

Descriptions of the *Aphodius sticticus* Panzer and *A. punctatosulcatus* Sturm Larvae (Coleoptera, Scarabaeidae)

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Abstract—Larvae of *Aphodius sticticus* Panzer and *A. punctatosulcatus* Sturm are described and illustrated.

MATERIALS AND METHODS

Larvae were reared in laboratory from the eggs laid by adults collected on 20.IV.1994 (*A. sticticus* Panzer) and 2.V.1998 (*A. punctatosulcatus* Sturm) near Ravnopol'e village (Minsk Prov., Pukhovichi Distr.). The egg laying and growth of the larvae were controlled in order to obtain larvae of all instars. The following material was used in the following study: 45 third-instar, 15 second-instar, and 1 first-instar larvae of *A. sticticus*; and 24 third-instar, 9 second-instar, and 4 first-instar larvae of *A. punctatosulcatus*.

The larvae were treated as follows: (1) killed with ethyl acetate, (2) cleansed in detergent solution, (3) rinsed in distilled water, (4) fixed in Bouen liquid, (5) rinsed in 80% ethyl alcohol, and (6) rinsed in 70% ethyl alcohol.

The larvae were preserved in 70% ethyl alcohol. The preliminary treatment of the larvae with ethyl acetate was used to minimize their shriveling and rolling up during fixation. For preparation making, heads of the larvae were detached and treated with 10% NaOH for 3 h; then the mouthparts were detached, rinsed in 5% acetic acid and distilled water, and embedded in standard Fore-Berlese medium. The general morphology, color and chaetotaxy of the head capsule, and spines of the anal sternite were examined in intact larvae in water with an MBS-10 stereoscopic microscope in reflected light at $\times 16$ –91 magnification. The preparations were examined with an AU-12 stereoscopic microscope in transmitted light at $\times 96$ –240 magnification. Measurements were taken with an eyepiece-micrometer. Figures were made using microscope cross hairs with proportions preserved.

Aphodius sticticus Panzer

Description. Third-instar larva. Head width 1.45–1.56 mm, length 1.04–1.21 mm. Head (Fig. 1) yel-

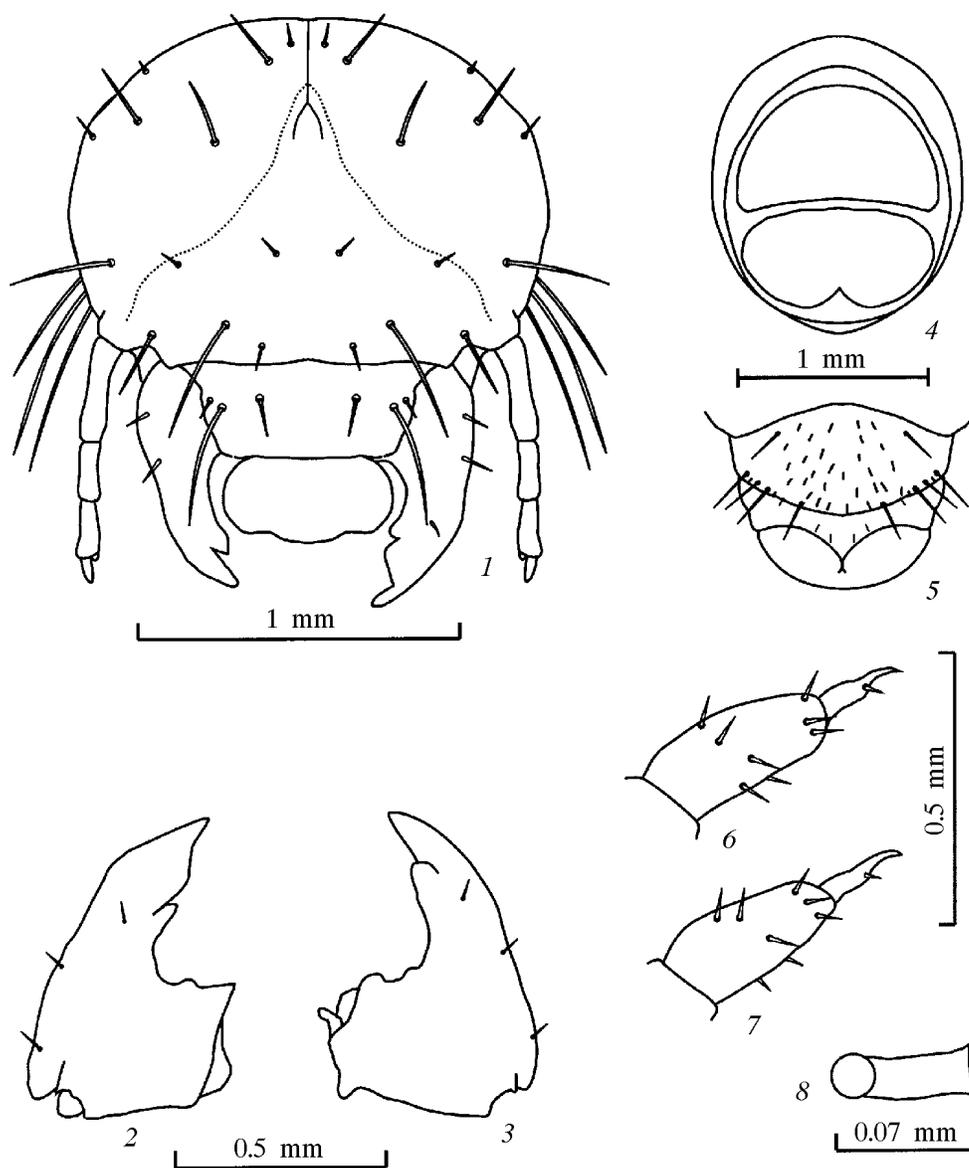
lowish brown without darker maculae, shining, with indistinct sculpture formed by fine irregular wrinkles; sclerites semitransparent. Epicranial suture about half as long as frons. Frontal sutures visible as fine pale lines, frequently indistinct. Each pleural sclerite with 7 long setae: 4 near basal membrane of antenna, 2 at the center of sclerite, and 1 near epicranial suture; 1 shorter seta near occipital foramen. Several short setae irregularly scattered over temporal part. Frons with 10 symmetrically arranged setae: 6 setae on anterior part (2 very short medially and 4 relatively long laterally) and 4 short setae in transverse row at frons center.

