

**Description of the third instar larvae of *Anisotoma axillaris*
and *A. glabra* (Coleoptera: Leiodidae), with a key
to larvae of European *Anisotoma* species**

Jan RŮŽIČKA

Department of Ecology, Czech Agricultural University, CZ–165 21 Praha 6, Czech Republic

Received July 29, 1996; accepted August 8, 1996

Published December 27, 1996

Abstract. Detailed descriptions of the third instar larvae of European species *Anisotoma axillaris* Gyllenhal, 1810 and *A. glabra* (Fabricius, 1792) including the setal pattern are given. A key to the third instar larvae of all five European species of *Anisotoma* Panzer, 1797 is provided.

Morphology, larva, Coleoptera, Leiodidae, *Anisotoma axillaris*, *A. glabra*, Palearctic region

INTRODUCTION

The genus *Anisotoma* Panzer, 1797 belongs to the tribe Agathidiini (Leiodidae: Leiodinae; sensu Newton & Thayer 1992) and contains 56 species distributed in Northern and Central America (29 species), Asia (22 species) and Europe (5 species) – Wheeler (1979, 1980, 1983), Hisamatsu (1985), Perkovsky (1987, 1992), Angelini & De Marzo (1986, 1988, 1994, 1995), Švec (1992), Angelini & Švec (1993, 1994) and Angelini & Svec (1995).

Representatives of this genus are known to be obligately associated with Myxomycetes. Both adults and larvae feed on the spores and most species can be bred on mature sporocarps (Wheeler 1984, Newton 1984). Moreover, both adult and larval stages have the molar lobe of mandible covered with dense asperities (more developed in larvae) which are usually interpreted as structures taking part in spore manipulation and crushing (Lawrence & Newton 1980, Wheeler 1984). However, *A. plasmodiophaga* Wheeler, 1980 was observed feeding as well as bred on plasmodia (Wheeler 1980) but the molar asperities are present both in adults and in larvae of this species (Wheeler 1984). Adults of *Anisotoma* are sometimes reported to be found feeding on spores of various Basidiomycetes but no breeding record is so far known (Newton 1984).

Immature stages of the tribe Agathidiini are only poorly known. The review of older papers was given by Angelini & De Marzo (1984) and modified by Wheeler (1990). Unfortunately, most of the papers contain only a brief description with a few, sometimes even incorrectly evaluated characters of significant taxonomic value. The description of all three larval instars of *A. basalis* (LeConte, 1853) from the Nearctic region by Wheeler (1990) is the first detailed description of *Anisotoma* larvae. Wheeler (1990) also introduced a chaetotaxic system based mostly on an arrangement of setae into imaginary longitudinal rows, modifying the system proposed for Staphylinidae: Aleocharinae by Ashe & Watrous (1984). So far, mature larvae of the following three European species were described in detail: *A. humeralis* (Fabricius, 1792) by Ratajczak (1995), *A. orbicularis* (Herbst, 1792) and *A. castanea castanea* (Herbst, 1792) by Ratajczak (1996).

In this paper, a detailed description of the third instar larvae of further two European species *A. axillaris* Gyllenhal, 1810 and *A. glabra* (Fabricius, 1792) is provided and a key to mature larvae of all five European species is given. The larva of *A. glabra* was briefly described by Schiödte (1861) and was treated later several times (e. g. Vaternahm 1917, Böving & Craighead 1930, Henriksen 1968) but only some further taxonomically important details were added. The larva of *A. axillaris* is described for the first time.

MATERIAL AND METHODS

I examined the following larval material:

Anisotoma axillaris: Bohemia mer., Křemže env., Kleť mt. (7151), 2.viii.1986, Petr Švácha leg., on Fagus-stump, larvae of instar III bred from adults, 9 specimens. Two specimens were reared till adults, 1 male specimen was dissected and the identification was verified.

A. glabra: Bohemia mer., Hluboká nad Vltavou (6952), 14.viii.1986, Petr Švácha leg., larvae of instar III bred from adults, 3 specimens; Rossia, Karelia bor., Pojakonda env., 11.vi.1989, Jan Růžička leg., mixed forest, larvae of instar III collected from rests of black Myxomycetes on staying stem of *Pinus* sp., 3 specimens.

The material was preserved in Pampel's fluid (after Švácha & Danilevsky 1987). The dissected larvae were mounted in Canada balsam on permanent slides and examined with a stereoscopic microscope (usually under 450×, maximum under 1000× magnification). All measurements were made using an ocular micrometer. All permanent slides are deposited in the author's collection.

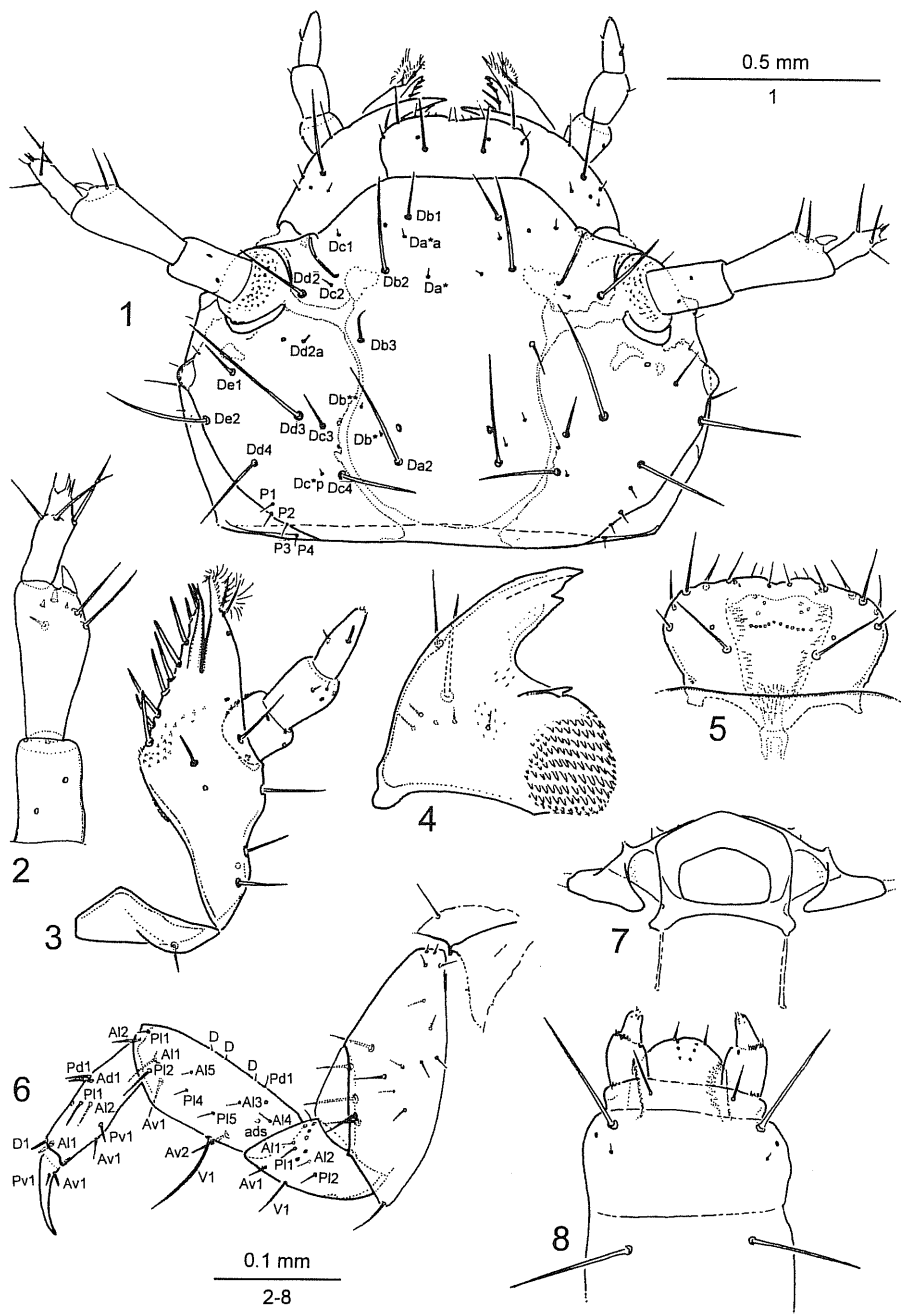
The following abbreviations are used throughout the text (Wheeler 1990, Ratajczak 1996, slightly modified): HL – head length, HW – head width, NIL – pronotal length, NIW – pronotal width, N3L – metanotal length, N3W – metanotal width, A1L – length of abdominal segment I, A1W – width of abdominal segment I, URI – length of urogomphal segment I, UR II – length of urogomphal segment II, URS – length of urogomphal apical seta antennal formula = comparative lengths of antennomere I : antennomere II : antennomere III : digitiform organ of antennomere II. Chaetotaxy labelling system is used in accordance with Wheeler (1990) and Ratajczak (1996). In descriptions, the numbers of setae and sensilla are given only for one half of the head or body segments.

