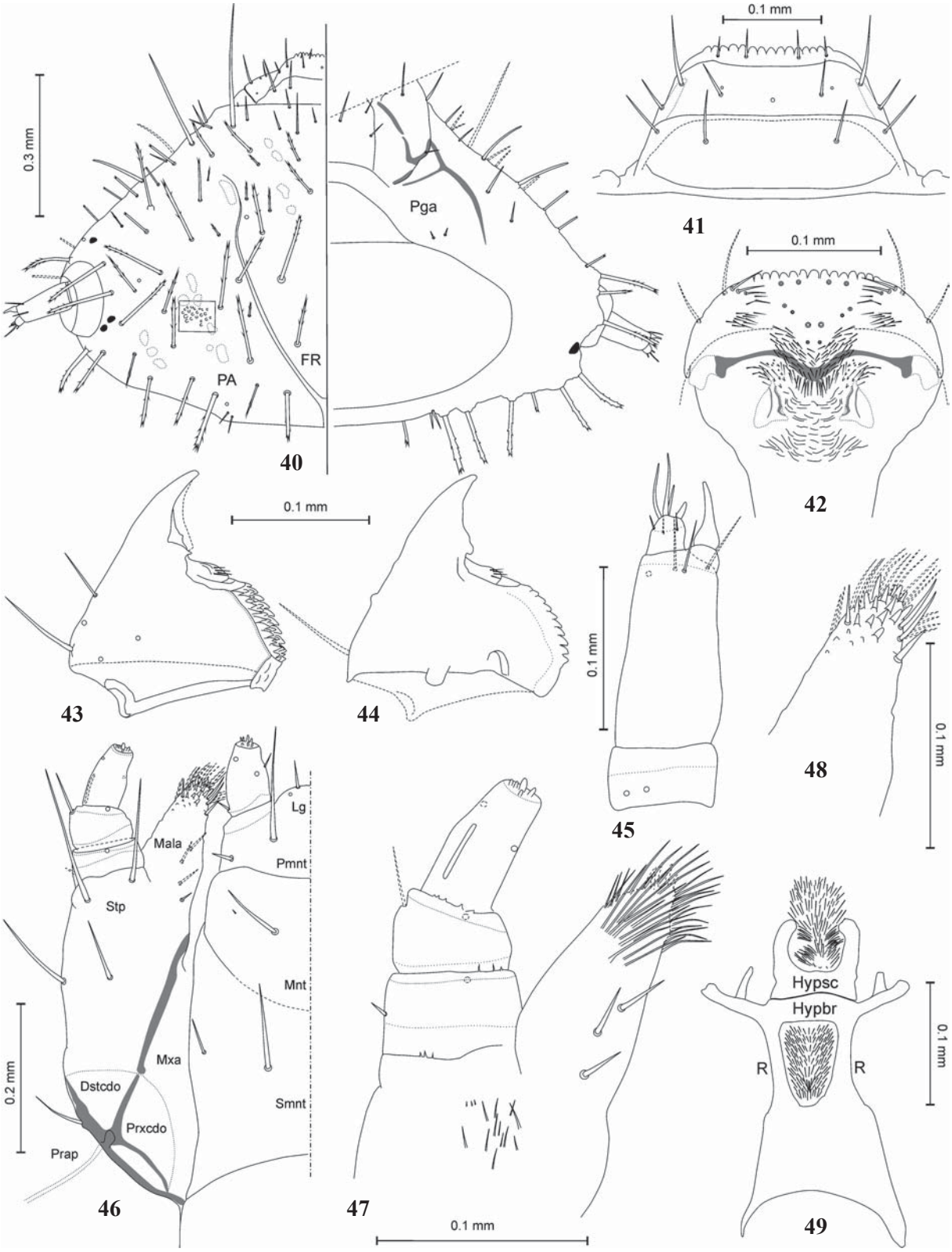
Each hypopleurite of AS I–VIII with 10–12 secondary setae (Fig. 54). Abdominal sternites I–VIII covered in distinctly larger and heavier sclerotized microasperities (Fig. 75); with 15–17 secondary setae on each side (Fig. 55).

