Genus	Vol. 21(2): 205-217	Wrocław, 30 VII 2010

The first description of the mature larva of *Bisnius nitidulus* (Gravenhorst, 1802) (Coleoptera: Staphylinidae)

[1]Bernard Staniec & [2]Ewa Pietrykowska-Tudruj
Department of Zoology, Maria-Curie Sklodowska University, Akademicka 19, 20-033 Lublin, Poland
[1]e-mail: hesperus@onet.eu; [2]e-mail:ewpiet@poczta.onet.pl

Abstract. The unknown morphology of mature larval instars (L_3) of *Bisnius nitidulus* is described in detail, with the illustrations of structural features and setal pattern provided. The diagnostic characters for the *B. nitidulus* and the closly related larvae of *Rabigus* and five species of *Philonthus* are established.

Key words: entomology, morphology, Coleoptera, Staphylinidae, *Bisnius*, rove-beetles, larva, stenotopic species, Poland.

INTRODUCTION

The genus *Bisnius* Stephens, 1829 represents 66 described species, distributed in Neotropical, Nearctic, Palaearctic, Oriental and Australian Regions, of which roughly 20 species have been recorded from Europe and 14 species from Poland (Burakowski et al. 1980, Herman 2001, Koch 1989, Lucht 1987, Staniec 2004). Within this genus, only limited data about the larval morphology of 6 species has been provided (Boller 1983, Kasule 1970, Paulian 1941, Pototskaya 1967, 1976, Xambeu 1900). Moreover, the existing descriptions require supplements or redescriptions.

Bisnius nitidulus is distributed in Europe, Russia, Kazakhstan, Mongolia and China. It is regarded as a stenotopic, psammobiontic and phytodetriticolous staphylinid, occurs on exposed areas and insolated slopes, specially on sandy and limestone soils. The species is found in rotten plant remains, excrements, and under stones (Burakowski et al. 1980, Koch 1989). Formerly it was included in the *Philonthus* genera. Actually,

according to HERMAN's (2001) taxonomic classification *Bisnius nitidulus* (GRAVENHORST) is a valid name.

With reference to immature stages of *Bisnius nitidulus* (GRAVENHORST, 1802), STANIEC & PIETRYKOWSKA-TUDRUJ (2007b) described the egg and STANIEC & KITOWSKI (2004) provided detailed description of pupa for the first time. The purpose of this study is to describe the so far unknown mature larval instars (L_3).

MATERIAL AND METHODS

The examined larvae were obtained by rearing adults. The mature individuals were collected (using Barber's traps) in the first decade of May 2003 in the xerothermic areas in Ciechanki Łańcuchowskie near Lublin, and Gródek near Zamość (the central part of eastern Poland). Imagines of the examined species were determined by the first author. The mature larval stages were obtained from the adults, at a temperature of 20±3°C. Different larval instars were fed with ant larvae. In the laboratory the larvae of *B. nitidulus* were recorded from the second decade of May until the second decade of June. Reared mature larvae (L_3) were preserved in a 1:1 solution of glycerine and alcohol. For microscopic slides the punctured larvae were rinsed in distilled water and cleared in KOH. Drawings were made from the preparations in lactic acid. The drawings of some parts of the body (antennae, mouth part, leg) were made using light microscopy (Olympus) with a camera lucida. Habitus illustrations and other morphological details (microstructure, sensillae, setae types, tentorial pit, stemmata, chaetotaxy of some sclerites) were prepared from photographs taken with Olympus digital camera. Material examined: 12 L_3 (reared from adults).