Anisotoma axillaris Gyllenhal, 1810

DIAGNOSIS. Two stemmata. Three small solenidia at base of digitiform solenidium of antennomere II, digitiform solenidium large, undivided. Mola (of mandible) with rows of sclerotized dense asperities. Dorsal integument of body with dense asperities, arranged into distinct transverse rows. Head with setae Da1 and Dd1 absent, dorsally with 4 pairs of campaniform sensilla. Antennae comparatively short. Dorsal surface of labrum with a single median pair of setae. Ventral surface of mentum with 1 large and 1 small pairs of setae. Large setae on dorsal surface of thorax and abdomen long and pointed. Pronotum with seta Dd2 present. Dorsal transverse row of mesonotum with 5 setae. Abdominal terga I–VIII with 6 pairs of large setae in posterior row (seta Db1 absent), rarely some terga with only 5+6 large setae (the pairs are usually asymmetrical and one seta P3 is absent in this case). Abdominal tergum IX medially divided. Urogomphus comparatively short, segment I about 1.4 times as long as wide, with 7 setae.

DESCRIPTION. Body cylindrical, narrowed posteriorly, widest at metanotum. Total body length 4.0–5.5 mm (average 4.7 mm). Metanotal width 1.07–1.23 mm (average 1.15 mm).

Head (Fig. 1): cranium wider than long; HW/HL = 1.42–1.51; HW = 0.69–0.72 mm. Chaetotaxy as follows: row Da with 3 setae: small setae Da*a and Da* on clypeus, large seta Da2 posteriorly on frons. Row Db with 5–6 setae: large Db1 and Db2 on clypeus, Db3 anterolaterally on frons; Db*, Db** and sometimes also 1 additional seta more medially in postero-lateral part of frons. Row Dc with 5 setae: small Dc1 laterally on clypeus, small Dc2 behind epistomal suture, large Dc3 and Dc4 on epicranium, closely to frontal suture, followed by very small Dc*p laterally to Dc4. Row Dd with 4 setae: larger Dd2 near connecting membrane of antenna, small



Figs 1–8. *Anisotoma axillarlis* Gyllenhal, larval instar III. 1 – head, dorsal aspect, 2 – left antenna, dorsal aspect, 3 – left maxilla, ventral aspect, 4 – right mandible, ventral aspect, 5 – labrum, dorsal aspect, 6 – foreleg, posterior aspect, 7 – hypopharyngeal sclerome, ventral aspect, 8 – labium, ventral aspect.

Dd2a anteriorly on epicranium (sometimes absent), very large Dd3 and large Dd4 on epicranium. Row De with 2 setae: large De1 and very large De2 laterally on epicranium. Lateral row with 1 large and 2 small setae. Posterior margin with 4 setae (P1–P4). Campaniform sensilla include 1 on clypeus (between Da*a and Dc1), 1 on frons (anteriorly from Da2), 2 on epicranium (1 laterally to Dd2a, 1 close to frontal suture between Dc3 and Dc4). Posterior part of frons and epicranium with moderately dense, minute asperities. Stemmata 2, laterally positioned.

Antenna (Fig. 2): antennal formula = 3.1:4.9:3:1. Comparative lengths of antennomere II : digitiform solenidium = 4.9; comparative lengths of antennomere II : antennomere III = 1.6. Antennomere I with 2 dorsal and 2 ventro-apical campaniform sensilla. Antennomere II with 2 dorsal and 1 ventral setae with 1 large, undivided thumb-like digitiform solenidium and 3 small solenidia in ventro-apical membranous area. Antennomere III with 3 larger subapical setae, with 1 subapical pointed process, with 1 subapical setiform sensillum and 2 apical peg-like sensilla.

Labrum (Fig. 5): subquadrate, lateral margins rounded. Epipharynx with median transverse row of about 13 campaniform sensilla, preceded by 3 pairs of more anteriorly placed and slightly irregularly distributed sensillae; laterally with longitudinal fields of mitrotrichiae. Dorsal surface of labrum medially with 1 pair of large setae and with 1 pair of campaniform sensilla. Lateral margin with 8 pairs of setae (1 lateral, 3 apical and 4 ventro-apical pairs), ventro-apically also with 1 pair of sensilla.

Mandible (Fig. 4): apically bidentate with internal edge serrate; prosthema pointed and sclerotized, basally with a group of regularly distributed, minute ventral spines. Mola distinct, ventrally with ca. 120 visible teeth. Dorsal surface of mandible with 1 large and 4 small setae and with 1 campaniform sensillum, lateral margin with 1 large seta.