Lobes of AS IX more convex, each with 13–16 secondary setae (Fig. 56); emargination between lobes significantly deeper, but noticeably not reaching the level of urogomphi



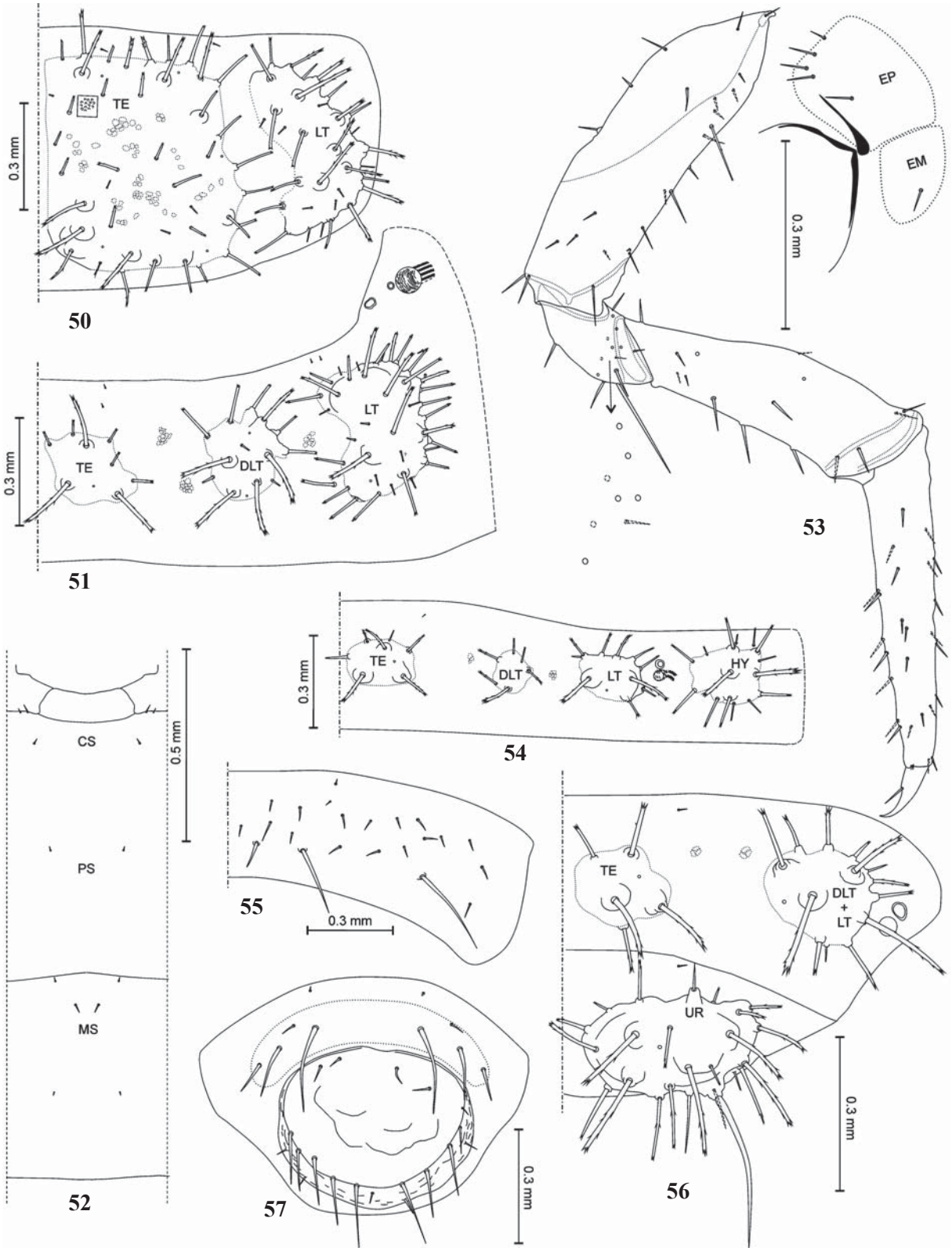
Figs 32–39. *M. rufipennis rufipennis*, first (32–37) and second (38–39) instar larva, microsculpture (32–35, 37–39): 32 — frontal sclerite; 33, 38 — pronotum; 34, 39 — abdominal tergite II; 35 — abdominal sternite II; 36 — abdominal spiracle; 37 — urogomphus. Not to scale.

Рис. 32–39. *M. rufipennis rufipennis,* личинка первого (32–37) и второго (38–39) возраста, микроскульптура (32–35, 37–39): 32 — фронтальный склерит; 33, 38 — пронотум; 34, 39 — II брюшной тергит; 35 — II брюшной стернит; 36 — брюшное дыхальце; 37 — урогомфа. Не в масштабе.