DESCRIPTION

Body length (from anterior margin of nasale to the end of pygopod): 3.63-5.03 mm (mean 4.30 mm); head width (between stemmata): 0.48-0.50 mm (mean 0.49 mm); pronotum width: 0.49-0.59 mm (mean 0.52 mm). Body relatively slightly sclerotized. Colour: head, yellowish-brown, thoracic tergites dark yellow, only first tergite darker than others; abdominal sclerites almost colourless; legs light yellow, mandibles and long setae light brown. Body elongated, prothorax 1.0-1.2 times as wide as head; pro-, meso- and metathorax almost equal in width; abdomen slightly widened to segment IV or V and then narrowed to the terminal segment of the body (Fig. 1). All setae of head and thorax, most of setae of abdominal sternite I, longest setae of abdominal tergites II-IV, some microsetae on other tergites and urogomphi simple (Fig. 2); remaining macro and microsetae of abdominal segments I-X, rod-shaped and frayed (Figs 3-7).

Head (Figs 8-19): 1.2-1.3 times as long as wide, side margins slightly convergent to the front; epicranial suture bifurcate before half of head length (Fig. 8). Chaetotaxy of dorsal side of head with 58 setae (Fig. 8): nasale (Na) with 22 setae (numbered 1-11), a pair of gland pits (Gp) and a pair of olfactory organs (Og) (Fig. 13); epicranial part (E) with 30 setae (numbered 12-26), a pair of glands (Gl) (Fig. 8B) and 4 pores (shown as a, b); posterior (P) part with 6 microsetae (numbered 27-29) and 2 pores (shown as c). Each side of head with 4 stemmata in the cluster (Fig. 8A). Structure of the head base in ventral view in fig 9. Apotome (Ap) in broad outline triangular (Fig.

10), distinctly extending beyond tentorial pits (Tp) by more than one length of tentorial pit; with 6 setae, 2 pores and a pair of glandular pits (Gp).

Antenna (Figs 11, 12) 4-segmented, length ratio of segments I-IV 1.1:1.6:1.7:1.0 respectively; segment I almost 1.1 times as long as wide at the base, with one pore ventro-apically; segment II 2.1 times as long as wide, with 4 pores; segment III 2.4 times as long as wide at maximum width, with 3 macro setae (1 growing on the outer margin, 2 on the inner margin), 2 sensory appendages (Sa) (one club-shaped and second tiny), 2 solenidia (So); segment IV 2.4 times as long as wide, about 2.3 times as long as bigger sensory appendage of segment III, with 3 macro setae and 4 solenidia (So) apically.

Anterior margin of nasale (Fig. 13) with 9 teeth divided into 3 distinct clusters - one middle consisted of 2 paramedian tooth (Pmt) and 1 median teeth (Mt), and two lateral clusters each with 3 lateral teeth (Lt_1-Lt_3); paramedian teeth (Pmt) about twice as long as median tooth (Mt); middle teeth (Lt_2) of external clusters weakly developed; lateral tooth Lt_1 and Lt_3 of equal length. Epipharynx (Fig. 14) with 4 bunches of straight, long hairs anteriorly and 47-50 long cuticular processes posteriorly. Mandible (Fig. 15) slender with 2 setae on outer margin and 2 pores dorsally; internal edge not serrated. Maxilla (Figs 16, 17): length ratio of cardo (Cd) and stipes (St) 1:1.3; cardo about 1.3 times as long as wide, bearing 1 ventro-lateral seta; stipes slightly and gradually narrowed to apical part, 2.2 times as long as wide with 9 setae (2 on outer margin, 2 ventral, 2 dorsal, 2 on or near inner margin, 1 ventro-apical) and 1 pore near inner margin. Mala (Ma) (Fig. 16) finger-shaped, slightly curved in apical part, 3.5 times as long as wide in the widest place; with 2 micro sensory appendages and 2 long setae apically, 1 micro seta at the outer margin and 1 pore at the base; length ratio of mala and segment I of maxillary palp 1:1.1 respectively. Palpifer (Pf) (Fig. 16) with 1 pore and 1 seta ventrally. Maxillary palp (Pm) 4-segmented; length ratio of segments I-IV: 1.4:2.1:1.9:1 respectively; segment I 1.4-1.6 times as long as wide, with 1 pore; segment II 2.5 times as long as wide, with 2 setae (code: 1, 2) and 2 pores near apex; segment III 3.7 times as long as wide, with 1 digitiform sensory appendage basally on outer margin; segment IV 3 times as long as wide, with 1 pore and a few micro sensory appendages on the apex.