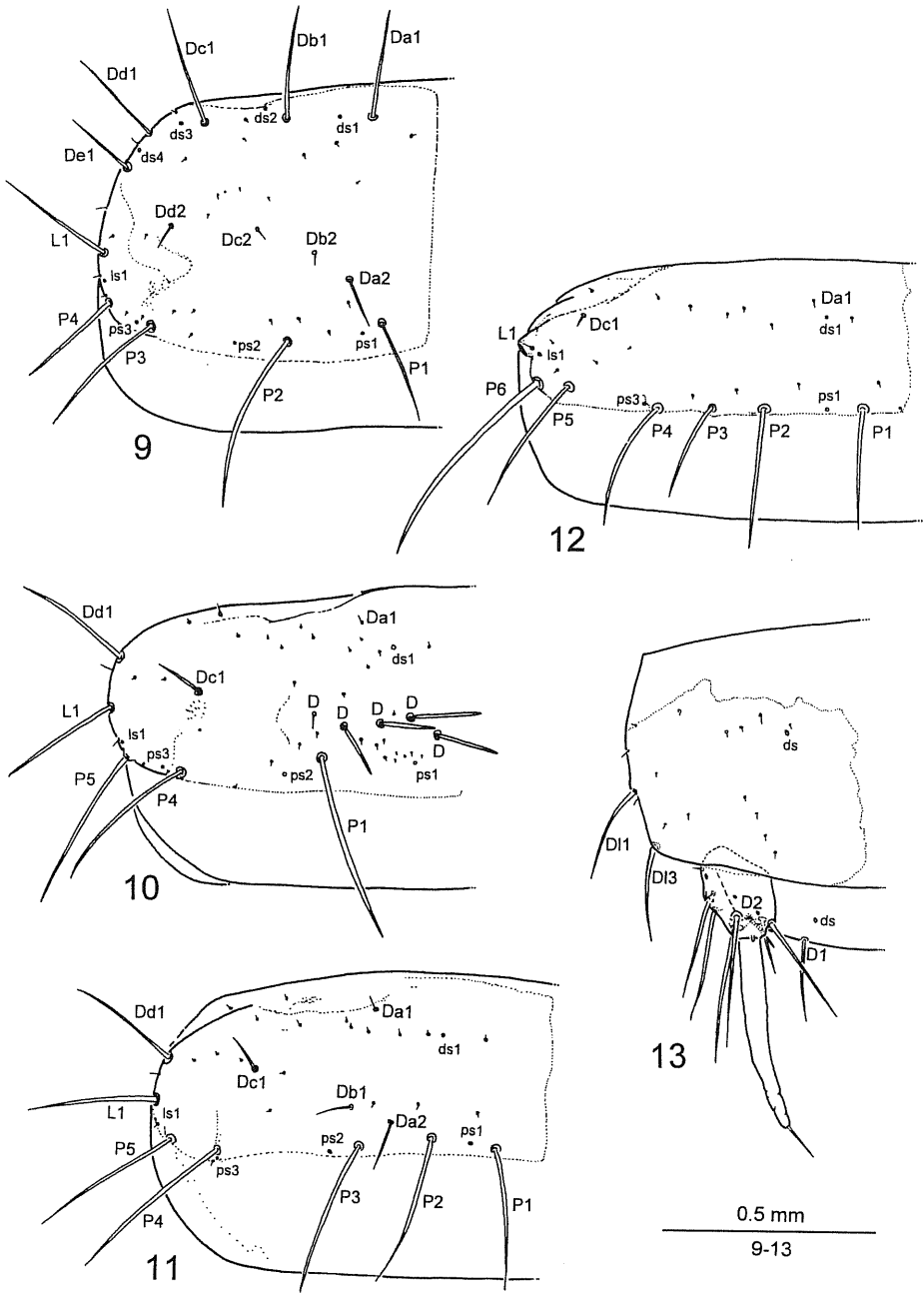
Maxilla (Fig. 3): lacinia lanceolate, with 8–9 mesal spines and a transverse group of small dorsal spines. Galea with fimbrinate, bibranched apex, with 2 subapical setae. Segment I of maxillary palpus dorso-laterally with a group of small spines, comparative lengths of maxillary palpus segments I:II:III = 0.75:0.9:1.

Labium (Fig. 8): comparative lengths of labial palpus segments I:II = 0.95; segment I apically with 1 campaniform sensillum and a group of sensilla; segment II antero-ventrally with 2 campaniform sensilla, antero-dorsally with 1 close-fitting digitiform sensillum and a group of apical sensilla. Praementum with 1 ventral seta and a group of latero-apical sensilla. Ligula dorso-laterally with a pair of serrate lobes, antero-ventrally with 1 pair of small apical setae and 3 pairs of campaniform sensilla. Mentum ventro-laterally with 1 very large and 1 small pair of setae and 1 pair of campaniform sensilla; submentum ventro-laterally with a pair of very large setae. Hypopharyngeal sclerome (Fig. 7) with complete anterior and posterior bridges, strongly sclerotized.

Foreleg (Fig. 6). Coxa: large, with 9 posterior and 8 anterior setae.

Trochanter: triangular, with 2–3 postero-dorsal setae (Pd1, Pd2, sometimes more ventrally with 1 additional seta) and with 2 posterior campaniform sensilla; anteriorly with 1 antero-ventral seta (Av1), 2 antero-lateral setae (A11, A12), 1 antero-dorsal seta, 1 ventral seta (V1) and with 4 campaniform sensilla.

Femur: short and broad, with single long ventral seta (V1), with 1 postero-dorsal seta (Pd1) and 2–3 small dorsal setae (D), with 2 larger and 2–3 small postero-lateral setae (P11, P12; P14, P15, sometimes with 1 additional seta between P14 and P15), with 1 postero-dorsal campaniform sensillum (pds); anteriorly with 5 antero-lateral (A11–A15) and 2 antero-ventral setae (Av1, Av2) and with 1 antero-dorsal campaniform sensillum (ads).



Figs 9–13. *Anisotoma axillarum* Gyllenhal, larval instar III. 9 – pronotum, dorsal aspect, 10 – mesonotum, dorsal aspect, 11 – metanotum, dorsal aspect, 12 – abdominal tergum I, dorsal aspect, 13 – abdominal tergum IX, uropomphus and anal membrane, dorsal aspect.

Tibia: shorter and more slender than femur, with 1 postero-dorsal seta (Pd1), 1 subapical dorsal seta (D1), 1 postero-lateral seta (P11) and 1 postero-ventral seta (Pv1); anteriorly with 1 antero-lateral seta (Ad1), 2 antero-lateral setae (Al1, Al2) and 1 antero-ventral seta (Av1), sometimes with 1 postero-dorsal campaniform sensillum near P11.

Tarsungulus: long and pointed, with a single pair of setae (Pv1, Av1).

Pronotum (Fig. 9): transverse, N1L/N1W = 2.0. Chaetotaxy: row Da with 2 setae (Da1, Da2), row Db with 2 setae (Db1, Db2), row Dc with 2 setae (Dc1, Dc2), row Dd with 2 setae (Dd1, Dd2), row De with 1 seta (De1), row L with 1 seta (L1), posterior transverse row with 4 setae (P1–P4); campaniform sensilla include 1 between Da1 and Db1 (ds1), 1 near Db1 (ds2), 1 between Dc1 and Dd1 (ds3), 1 between Dd1 and De1 (ds4), 1 near P1 (ps1), 1 between P2 and P3 (ps2), 1 between P3 and P4 (ps3) and 1 between P4 and L1 (ls1); ca. 12–13 very small setae below Da1–Dd1, ca. 9–12 very small setae above posterior transverse row, ca. 4–5 very small setae laterally between De1 and P4. Pronotal surface with sparse minute asperities, arranged into transverse rows.

Mesonotum (Fig. 10): transverse chaetotaxy as follows: row Da with 1 small seta (Da1), row Dc with 1 seta (Dc1), row Dd with 1 seta (Dd1), row L with 1 seta (L1), posterior transverse row with 3 setae (P1, P4, P5), discal transverse row with 5 setae (D); campaniform sensilla include 1 postero-medially to Da1 (ds1), 1 posteriorly to the discal transverse row (ps1), 1 laterally to P1 (ps2), 1 between P4 and P5 (ps3), 1 between P5 and L1 (ls1); ca. 10–12 small setae below Da1–Dd1, ca. 15 small setae between discal and posterior transverse rows, only 2 small setae laterally between Dd1 and P5.