Figs 40–49. *M. rufipennis rufipennis*, third-instar larva: 40 — head; 41 — clypeus and labrum; 42 — epipharynx; 43–44 — left mandible; 45 — antenna; 46 — labio-maxillar complex; 47 — distal part of maxilla; 48 — mala; 49 — hypopharynx. 40 — left — dorsal view, right — ventral view; 41, 44, 47 — dorsal view; 42–43, 45–46, 48–49 — ventral view.

Рис. 40–49. *M. rufipennis rufipennis*, личинка третьего возраста: 40 — голова; 41 — наличник и верхняя губа; 42 — эпифаринкс; 43–44 — левая мандибула; 45 — антенна; 46 — лабио-максиллярный комплекс; 47 — дистальная часть максиллы; 48 — мала; 49 — гипофаринкс. 40 — слева — сверху, справа — снизу; 41, 44, 47 — сверху; 42–43, 45–46, 48–49 — снизу.



Figs 50–57. *M. rufipennis rufipennis*, third-instar larva: 50 — prothoracic tergites; 51 — mesothoracic tergites; 52 — pro- and mesothoracic sternites; 53 — middle leg; 54 — abdominal segment II; 55 — abdominal segment VI; 56 — abdominal segments VIII–IX; 57 — abdominal segments IX–X. 50–51, 54, 56 — dorsal; 52, 55, 57 — ventral; 53 — anterior.

Рис. 50–57. *M. rufipennis rufipennis*, личинка третьего возраста: 50 — тергиты переднегруди; 51 — тергиты среднегруди; 52 — стерниты передне- и среднегруди; 53 — нога второй пары; 54 — II брюшной сегмент; 55 — VI брюшной сегмент; 56 — VIII–IX брюшные сегменты; 57 — IX–X брюшные сегменты. 50–51, 54, 56 — сверху; 52, 55, 57 — снизу; 53 — спереди.

Figs 58–60. *M. marginalis*, third-instar larva, habitus: 58 — dorsal; 59 — ventral; 60 — lateral.
Рис. 58–60. *M. marginalis*, личинка третьего возраста, габитус: 58 — сверху; 59 — снизу; 60 — сбоку.

(Fig. 67). Sternite IX on each side with single secondary simple seta; pygopod dorsally on each side with 2–3 secondary simple setae (Fig. 57).

Mycetina marginalis Gebler, 1830,

MATERIAL. 30 third-instar larvae (two reared to adult): Russia, Primorsky krai, Lazovsky dist., Proselochny cordon, 42°59′888″N 134°06′935″E, under bark of *Quercus*, 18.VIII.2007, leg. A.Zaitsev & K.Makarov, adult determined by K.Makarov.

Third-instar larva
Figs 58–60, 61–66, 78–79.

Maximum body length 6.0 mm; head length 0.8 mm; head width 1.2 mm; maximum width of thorax 2.3 mm; maximum width of abdomen 2.6 mm. Head yellowish-gray; dark spots less evident, with blurred boundaries; setal bases barely darkened. Antennae of the same color as head capsule, labrum light-brown, clypeus yellowish-gray; mandibles brownish-yellow, strongly darkened apically. Edge of head capsule in the area of clypeus, mandibles and maxillae strongly pigmented. Maxillae and labium grayish-yellow. Body grayish, pleurites and sternites a bit lighter. Dorsolateral and laterotergites distinctly lighter than surrounding area. Legs yellowish, apices of claws darkened (Figs 58–60).

Very similar to *M. rufipennis rufipennis*, can be distinguished by the following features.

Sensorial appendage of antennomere II almost as long as antennomere III (Fig. 61); urogomphi almost twice shorter in comparison with *M. rufipennis rufipennis* (Figs 65, 79); emargination between lobes of AS IX deeper, reaching the level of urogomphi (Fig. 66).

Chaetotaxy differences. Labial palp without microseta on inner margin (Fig. 62). Each side of meso- and metathoracic tergite with three secondary setae (Fig. 63); each tergite of AS I–VII with 1–2 secondary setae (Fig. 64); dorsolateral tergites of AS I–VII lack secondary setae entirely (Figs 64–65, 78).

Discussion

Comparative remarks

Larval stages of only two species of *Mycetina* have been described so far: *M. cruciata* [Burakowski, 1997; Beutel, 2000] and North American *M. perpulchra* Newman, 1838 [Tomaszewska, 2005]. Furthermore, some drawings of undetermined *Mycetina* larva have been provided by Hayashi [1992].