Clypeus trapeziform, pale brown; its distal and proximal parts of the same color, separated by dark line. Clypeus with 4 long setae (2 longer laterally and 2 shorter medially) and 2 very short setae on the very lateral margins, often indistinct.

Labrum three-lobed, with 28 setae: 16 short and 2 long on anterior margin, 2 long dorso-laterally, 4 short ventro-laterally, and 4 dorsally (2 short, proximally and 2 long, distally). Ventral side of labrum with sensory structures of the epipharynx (Fig. 9).

Mandibles (Figs. 2, 3) subtriangular, asymmetrical; left mandible slightly longer than the right one, its scissorial area broader. Base pale brown, scissorial and molar areas darker, almost black. Lateral margins of each mandible with 3 short setae.

Maxillae (Figs. 10, 11) symmetrical, their chaetotaxy slightly varying between specimens and between left and right maxillae in the same specimen. Cardo with 4 short setae: 2 ventrally and 2 laterally near base of stypes. Ventral side of stypes with 1 long seta proximally and 1 short seta distally. Dorsal side of stypes with a row of 8 or 9 stridulatory teeth and 2 short setae near base of palpifer. Palpifer with 1 or



Figs. 1–8. *Aphodius sticticus* Panzer.: (1) head; (2, 3) mandibles in dorsal view [(2) left, (3) right]; (4) anal segment; (5) anal sternite; (6, 7) tibia and tarsus [(6) fore, (7) middle]; (8) spine of anal sternite.

2 stridulatory teeth and 1 seta. Maxillary palp 4-segmented; 1 seta present on 1st and 4th segments, and 2, on 3rd segment. Galea with a row of 6–8 short setae on ventral side and 5 longer setae on dorsal side and apex; 1 short setae on dorsal side proximally. Dorsal side of lacinia with 5 long and thick setae along median margin; ventral side with relatively long seta apically. Base of lacinia with 1 short seta dorsally and 1 seta ventrally. Apex of lacinia tridentate.