Metanotum (Fig. 11): transverse, N3L/N3W = 2.5; chaetotaxy as follows: row Da with 2 setae (Da1, Da2), row Db with 1 seta (Db1), row Dc with 1 seta (Dc1), row Dd with 1 seta (Dd1), row L with 1 large seta (L1), posterior row with 5 setae (P1–P5); campaniform sensilla include 1 postero-medially to Da1 (ds1), 1 between P1 and P2 (ps1), 1 laterally to P3 (ps2), 1 postero-laterally to P4 (ps3), 1 between P5 and L1 (ls1); ca. 14 small setae posteriorly to Da1, ca. 5 small setae between P1 and P5, 2 small setae laterally between Dd1 and P5.

Abdominal tergum I (Fig. 12): A1L/A1W = 2.7; chaetotaxy as follows: row Da with 1 very small seta (Da1), row Dc with 1 seta (Dc1), row L with 1 small seta (L1), posterior row with 6 setae (P1–P6); campaniform sensilla include 1 postero-medially to Da1 (ds1), 1 between P1 and P2 (ps1), 1 laterally to P4 (ps3) and 1 postero-medially to L1 (ls1); ca. 8 very small setae between and posteriorly to Da1 and Dc1, ca. 8 very small setae between P1 and P6.

Abdominal tergum IX (Fig. 13): with 2 dorso-lateral setae (D11, D13), 1 campaniform sensillum (ds) and 15 small setae.

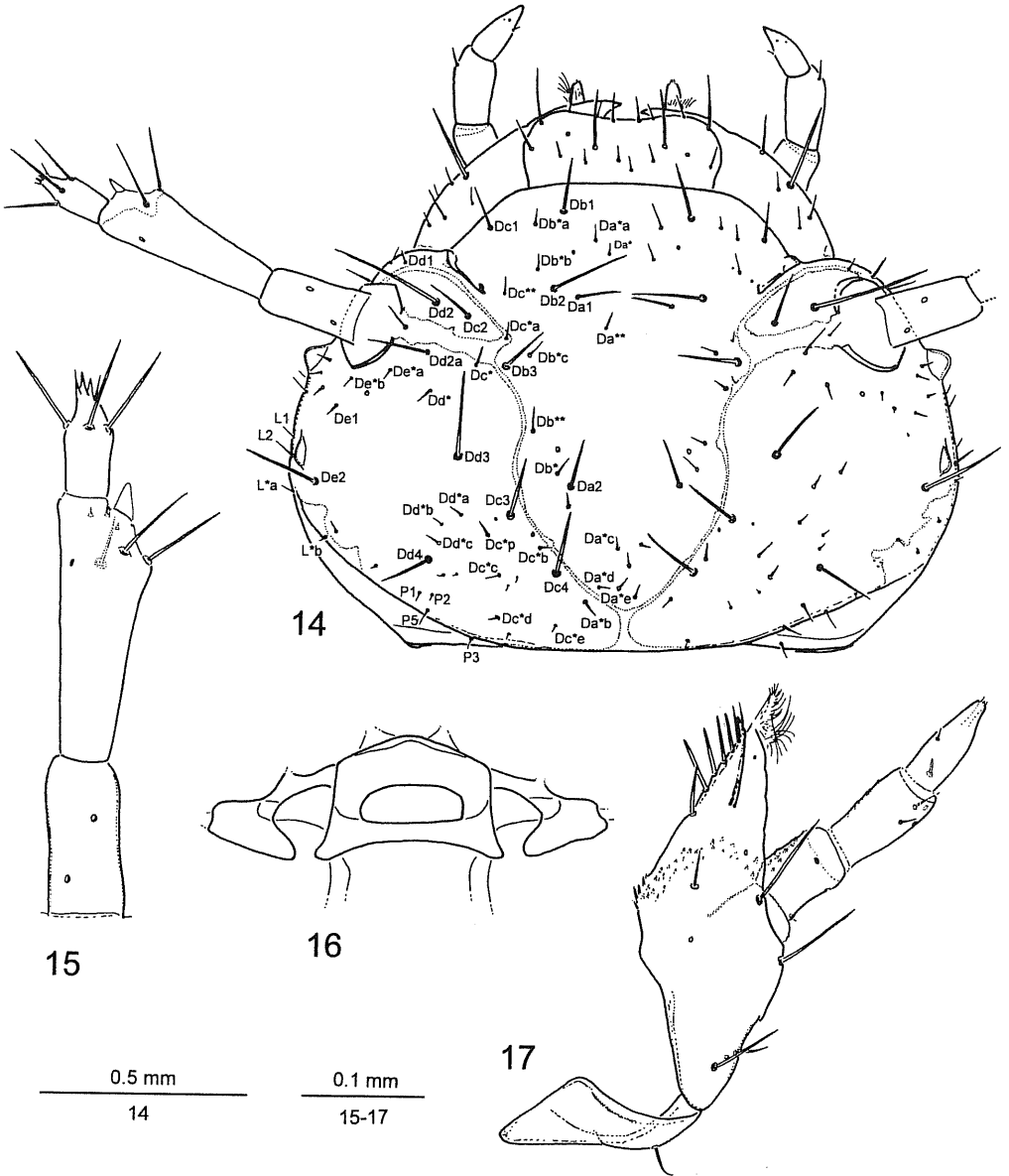
Urogomphus (Fig. 13): comparatively short; comparative lengths of URI:URII:URIII = 2.4:4.7:1. Urogomphal segment I about 1.4 times as long as wide, with 3 large dorsal, 3 large ventral and 1 small ventro-lateral setae, dorsally with 4–5 campaniform sensilla. Urogomphal segment II with 1 apical seta. Dorsal side of segment I with sparse asperities.

Abdominal sternum IX and anal membrane (Fig. 13): abdominal sternum IX with 1 very small antero-medial seta and posterior transverse row of 5 larger setae. Dorsum of anal membrane with 2 larger setae (D1, D2) and 1 campaniform sensillum antero-medially to D1; ventrally with ca. 11 pairs of small setae and 1 campaniform sensillum.

Anisotoma glabra (Fabricius, 1792)

DIAGNOSIS. Two stemmata. Three small solenidia at base of digitiform solenidium of antennomere II, digitiform solenidium large, undivided. Mola (of mandible) with rows of sclerotized

dense asperities. Dorsal integument of body with dense asperities, arranged into honeycomb-like figures. Head with setae Da1 and Dd1, with numerous additional small setae and with 5 pairs of campaniform sensilla. Antennae comparatively long. Dorsal surface of labrum with 3 median pairs of setae. Ventral surface of mentum with 1 large and 2 medium pairs of setae. Large setae on dorsal



Figs 14–17. *Anisotoma glabra* (Fabricius), larval instar III. 14 – head, dorsal aspect, 15 – left antenna, dorsal aspect, 16 – hypopharyngeal sclerome, ventral aspect, 17 – left maxilla, ventral aspect.

surface of thorax and abdomen short and stout, apically truncated. Terga with numerous additional very small setae. Pronotum with seta Dd2 present. Dorsal transverse row of mesonotum with 2 setae. Abdominal terga I–VIII with 5 pairs of large setae (setae Dd1 and P3 absent). Femur with additional small postero- and antero-lateral setae. Tibia with additional setae Pv2, Av2 and D2. Abdominal tergum IX medially divided. Urogomphus comparatively strongly prolonged, segment I about 6.1 times as long as wide, with 15 setae.