Hypopharynx (Fig. 18): membranous and thickly pubescent, membranous vertical stripe (marked dashed of line in fig. 18) with about 100 hairs. Labium (Fig. 19): only slightly narrowed to the basal part, in the apical part 1.4 x wider than at the base, ventral side of prementum (Pmnt) sclerotized, with 4 setae (2 macro, 2 micro) and 2 pores laterally. Ligula (Lg) conical, about 1.8 times as long as wide at the base and almost as wide as segment I of labial palp at the base; length ratio of ligula and segment I of labial palp 1:1.4 respectively. Labial palp (Pl) 3-segmented, length ratio of segments I-III: 2:1.1:1 respectively; width ratio of segments I-III: 2.4:1.6:1 respectively; length to width ratio: 2.5, 1.7, 3.2 respectively; segment I with 1 pore in a half of the length at the inner edge; segment III with 1 pore laterally at the outer edge and a few apical micro sensory appendages.

Foreleg (Figs 21, 22): coxa (Cx) with 15 setae and a few pores, trochanter (Tr) with 9 setae, femur (Fe) with 25 setae: 15 spine-shaped of different length on ventral

side (numbered: 1-15), 10 microsetae on dorsal side (numbered: 16-25) and 2 pores (code: a, b); tibia (Tb) with 19 spine-shaped setae of different length (numbered:1-19), 1 pore (code: a) and 5 micro cuticular processes at the apex (Figs 21, 22), tibial comb rudimental, comprising only 1 seta (code: 18); tarsungulus (Tu) with 3 spine-shaped setae (numbered:1-3). Length ratio of coxa, trochanter, femur, tibia and tarsungulus: 2.8:1.5:2.7:1.9:1 respectively. Cervicosternum (Cr) (Fig. 20) triangular uniform (not divided by median ecdysial line into two parts). Prosternal area with 2 quadrangular in outline sternites (Sn), each one with one seta.

Abdomen (Figs 1, 23-33): segments I-VIII each with tergite (Te) and sternite (St), a pair of paratergites (Pt) and a pair of parasternites (Ps) laterally; on segment I paratergites and parasternites fused (Fig. 23); on segments II-VIII paratergites divided on two parts: greater anteriorly and tiny posteriorly (Figs 23, 24); tergites and sternites of abdominal segments I-VII divided on two parts by membranous, longitudinal area (Figs 25-28). Segment I: tergites with 32 simple setae (numbered: 1-16) and 2 rod-shaped and frayed setae (code: 18), 8 pores (code: a-d) and a pair of campaniform sensillae (Ca) (Fig. 25); sternites with 16 simple setae (numbered: 1-8) (Fig. 26); fused paratergite and parasternite on each side with 6 simple setae (4 macro, 2 micro). Segment II-VIII: tergites with 44 setae (numbered: 1-22), 4 pores (code: a, b) and a pair of campaniform sensillae (Ca) (Figs 27); sternites with 26 setae (numbered: 1-13): 22 macro rod-shaped and frayed, 4 micro simple (numbered: 4, 5) (Fig. 28). Tergite and sternite of segment IX with 16 setae, 2 pores and 14-16 setae, 2-4 pores respectively (Figs 29, 32); microstructure of abdominal tergite IX as in Fig. 29A. Segment IX with a pair of 2-segmented urogomphi (Ug) (Fig. 31); segment I of urogomphus with 28-29 setae (14 rod-shaped and frayed, 14 simple) and 3 pores (Fig. 33); segment II with 3 setae (one long apical); length ratio of segments I and II of urogomphus and apical seta: 2.2:1:1.4 respectively (Fig. 33); microstructure of urogomphi as in Fig. 31A. Abdominal tergites I-IX each with a pair of campaniform sensillae (Ca) laterally (Fig. 29B). Segment X (pygopod), distinctly longer (1.4 times) than segment I of urogomphus and almost as long as segment I and II together; dorsal side with 20-25 setae (a few rod-shaped and frayed) and 1-2 pores (Fig. 30); ventral side with about 20 different length simple setae and a few pores (Fig. 32); Abdominal segments I-VIII, each with a pair of spiracles located between tergites (Te) and paratergites (Pt) (Figs 23, 24).