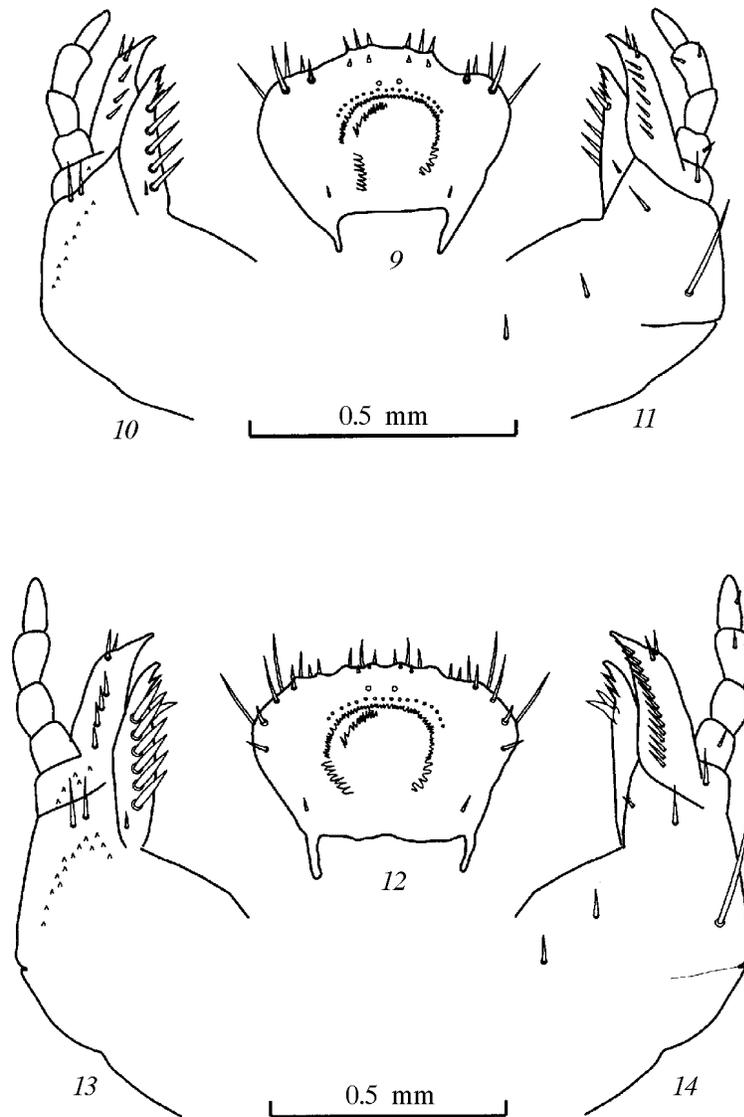
All legs of subequal length, each with 36 setae: 3 on coxa, 7 on trochanter, 11 on femur, 13 on tibia, and 2 on tarsus. Fore legs differing from others in slightly longer tarsal setae (Figs. 6, 7).

Anal sternite with 25–30 uniform flattened, apically widened spines (Fig. 8) not separated into two groups (Figs. 5, 8). Lower anal lobe sinuate in the middle and rounded on sides (Fig. 4).

Second-instar larva differing from third-instar larva in smaller size: head width 1.04–1.17 mm, length 0.71–1.81 mm.

First-instar larva differing from second-instar one in size: head width 0.66 mm, length 0.41 mm.

Larvae of the following three *Chilothorax* Muls. species *A. melanostictus* W. Schm. (Maltsev, 1966), *A. lineolatus* Ill. (Palestrini, Barbero, 1993), and *A. di-*



Figs. 9–14. *Aphodius* Ill.: (9–11) *A. sticticus* Panzer; (12–14) *A. punctatosulcatus* Sturm. (9, 12) Labrum in ventral view; (10, 11, 13, 14) maxilla [(10, 13) dorsal view, (11, 14) in ventral view].