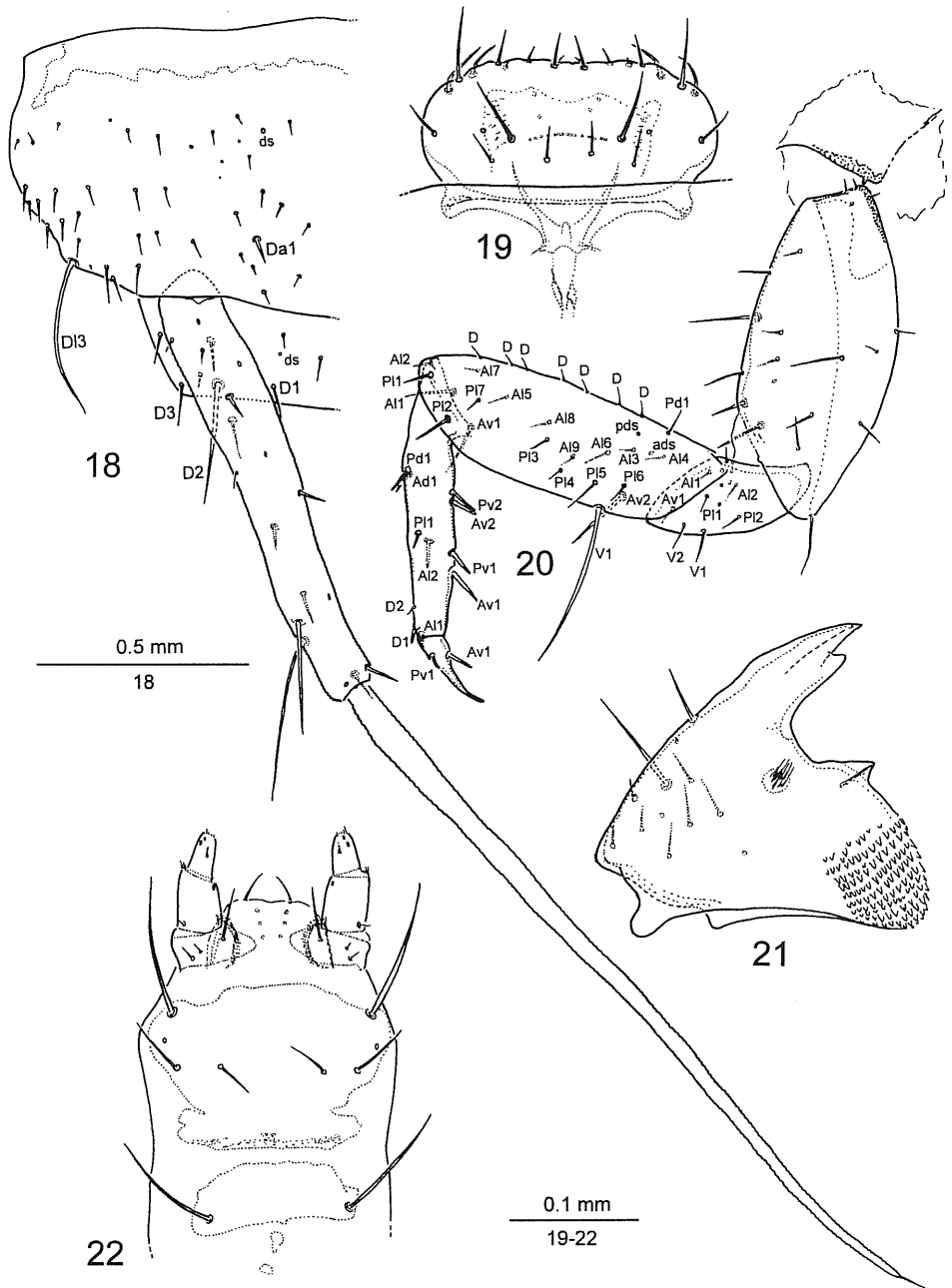
DESCRIPTION. Body cylindrical, narrowed posteriorly, widest at metanotum. Total body length 5.5–6.5 mm (average 6.0 mm). Metanotal width 1.23–1.38 mm (average 1.32 mm).

Head (Fig. 14): cranium wider than long; HW/HL = 1.41; HW = 0.90–0.93 mm. Chaetotaxy as follows: row Da with 7–13 setae: small setae Da*a (sometimes absent), Da* and larger Da1 on clypeus, small Da** (sometimes absent) anteriorly on frons, large seta Da2 on frons, posteriorly with a group of 2–7 small setae (usually three – Da*c, Da*d and Da*e), epicranium posteriorly with small seta Da*b. Row Db with 8–12 setae: clypeus with large Db1 and small Db*a, Db* and sometimes with 1 additional small seta; frons with large seta Db3 and 1–3 antero-lateral small setae (Db*c and 1–2 additional setae, usually absent) and with 2–3 more posteriorly situated, small setae (Db*, Db** and 1 additional seta, usually absent). Row Dc with 10–13 setae: larger seta Dc1 and small Dc** laterally on clypeus, medium Dc2 behind the epistomal suture, small Dc* anteriorly on epicranium; posteriorly on epicranium with 2 large setae (Dc3, Dc4) and a group of 4–7 small setae (Dc*p, Dc*b, Dc*d, Dc*e and sometimes up to 3 additional very small setae). Row Dd with 10–14 setae: small seta Dd1 anteriorly on epicranium before the antennal insertion, very large seta Dd2 and 2 smaller setae (Dd2a, Dd2b) near antennal insertion, more posteriorly 1–3 small setae (Dd* and sometimes 1–2 additional small setae), large seta Dd3 and Dd4 discally on epicranium, between them with a group of 3–5 small setae (Dd*a–Dd*c and sometimes 2 additional setae). Row De with 4 setae: epicranium with 3 small (De*a, De*b and De1) and 1 large lateral seta (De2). Lateral row with about 6 small setae. Posterior margin with 4–5 setae (P1–P3, P5, sometimes 1 additional small seta). Campaniform sensilla include 1 on clypeus (between Db1 and Db2), 1 on frons (anteriorly from Da2), 2 on epicranium (1 between De*a and De*b, 1 close to frontal suture between Dc3 and Dc4). Dorsal side completely covered by asperities arranged into honeycomb-like figures. Stemmata 2, laterally positioned.

Antenna (Fig. 15): antennal formula = 3.2:5.9:2.1:1. Comparative lengths of antennomere II: digitiform solenidium = 5.9; comparative lengths of antennomere II : antennomere III = 2.8. Antennomere I with 2 dorsal campaniform sensilla. Antennomere II with 2 dorsal and 1 ventral setae; with 1 dorsal campaniform sensillum; with 1 large, undivided thumb-like digitiform solenidium and with 3 small solenidia in ventro-apical membraneous area. Antennomere III with 3 larger subapical setae, with 1 subapical pointed process, with 1 subapical setiform sensillum and 2 apical peg-like sensilla.