Taxonomic remarks

Based on the data listed in the table and the description presented above, the diagnostic characters for the *B. nitidulus* and for the closly related and comparatively well described larvae of *Rabigus* and selected *Philonthus* species are established. For *B. nitidulus* larva they are the following: (1) presence a pair of setae (code: 10) on nasale between glandular pits instead pores occurring in the remaining studied species (Fig. 13); (2) presence a pair of microsetae (numbered: 24) on head (Fig. 8); (3) lateral teeth Lt_1 and Lt_3 of equal length (Fig. 13); (4) epipharynx with 47-50 long cuticular processes posteriorly (Fig. 14); (5) stipes stocky relatively, at most 2.2 x as long as wide at the base (Fig. 17); (6) seta at the inner margin (numbered: 1) of second segment of maxillary palp located exactly in the half of segment length (Fig. 17). For the

Philonthus species examined the combination of the diagnostic characters is as follows: (A) antennal segment I relatively slender, at least 2.6-3.5 x as long as wide; (B) nasale with lateral tooth Lt_3 bigger than tooth Lt_1; (C) epipharynx with 17-35 long cuticular processes posteriorly; (D) labial palp with first segment 2.8-3.4 x as long as wide. For the *Rabigus* (*R. tenuis*) larva the diagnostic characters are as follows: (I) apotome extending beyond tentorial pits by less than one length of tentorial pits; (II) nasale with lateral tooth Lt_1 bigger than tooth Lt_3; (III) urogomphus with relatively long segment I, about 3.5 longer than segment II.

Considering the above-mentioned diagnosis, the number of characteristic morphological features of mature larvae is as follows: six for *Bisnius nitidulus*, four for the Philonthus species examined, and three for *Rabigus tenuis*. According to the present study, morphological larval characters show far closer relationship of the genus *Philonthus* with *Rabigus*, than with *Bisnius*. Within the five *Philonthus* species examined, larvae of *Ph. fumarius* and *Ph. nigrita* are the most similar in morphology (Tab.).

REFERENCES

Boller, F., 1983. Zur Larvalmorphologie der Gattung *Philonthus* Curtis (Coleoptera, Staphylinidae). Spixiana, **6**: 113-131.

Burakowski, B., Mroczkowski, M., Stefańska, J., 1980. Chrząszcze Coleoptera - Kusakowate Staphylinidae, część 2. Katalog Fauny Polski, Warszawa, XXIII 7: 1-272.

Herman, L. H., 2001. Catalog of the Staphylinidae (Insecta: Coleoptera). 1758 to the end of the second Millennium. VI. Staphylininae group (Part 3). Bull. Amer. Mus. Nat. Hist., **265**: 3021-3839.

Kasule, F. K., 1970. The larvae of Paederinae and Staphylinidae (Coleoptera: Staphylinidae) with keys to the known British genera. Trans. Roy. Entomol. Soc. London, **122**: 49-80, 144 figs.

Koch, K., 1989. Die Käfer Mitteleuropas. Ökologie, 1. Goecke & Evers Verlag, Krefeld. 440 pp.

Lucht, W. H., 1987. Die Käfer Mitteleuropas. Katalog. Goecke & Evers Verlag, Krefeld: 342 pp.

Mulsant, E., Rey, C., 1876. Tribu des brévipennes. [Staphyliniens]. Ann. Soc. Agric. Hist. Nat. Lyon, (4) **8** [1875]: 145-856.