In descriptions of both *M. cruciata* and *M. perpulchra* the presence of urogomphi have not been mentioned, most likely they were overlooked due to the insufficient size. Nevertheless, available data on *M. cruciata* larva are enough to compile the appropriate key to species, occurring in Russia, with the exception of *M. stackelbergi*, which is known by the single female from the Ussuriysky reserve [Kryzhanovskij, 1976].

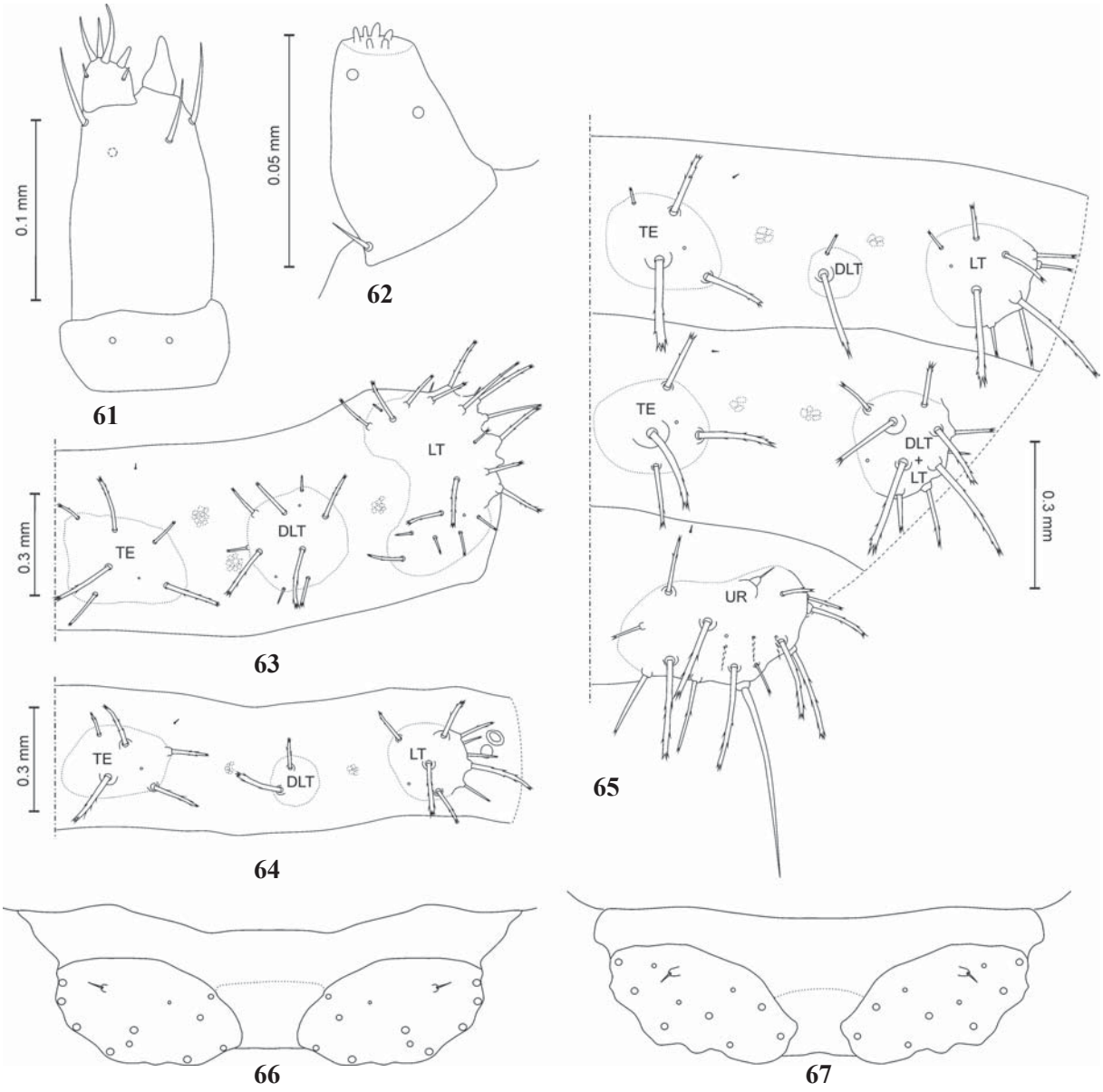
The key to known last-instar larvae of *Mycetina*, occurring in Russia