Labrum (Fig. 19): subquadrate, lateral margins rounded. Epipharynx with median transverse row of about 15 campaniform sensilla, preceded by 2 pairs of more anteriorly placed and slightly irregularly distributed sensillae; antero-laterally with small fields of microtrichiae. Dorsal surface of labrum medially with 1 pair of large setae and 2 pairs of small setae and with 1 pair of campaniform sensilla. Lateral margin with 8 pairs of setae (1 lateral, 3 apical and 4 ventro-apical pairs), ventro-apically also with 1 pair of sensilla.

Mandible (Fig. 21): apically bidentate with internal edge very slightly serrate; prosthema robust, pointed and sclerotized, basally with a group of minute ventral spines in an unsclerotized field. Mola distinct, ventrally with ca. 150 visible teeth. Dorsal surface of mandible with 1 large and 5–7 small setae and with 2 campaniform sensilla, lateral margin with 1 large seta.



Figs 18–22. *Anisotoma glabra* (Fabricius), larval instar III. 18 – abdominal tergum IX, uropomphus and anal membrane, dorsal aspect, 19 – labrum, dorsal aspect, 20 – foreleg, posterior aspect, 21 – right mandible, ventral aspect, 22 – labium, ventral aspect.

Maxilla (Fig. 17): lacinia lanceolate, with 7–9 mesal spines and with a transverse group of small dorsal spines. Galea with fimbriate, bibranched apex, subapical setae absent. Maxillary palpus relatively long, with a group of small spines dorso-laterally on segments I and II, comparative lengths of maxillary palpus segments I:II:III = 0.9:1.3:1.

Labium (Fig. 22): comparative lengths of labial palpus segments I:II = 1.3; segment I basally with 1 small ventral seta, apically with 1 campaniform sensillum and a group of sensilla; segment II antero-ventrally with 2 campaniform sensilla, antero-dorsally with 1 close-fitting digitiform sensillum and a group of apical sensilla. Praementum with 1 larger and 2 small ventral setae. Ligula dorso-laterally with a pair of serrate lobes, antero-ventrally with 1 pair of small apical setae and 3 pairs of campaniform sensilla. Mentum ventro-laterally with 1 very large and 1–2 smaller pairs of setae and 1 pair of campaniform sensilla; submentum ventro-laterally with a pair of very large setae. Hypopharyngeal sclerome (Fig. 16) with complete anterior and posterior bridges, strongly sclerotized.

Foreleg (Fig. 20). Coxa: large, with 13 posterior and 6 anterior setae and 1 anterior campaniform sensillum.

Trochanter: triangular, with 2 postero-dorsal setae (P11, P12) and with 2 posterior campaniform sensilla; anteriorly with 1 antero-ventral seta (Av1), 2 antero-lateral setae (A11, A12), 1 antero-dorsal seta, 2 ventral setae (V1, V2) and with 4 campaniform sensilla.

Femur: long and broad, with single ventral seta (V1), 1 postero-dorsal seta (Pd1) and 5–7 small dorsal setae (D), with 2 larger and 5–6 small postero-lateral setae (P11, P12; P13–P17, sometimes an additional seta is present between P13 and P17), with 1 postero-dorsal campaniform sensillum (pds); anteriorly with 1 large and 7–8 small antero-lateral setae (A11; A12–A19), 2 large antero-ventral setae (Av1, Av2) and with 1 antero-dorsal campaniform sensillum (ads).

Tibia: only slightly shorter than femur, slender, with 1 postero-dorsal seta (Pd1), 2 subapical dorsal setae (D1, D2), 1 postero-lateral seta (P11) and 2 postero-ventral setae (Pv1, Pv2); anteriorly with 1 antero-dorsal seta (Ad1), 2 antero-lateral setae (A11, A12) and 2 antero-ventral setae (Av1, Av2).

Tarsungulus: long and pointed, with a single pair of setae (Pv1, Av1).

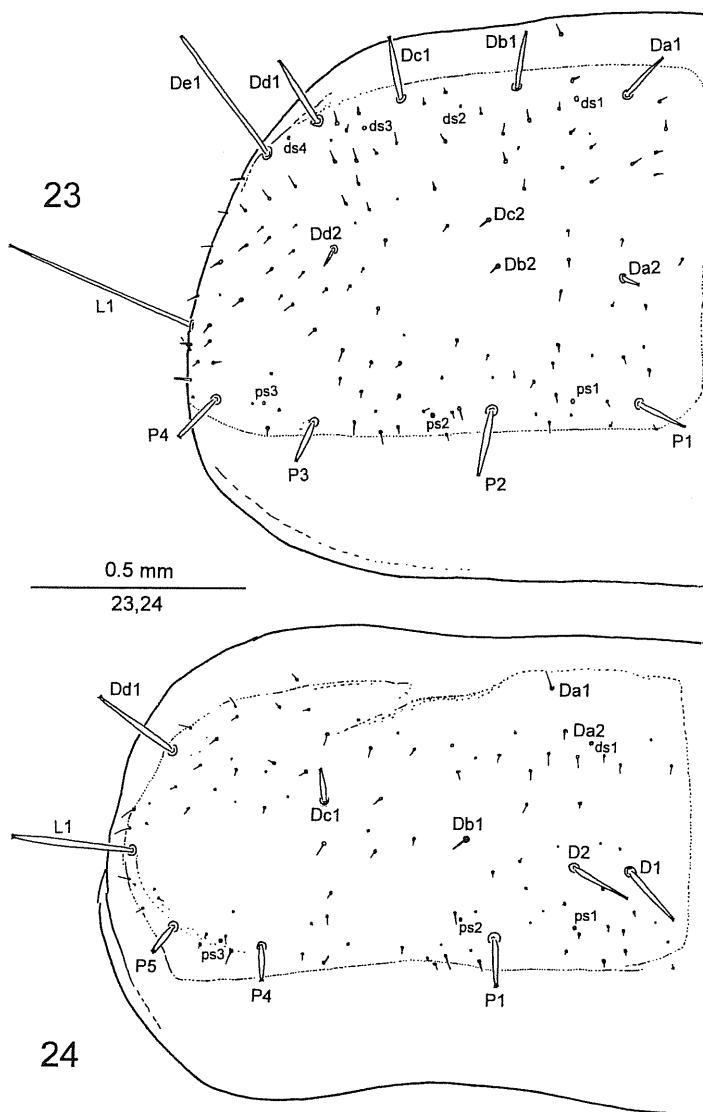
Pronotum (Fig. 23): transverse, N1L/N1W = 1.8. Chaetotaxy: row Da with 2 setae (Da1, Da2), row Db with 2 setae (Db1, Db2), row Dc with 2 setae (Dc1, Dc2), row Dd with 2 setae (Dd1, Dd2), row De with 1 seta (De1), row L with 1 seta (L1), posterior transverse row with 4 setae (P1–P4); campaniform sensilla include 1 between Da1 and Db1 (ds1), 1 between Db1 and Dc1 (ds2), 1 between Dc1 and Dd1 (ds3), 1 between Dd1 and De1 (ds4), 1 between P1 and P2 (ps1), 1 between P2 and P3 (ps2) and 1 between P3 and P4 (ps3); ca. 30–35 small setae below Da1–Dd1, ca. 40–45 small setae above posterior transverse row and ca. 12–15 small setae laterally between De1 and P4. Pronotal surface with dense minute asperities, arranged into honeycomb-like figures.