Paulian, R., 1941. Les premiers états des Staphylinoides (Coleoptera) étude de morphologie comparée. Mém. Mus. Nat. Hist. Natur. (n.sér.), **15**: 1-361.

Pietrykowska-Tudruj, E., Staniec, B., 2006. Description of the egg and larva of *Philonthus punctus* (Gravenhorst, 1802) (Coleoptera, Staphylinidae, Staphylininae). D. Entomol. Zeitschr., **53**: 179-192.

Pototskaya, V. A., 1967. Opredelitel' lichinok korotkonadkrylykh zhukov evropeiskoi chasti SSSR. Moskva, Academiya Nauk SSSR, Izdatel'stvo Nauka, 120 pp.

—, 1976. Lichinki zhuko-stafilinid (Coleoptera, Staphylinidae), razvivaiushchikhsia v drevesine. pp. 156-174. In: B. M. Mamaev, Evoliutsionnaia morfologiia lichinok nasekomykh. Moskva: Akademyia Nauk SSSR, Izdatel'stvo Nauka.

Staniec, B., 2004. Kusakowate (Staphylinidae). str. 153-155, 162-176, W: Fauna Polski – charakterystyka i wykaz gatunków (Bogdanowicz, W., Chudzica, E., Pilipiuk, I., Skibińska, E., red.). Muzeum i Instytut Zoologii PAN, Warszawa, 1, 509 pp.

Staniec, B., Kitowski I., 2004. A description of the pupae of *Philonthus umbriatilis* (Gravenhorst, 1802), *Ph. lepidus* (Gravenhorst, 1802) and *Bisnius* (=*Philonthus* sensu lato) *nitidulus* (Gravenhorst, 1802) (Coleoptera: Staphylinidae). Genus, **15**: 47-58.

Staniec, B., Pietrykowska-Tudruj, E., 2007a. Developmental stages of *Philonthus rubripennis* Stephens, 1832 (Coleoptera, Staphylinidae, Staphylininae) with comments of its biology. D. Entomol. Zeitschr., **54**: 95-113.

—, 2007b. Comparative morphology of the eggs of sixteen Central European species of Staphylininae (Coleoptera, Staphylinidae). D. Entomol. Zeitschr., **54**: 235-252.

Table. Some diagnostic morphological characters of the known mature larvae of the selected *Bisnius*, *Philonthus* and *Rabigus* species. Abbreviations: Gp - glandular pit; Lr - length ratio; Ltwr - length to width ratio; Mt - medial tooth; Na - nasale; Npr - number of cuticular processes posteriorly; Nrs - number of setae; Pg - pygopod; Pl - labial palp; Pm - maxillary palp; Pmt - paramedial tooth; Seg. - segment; Tp - tentorial pits; Ug - urogomphus; measurements in mm.