1. Dorsal and lateral areas of head capsule as well as body segments covered in numerous frayed setae: more than 100 on each side of the head capsule, about 60 on each side of pronotum; about 25 on each metathoracic tergite, 15 on each abdominal tergite I–VIII, 12 on each abdominal dorsolateral tergite I–VII. Anterior margin of labrum with 12 denticles. European part ..... *M. cruciata*

— Number of frayed setae on dorsal and lateral areas of head capsule and body segments significantly less (see descriptions above); anterior margin of labrum with 15 denticles. Far East 2
2. Sensorial appendage of antennomere II almost twice as long as antennomere III; average length of the urogomphus 0.05 mm; emargination between lobes on AS IX noticeably not reaching the level of urogomphi; dorsolateral tergites of AS I–VII with 4–5 secondary setae each (Figs 45, 54, 67, 76–77) ..... *M. rufipennis rufipennis*
— Sensorial appendage of antennomere II almost as long as antennomere III; average length of the urogomphus 0.025 mm; emargination between lobes on AS IX reaching the level of urogomphi; dorsolateral tergites of AS I–VII without secondary setae (Figs 61, 64, 66, 78–79) .... *M. marginalis*

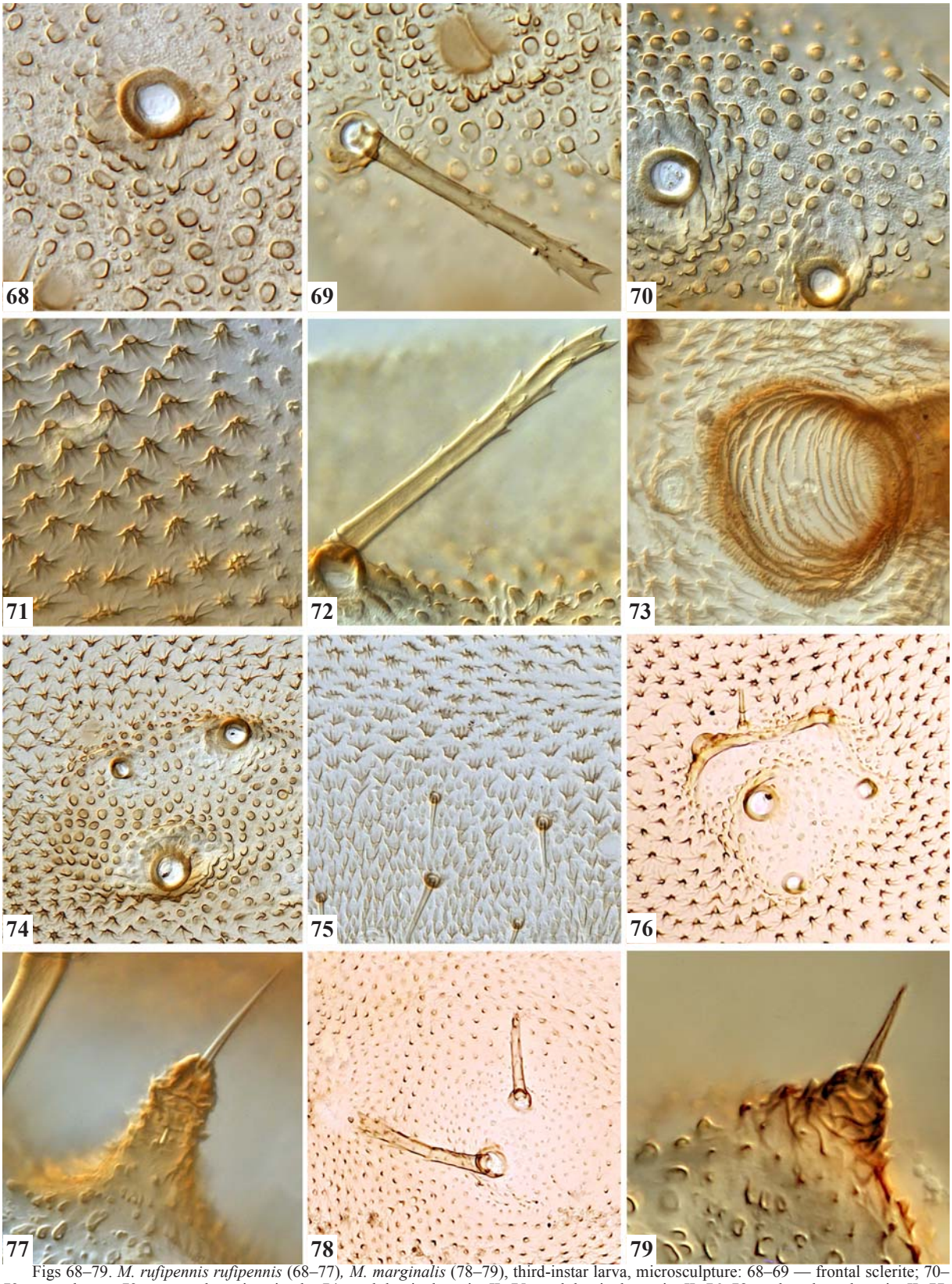
The state of knowledge of first-instar larvae of Endomychidae