Mesonotum (Fig. 24): transverse chaetotaxy as follows: row Da with 2 small setae (Da1, Da2), row Dd with 1 seta (Db1), row Dc with 1 seta (Dc1), row Dd with 1 seta (Dd1), row L with 1 seta (L1), posterior transverse row with 3 setae (P1, P4, P5), discal transverse row with 2 setae (D1, D2); campaniform sensilla include 1 medially to Da2 (ds1), 1 posteriorly to D2 (ps1), 1 laterally to P1 (ps2), 1 between P4 and P5 (ps3); ca. 35 very small setae posteriorly to Da1–Dd1, ca. 35–40 very small setae between discal and posterior transverse rows, ca. 8 small setae laterally between Dd1 and P5.

Metasternum (Fig. 25): transverse, N3L/N3W = 2.1; chaetotaxy as follows: row Da with 1 seta (dDa1), row Db with 1 seta (Db1), row Dc with 1 seta (Dc1), row Dd with 1 seta (Dd1), row

L with 1 seta (L1), posterior transverse row with 5 setae (P1–P5); campaniform sensilla include 1 postero-medially to Da1 (ds1), 1 posteriorly to P2 (ps1), 1 between P3 and P4 (ps2), 1 between P4 and P5 (ps3); ca. 30 very small setae posteriorly to Da1, ca. 30 very small setae between P1 and P5, ca. 6 small setae laterally between Dd1 and P5.

Abdominal tergum I (Fig. 26): A1L/A1W = 3.9; chaetotaxy as follows: posterior transverse row with 5 setae (P1, P2, P4–P6); campaniform sensilla include 1 anteriorly (ds1), 1 between P1



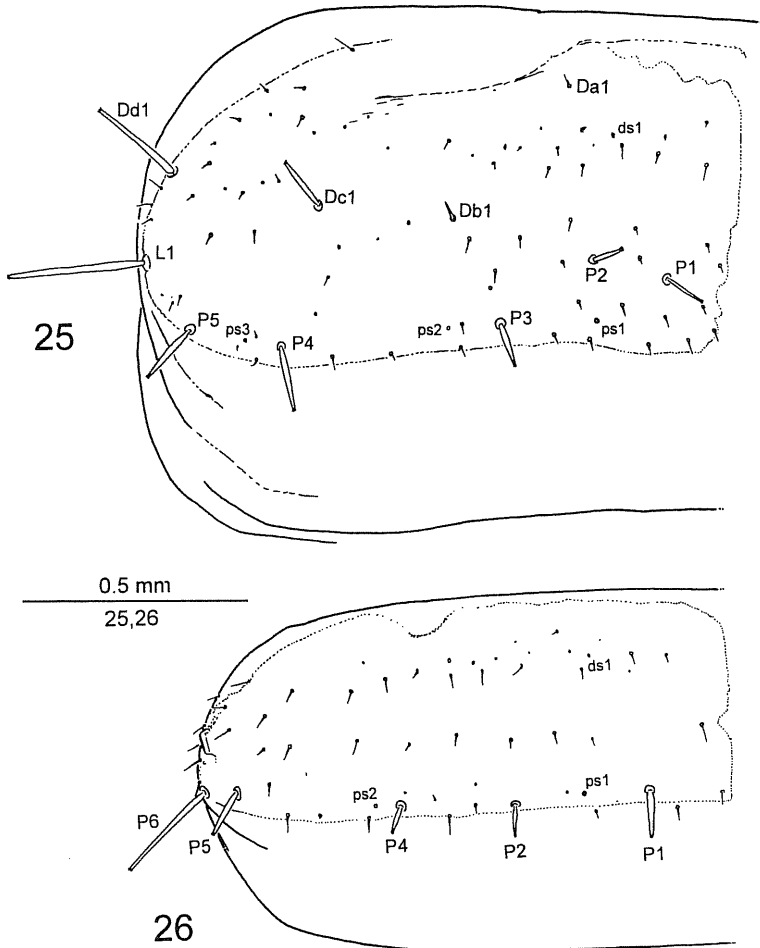
Figs 23–24. *Anisotoma glabra* (Fabricius), larval instar III. 23 – pronotum, dorsal aspect, 24 – mesonotum, dorsal aspect.

and P2 (ps1), 1 laterally to P3 (ps2); ca. 20–25 very small setae anteriorly, ca. 15 very small setae between and before P1 and P6, ca. 6 small setae laterally.

Abdominal tergum IX (Fig. 18): with 1 postero-medial larger seta (Da1) and 1 dorso-lateral seta (Dl3), with 1 campaniform sensillum (ds) and ca. 35 small setae.

Urogomphus (Fig. 18): comparatively very long; comparative lengths of URI:URII:URIII = 15.7:28.1:1. Urogomphal segment I about 6.1 times as long as wide, with 4 dorsal, 8 ventral and 2 small lateral setae, dorsally with 5 campaniform sensilla. Urogomphal segment II with 1 apical seta. Surface asperities arranged into transverse, short rows on both sides of segment I, basal part of segment II also with minute asperities.

Abdominal sternum IX and anal membrane (Fig. 18): abdominal sternum IX with 1 small antero-medial seta, posterior transverse row of 5 larger setae and a group of 8 anterior setae.



Figs 25–26. *Anisotoma glabra* (Fabricius), larval instar III. 25 – metanotum, dorsal aspect, 26 – abdominal tergum I, dorsal aspect.

Dorsum of anal membrane with 3 larger setae (D1–D3), 3 smaller setae and 1 campaniform sensillum placed antero-medially to D1; ventrally with ca. 21 small setae and 2 campaniform sensilla.

A key to the third instar larvae of European *Anisotoma* species

The following key is based on a reared larval material of instar III of all 5 European species (dissected and mounted on permanent slides) as well as on papers of Ratajczak (1995, 1996).

- 1 Urogomphi comparatively short, segment I 1.4–1.5 times as long as wide. Body dorsum with dense asperities, arranged into distinct transverse rows. 2
- Urogomphi comparatively long, segment I 3.0–6.1 times as long as wide. Body dorsum either with honeycomb-like asperities, or glabrous, without asperities. 3
- 2 Pronotum with seta Dd2 absent (Fig. 9). Posterior transverse row on abdominal terga I–VIII with 7 pairs of setae (seta Db1 present and shifted to posterior row), exceptionally with only 6+7 setae on few segments (usually asymmetrically). *A. humeralis*
- Pronotum with seta Dd2 present. Posterior transverse row on abdominal terga I–VIII with only 6 pairs of setae (seta Dd1 absent, Fig. 12), exceptionally few segments with only 5+6 setae (one seta P3 also absent in this case, usually asymmetrically). *A. axillaris*
- 3 Head with seta Dd1 absent. Labrum with 1 pair of medial setae. Dorsal surface of thorax and abdomen with very long, pointed setae (setae Db1, P3, P4 and L1 on pronotum longer than the sclerotized part of pronotum). *A. orbicularis*
- Head with seta Dd1 present. Labrum with 3–4 pairs of medial setae. Dorsal surface of thorax and abdomen either with moderately long, pointed setae (setae Db1, P3, P4 and L1 on pronotum about 0.5 times as long as the sclerotized part of pronotum), or the setae are short and truncate. 4
- 4 Thorax and abdomen dorsally with moderately long, pointed setae. Dorsum without asperities. Pronotum with seta Dd2 absent. Posterior transverse row on abdominal terga I–VIII with 6 pairs of setae, seta P3 present. *A. castanea castanea*
- Thorax and abdomen dorsally with short, truncate setae. Dorsum with honeycomb-like asperities. Pronotum with seta Dd2 present. Posterior transverse row on abdominal terga I–VIII with 5 pairs of setae, seta P3 absent. *A. glabra*