Character	Genus/Species							
	Bisnius		***Philonthus***					***Rabigus***
	nitidulus	Figure in this study	*fumarius*	*lepidus*	*nigrita*	*punctus*	*rubripennis*	*tenuis*
Body length	3.63-5.03	-----	6.48-8.00	5.80-7.40	9.10-10.71	8.75-10.00	5.25-6.75	6.10-7.10
Head								
Width	0.48-0.50	-----	0.98-1.02	0.72-0.77	0.88-0.97	1.29-1.34	0.70-0.76	0.65-0.68
Presence a pair of setae (10) or pores on Na between Gp	setae	13	pores	pores	pores	pores	pores	pores
Occurrence a pair of microsetae (24)	presence	8	lack	lack	lack	lack	lack	lack
Apotome extending beyond Tp	by about one length of Tp	10	by about two length of Tp	by about one length of Tp	by about three length of Tp	by about one length of Tp	by about one length of Tp	by less than one length of Tp
Antenna								
Lr of Seg I-IV	1.1:1.6:1.7:1	11	1.2:1.9:1.6:1	1:1.8:1.6:1.2	1.3:1.9:1.6:1	1:2.1:1.5:1.1	1:2:1.8:1.3	1:1.9:2.1:1.1
Ltwr of Seg II-IV	2.1, 2.4, 2.4	11	3.5, 3, 3.4	2.8, 2.9, 3.2	2.8, 2.6, 2.4	3.3:3.3:3.8	2.6, 2.8, 2.9	2.3, 2.5, 2.5
Labrum								
Lr Pmt to Mt	2:1	13	2.3:1	2.1:1	2.2-2.4:1	1.6:1	2.7-3:1	2.1:1
Lateral teeth of Lt_1 and Lt_3	equal length	13	Lt_3 bigger than Lt_1	Lt_3 bigger than Lt_1	Lt_3 bigger than Lt_1	Lt_3 bigger than Lt_1	Lt_3 bigger than Lt_1	Lt_1 bigger than Lt_3
Npr of epipharynx	47-50	14	about 35	17	about 35	about 25	about 20	14
Maxilla								
Ltwr of stipes	2.2:1	17	3.1:1	2.5:1	3.5:1	2.6:1	3.2:1	2.8:1
Lr of mala and segment I of Pm	1:1.1	16	1:2	1:1.2	1:2.2	1:1.3	1:1.2	1:1.4
Seg II of Pm: location of seta 1	in half of length	17	closer the base	closer the base	closer the base	closer the base	closer the base	closer the base

Character	Genus/Species							
	Bisnius		***Philonthus***					***Rabigus***
	nitidulus	Figure in this study	*fumarius*	*lepidus*	*nigrita*	*punctus*	*rubripennis*	*tenuis*
Labium								
Ltwr ratio of ligula	about 1.8:1	18, 19	1.7-1.8:1	2.1:1	1.9-2:1	2.3:1	2:1	2.1:1
Pl - Lr of Seg I-III	2:1.1:1	18, 19	3.4:1.6:1	2.8:1.8:1	3.4:1.6:1	3.3:1.9:1	2.5:1.4:1	2.1:1.4:1
Pl - Ltwr of SegI-III	2.5, 1.7, 3.2	18, 19	3.3, 2.5, 3	2.5, 3, 2	3.2, 2.7, 2.3	3.8, 2.8, 3.3	2.4, 2.5, 3.5	2.3, 2.3, 3
Fore tibia								
Number of all setae	19	21, 22	21	18	18	21	19	18
Nrs of tibial comb	1	22	4	0	0	2	1	0
Urogomphus								
Nrs of Seg I	28-29	33	26	22	31	24-28	20-22	25
Lr of Seg I and II	2.2:1	33	2.1:1	1.6:1	2.3:1	1.9:1	2.3:1	3.5:1
Lr of Seg I of Ug and Pg	1:1.4	33	1:1.3	1:1.5	1:1.4	1:1.6	1:1.5	1:1.1
Lr of Ug and Pg	1:1	31	1.1:1	1:1	1.1:1	1:1	1:1	1:1.2
References	Present study		Staniec & Pietrykowska-Tudruj (2008b)	Staniec & Pietrykowska-Tudruj (in press)	Staniec & Pietrykowska-Tudruj (2008a)	Pietrykowska-Tudruj & Staniec (2006)	Staniec & Pietrykowska-Tudruj (2007a)	Staniec & Pietrykowska-Tudruj (2009)