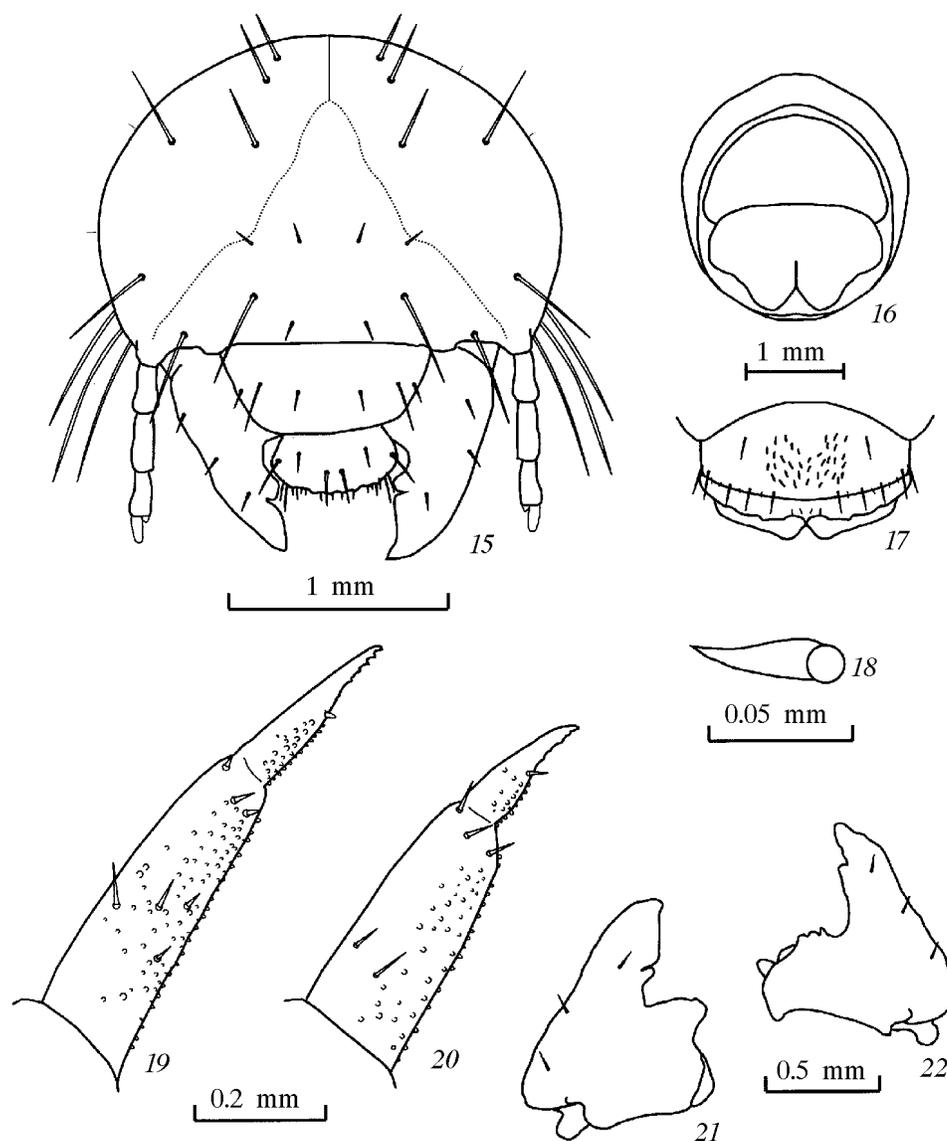
sticticus Müll. (Frolov, 1996) have been described, the description of *A. melanostictus* being short. Based on these descriptions and a study of the morphology of *A. sticticus*, I found no diagnostic characters distinguishing the larvae of the subgenus *Chilothorax* from larvae of the other *Aphodius* subgenera. The larvae of the four species share pale brown or brown color of the head, rounded sides of the lower anal lobe, and more or less uniformly arranged spines on the anal sternite. The larva of *A. sticticus* can be distinguished from *A. melanostictus* by the equal width and uniform coloration of the anterior and posterior parts of the clypeus (preclypeus and postclypeus); in the latter species, the postclypeus is narrower and lighter than the preclypeus. *A. sticticus* larva also differs from *A. lineola-*

tus in the lacinia with 5 long setae on dorsal side, and from *A. distinctus*, in the shape of setae on the anal sternite and galea with 6–8 setae on the dorsal side.

Aphodius punctatosulcatus Sturm

Description. Third-instar larva. Head width 2.13–2.00 mm, length 1.55–1.38 mm. Head (Fig. 15) pale brown, its surface appearing dull because of fine dense granulation. Epicranial suture about half as long as frons. Frontal sutures appearing as fine pale lines.

Each pleural sclerite with 8 long setae: 4 near the basal membrane of the antenna, 2 at the center of a sclerite, and 2 near the epicranial suture. Several short setae irregularly scattered over temporal part.



Figs. 15–22. *Aphodius punctatosulcatus* Sturm.: (15) head; (16) anal segment; (17) anal sternite; (18) spine of anal sternite; (19, 20) tibia and tarsus [(19) middle, (20) fore]; (21, 22) mandibles in dorsal view [(21) left, (22) right].

Frons with 10 symmetrically arranged setae: 6 on anterior part (2 very short medially and 4 relatively long laterally) and 4 short in transverse row at the frons center.

Clypeus trapeziform (slightly asymmetrical in the specimens examined), pale brown (postclypeus slightly paler), with 4 long setae (2 longer laterally and 2 shorter medially) and 2 very short indistinct setae on the very lateral margins.