According to Wheeler (1990), the third instar larvae of *Anisotoma* can be characterized by the presence of 3 small solenidia ventrally near the base of large thumb-like, digitiform, ventro-apical solenidium on antennomere II (Figs 2, 15). Another character mentioned by Wheeler (1990) – the presence of seta P3 in transverse setal row of abdominal tergum I – can not be used as a generic character for *Anisotoma* as the seta P3 is absent in larvae of *A. glabra* (Fig. 26).

Acknowledgements

I am very much obliged to Petr Švácha (České Budějovice) for the donation of material and valuable help. Many thanks are due to David Král (Praha) and David Boukal (České Budějovice) for comments on the manuscript.

REFERENCES

- ANGELINI F. & DE MARZO L. 1984: Morfologia della larva matura e della pupa in *Agathidium varians* Beck (Coleoptera, Leiodidae, Anisotomini). *Entomologica (Bari)* **19**: 51–60.
- ANGELINI F. & DE MARZO L. 1986: Expeditions 1982, 1983 and 1984 of Genova Natural History Museum in Nepal. Anisotomini (Coleoptera, Leiodidae). *Rev. Suisse Zool.* **93**: 827–873.
- ANGELINI F. & DE MARZO L. 1988: Anisotomini del Giappone (Coleoptera, Leiodidae). *Entomologica (Bari)* **23**: 47–122.
- ANGELINI F. & DE MARZO L. 1994: Catalogue of the Agathidiini of Nepal with descriptions of new species (Coleoptera: Leiodidae). *Stutt. Beitr. Naturk., Ser. A.* **505**: 1–53.
- ANGELINI F. & DE MARZO L. 1995: Agathidiini from Taiwan collected by Dr. Ales Smctana (Coleoptera, Leiodidae, Agathidiini). *Rev. Suisse Zool.* **102**: 175–225.
- ANGELINI F. & ŠVEC Z. 1995: New species and records of Leiodinac from China (Coleoptera: Leiodidae). *Linzer Biol. Beitr.* **27**: 507–523.
- ANGELINI F. & ŠVEC Z. 1993: Descrizione di una nuova specie del genere *Anisotoma* Panzer (Coleoptera Leiodidae). *Boll. Soc. Entomol. Ital.* **125**: 118–120.

- ANGELINI F. & ŠVEC Z. 1994: Review of Chinese species of the subfamily Leiodinae (Coleoptera: Leiodidae). *Acta Soc. Zool. Bohem.* **58**: 1–31.
- ASHE J. S. & WATROUS L. E. 1984: Larval chaetotaxy of Aleocharinae (Staphylinidae) based on a description of *Athcta coriaria* Kraatz. *Coleopt. Bull.* **38**: 165–179.
- BÖVING A. G. & CRAIGHEAD F. C. 1930: An illustrated synopsis of the principal larval forms of the order Coleoptera. *Entomol. Am., N. S.*, **11**: 1–351.
- HISAMATSU S. 1985: Notes on some Japanese Coleoptera, I. *Trans. Shikoku Entomol. Soc.* **17**: 5–13.
- LAWRENCE J. F. & NEWTON A. F., JR. 1980: Coleoptera associated with fruiting bodies of slime molds (Myxomycetes). *Coleopt. Bull.* **34**: 129–143.
- NEWTON A. F., JR. 1984: Mycophagy in Staphylinoida (Coleoptera). Pp.: 302–353. In: WHEELER Q. & BLACKWELL M. (eds.): *Fungus-insect relationships: perspectives in ecology and evolution*. New York: Columbia University Press, 514 pp.
- NEWTON A. F., JR. & THAYER M. K. 1992: Current classification and family-group names in Staphyliniformia (Coleoptera). *Fieldiana Zool., N. S.* **67**: 1–92.
- PERKOVSKY E. E. 1987: An addition to the fauna of the Leiodinae beetles (Coleoptera, Leiodidae) of the Far East with description of three new species. *Vestn. Zool.* **6**: 19–24 (in Russian, Engl. abstr.).
- PERKOVSKY E. E. 1992: New species of *Anisotoma* genus (Coleoptera, Leiodidae) from Tuva. *Dopov. Akad. Nauk Ukr.* **1992**: 113–114 (in Russian, Engl. abstr.).
- RATAJCAK A. 1995: Redescription of the third larval instar of *Anisotoma humeralis* (F.) (Coleoptera: Leiodidae). *Genus* **6**: 277–288.
- RATAJCAK A. 1996: Description of the third larval stage of *Anisotoma orbicularis* (Herbst) and redescription of the third larval stage of *A. castanca* (Herbst) (Coleoptera: Leiodidae). *Genus*, in press.
- SCHÖDTE J. M. C. 1861: De metamorphosi Eleutheratorum observationes. *Natuurwet. Tijdschr.* **3**(1): 193–232.
- ŠVÁCHA P. & DANILEVSKY M. L. 1987: Cerambycid larvae of Europe and Soviet Union (Coleoptera, Crambycoidea). Part 1. *Acta Univ. Carol. – Biol.* **30**(1986): 1–176.
- ŠVEC Z. 1992: On two palaeartic *Anisotoma* (Coleoptera, Leiodidae). *Annot. Zool. Bot. (Bratislava)* **209**: 1–5.
- WHEELER Q. D. 1979: Slime mold beetles of the genus *Anisotoma* (Leiodidae): classification and evolution. *Syst. Entomol.* **4**: 251–309.
- WHEELER Q. D. 1980: Studies on neotropical slime mold/beetle relationships, part I: natural history and description of a new species of *Anisotoma* from Panama (Coleoptera: Leiodidae). *Proc. Entomol. Soc. Wash.* **82**: 493–498.
- WHEELER Q. D. 1983: Slime mold beetles of the genus *Anisotoma* (Leiodidae): supplement 1. Description of a new species of the scopula subgroup from Mexico. *Coleopt. Bull.* **37**: 45–48.
- WHEELER Q. D. 1984: Evolution of slime mold feeding in leioidid beetles. Pp.: 446–477. In: WHEELER Q. D. & BLACKWELL M. (eds.): *Fungus-insect relationships: perspectives in ecology and evolution*. New York: Columbia University Press, 514 pp.
- WHEELER Q. D. 1990: Morphology and ontogeny of postembryonic larval *Agathidium* and *Anisotoma* (Coleoptera: Leiodidae). *Am. Mus. Nov.* **2986**: 1–46.