Actually, as known to author, only a couple of papers with the mention of first-instar larvae have been published: that of *Leiestes seminiger* Gyllenhal, 1808 [Burakowski, Ślipiński, 2000] and *M. cruciata* [Burakowski, 1997]. In former, authors pointed out the principal differences from mature larva, such as slender body, well-developed teeth on incisor edge of mandible, and relatively longer setae on head capsule and tergal sclerites.



Figs 61–67. *M. marginalis* (61–66), *M. rufipennis rufipennis* (67), third-instar larva: 61 — antenna; 62 — labial palp; 63 — mesothoracic tergites; 64 — abdominal segment II; 65 — abdominal segments VII–IX; 66–67 — abdominal segment IX, schematically. 61–62 — ventral; 63–67 — dorsal.

Рис. 61–67. *M. marginalis* (61–66), *M. rufipennis rufipennis* (67), личинка третьего возраста: 61 — антенна; 62 — нижнегубной щупик; 63 — тергиты среднегруди; 64 — II брюшной сегмент; 65 — VII–IX брюшные сегменты; 66–67 — IX брюшной сегмент, схематично. 61–62 — снизу; 63–67 — сверху.



Figs 68–79. *M. rufipennis rufipennis* (68–77), *M. marginalis* (78–79), third-instar larva, microsculpture: 68–69 — frontal sclerite; 70–72 — prothorax; 73 — mesothoracic spiracle; 74 — abdominal tergite II; 75 — abdominal sternite II; 76, 78 — dorsolateral tergite II; 77, 79 — urogomphus. Not to scale.

Рис. 68–79. *M. rufipennis rufipennis* (68–77), *M. marginalis* (78–79), личинка третьего возраста, микроскульптура: 68–69 — фронтальный склерит; 70–72 — переднегрудь; 73 — дыхальце среднегруди; 74 — II брюшной тергит; 75 — II брюшной стернит; 76, 78 — II дорсолатеральный тергит; 77, 79 — урогомфа. Не в масштабе.

This is also true for *M. rufipennis rufipennis*, with the addition of other distinctions mentioned above, including chaetotaxy. The "first-instar" larva of *M. cruciata*, which have been described by Burakowski [1997], is most likely of the subsequent instar, judging by the body length (2.5 mm, while last-instar measured as 5 mm) and the presence of additional setae on tergal sclerites.

So, in fact, with the lack of detailed descriptions of early instars, it is natural that no attempts have been made to describe the "primary" chaetotaxy of Endomychidae (sensu Robertson et al [2015]). In the present study it was shown that chaetome of the first instar of *M. rufipennis rufipennis* is quite concise, contrary to that of the last, which is characterized (as in the majority of other representatives) by hyperchaetosis. This, in theory, facilitates the establishment of its common plan for the family and, consequently, the elaboration of the nomenclature. But, in fact, a lot of difficulties in detecting of homologies of chaetome elements occur, related to the great morphological variability within Endomychidae. One of the most important features, affecting the position of setae and pores, is the type of attachment of the head capsule, which can be pro- or hypognatous (resulting, among other things, in various position of antennal insertions). The other is connected with the structure of thoracic and abdominal tergites, which can be solid or modified with various types of projections [Kemner, 1924; Hayashi, Nakamura, 1953; Pakaluk, 1984; Costa, Vanin, 1988; Tomaszewska, 2005]. Thus, the identification and description of the "primary" chaetotaxy of Endomychidae is a topic for a separate comparative morphological study, which will be possible after descriptions of early-instar larvae of other representatives of the family.

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