Labrum three-lobed, with 32 setae: 18 short and 2 long, on anterior margin; 2 long dorso-laterally; 6 short ventro-laterally; and 4 dorsally (2 short proximally and 2 long distally). Ventral side of labrum with sensory structures of epipharynx (Fig. 12).

Mandibles (Figs. 21, 22) subtriangular, asymmetrical; left mandible slightly longer than the right one, its scissorial area broader. Base pale brown, scissorial and molar areas darker, almost black. Lateral margins of each mandible with 3 short setae.

Maxillae (Figs. 13, 14) symmetrical. Cardo with 4 short setae: 2 on ventral side and 2 on lateral margin near base of stypes. Ventral side of stypes with long setae proximally and short setae distally. Dorsal side of stypes with a row of 14–18 stridulatory teeth and 2 or 3 short setae near palpifer base. Palpifer with 4–6 stridulatory teeth and 1 seta. Maxillary palp 4-segmented; 1st and 4th segments with 1 and 2nd with 3 setae. Galea with a row of 11–16 short setae on ven-

tral side and 6 longer setae on dorsal side and apex; 1 short seta on dorsal side proximally. Dorsal side of lacinia with 6 long and thick setae along median margin; ventral side with relatively long seta apically; base with 2 short setae (1 dorsally and 1 ventrally). Apex of lacinia tridentate.

All legs of subequal length. Each leg with 39 setae: 7 on coxa, 7 on trochanter, 11 on femur, 12 on tibia, and 2 on tarsus. Fore tarsus longer than others, with longer setae. Tarsal apices distinctly serrate in lateral view. Tarsi, tibiae, and, in part, femora with numerous small tubercles (Figs. 19, 20).

Center of anal sternite with 25–30 equally-shaped, flattened, acute spines occasionally forming 2 groups indistinctly separated by smooth area (Figs. 17, 18). Some spines in posterior part of sternite forming more or less distinct rows named “palidia” in foreign literature, regardless of whether these spines are similar to the others or not (as in larvae of species of the subgenus *Acrossus*). Lower anal lobe partially divided by longitudinal furrow, slightly sinuate laterally (Fig. 16).

Second-instar larva differs from the third-instar larva in smaller size: head width 1.36–1.43 mm, length 0.90–0.99 mm.

First-instar larva differs from the second-instar larva in smaller size: head width 0.87–0.93 mm, length 0.60–0.64 mm.

The larva of *A. punctatosulcatus* differs from that of another species of the subgenus *Melinopterus* Muls.,

A. prodromus Brahm (Madle, 1935, Jerath, 1960), in the granulate head, details of structure of mouthparts and legs, and serrate tarsi.

Discrepancies in the descriptions concerning the presence or absence of distinct rows of setae on the anal sternite, which are stated by Krell (1997), are probably due to considerable intraspecific variability of this character (which is also found in *A. punctatosulcatus*), not necessarily indicating a difference between the European and North American populations.

REFERENCES

1. Frolov, A.V., Descriptions of the larvae of *Aphodius distinctus* (Müll.) and *A. scybalarius* (F.) (Coleoptera, Scarabaeidae), *Entom. Obozr.*, 1996, vol. 75, no. 3, pp. 577–586.
2. Jerath, M.L., Notes on Larvae of Nine Genera of Aphodiinae in the United States (Coleoptera: Scarabaeidae), *Proc. U. S. Nat. Mus.*, 1960, vol. 111, pp. 43–94.
3. Krell, F.-T., 6. Überfamilie: Scarabaeoidea. Nachtrag zur 33. Familie: Scarabaeidae. 14. Gattung: *Aphodius* Illiger, *Klausnitzer B. Die Larven der Käfer Mitteleuropas*, 1997, vol. 4, *Polyphaga*, no. 3, pp. 106–123.
4. Madle, H., Die Larven der Gattung *Aphodius* Ill., *Arb. Phis. Angew. Ent.*, 1935, vol. 2, no. 4, pp. 289–304.
5. Mal'tsev, I.V., Descriptions of Some Unknown Larvae of Scarab Beetles (Coleoptera, Scarabaeidae) from Crimea, *Entom. Obozr.*, 1966, vol. 45, no. 1, pp. 144–149.
6. Palestini, C. and Barbero, E., Gli stadi preimaginali di *Aphodius (Chilothorax) lineolatus* Illiger, 1803 (Coleoptera: Scarabaeoidea: Aphodiinae), *Elytron*, 1993, vol. 7, pp. 49–56.