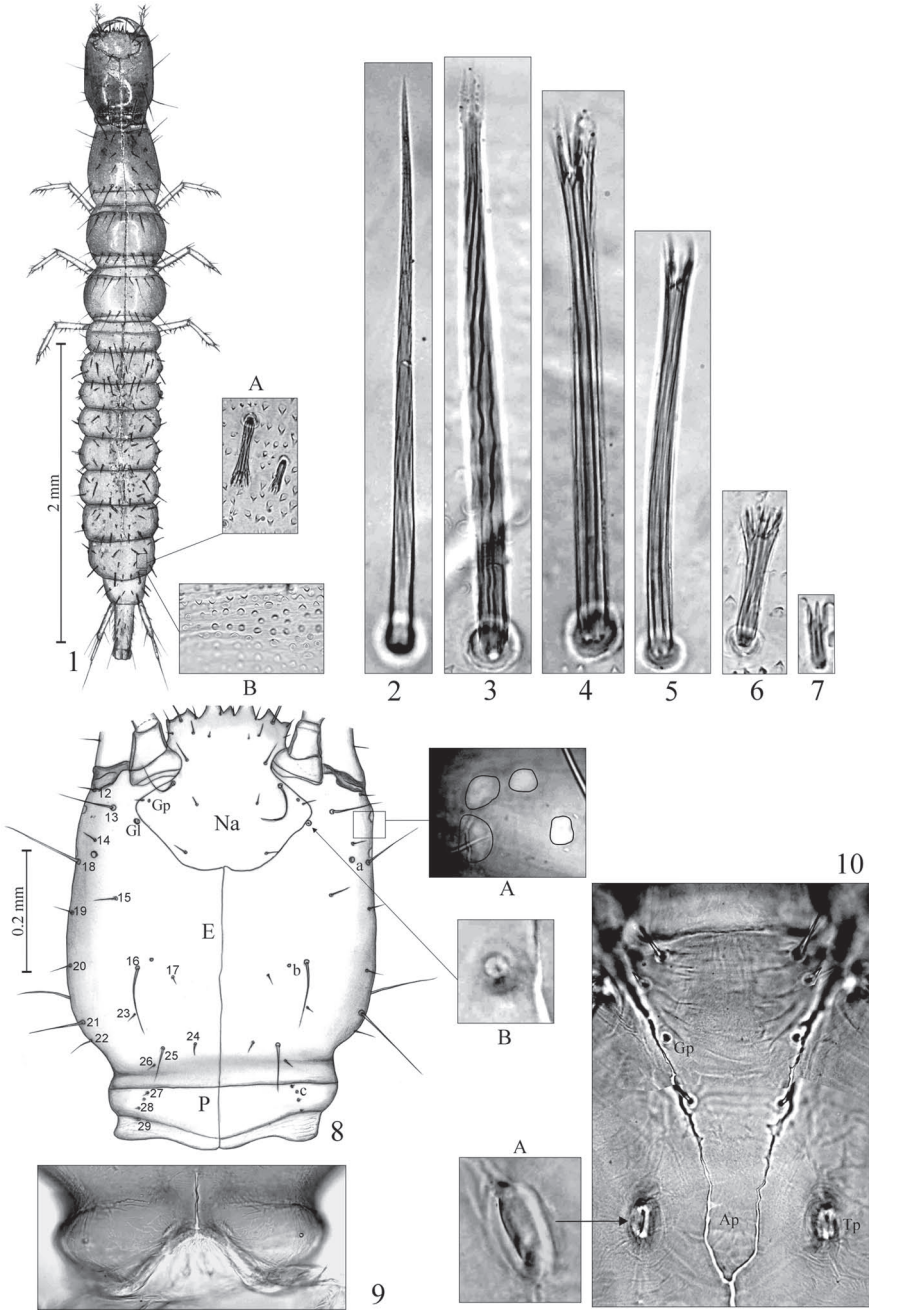
—, 2008a. Morphology of developmental stages and notes on biology of *Philonthus nigrita* (Gravenhorst, 1806) (Coleoptera, Staphylinidae) - a stenotopic species inhabiting of *Sphagnum* peatbogs. D. Entomol. Zeitschr., **55** (1), 167-183.

—, 2008b. Morphology of developmental stages of *Philonthus fumarius* (Gravenhorst, 1806) (Coleoptera, Staphylinidae) with notes on biology. Acta Zool. Acad. Scient. Hung., **54** (3): 213-234.

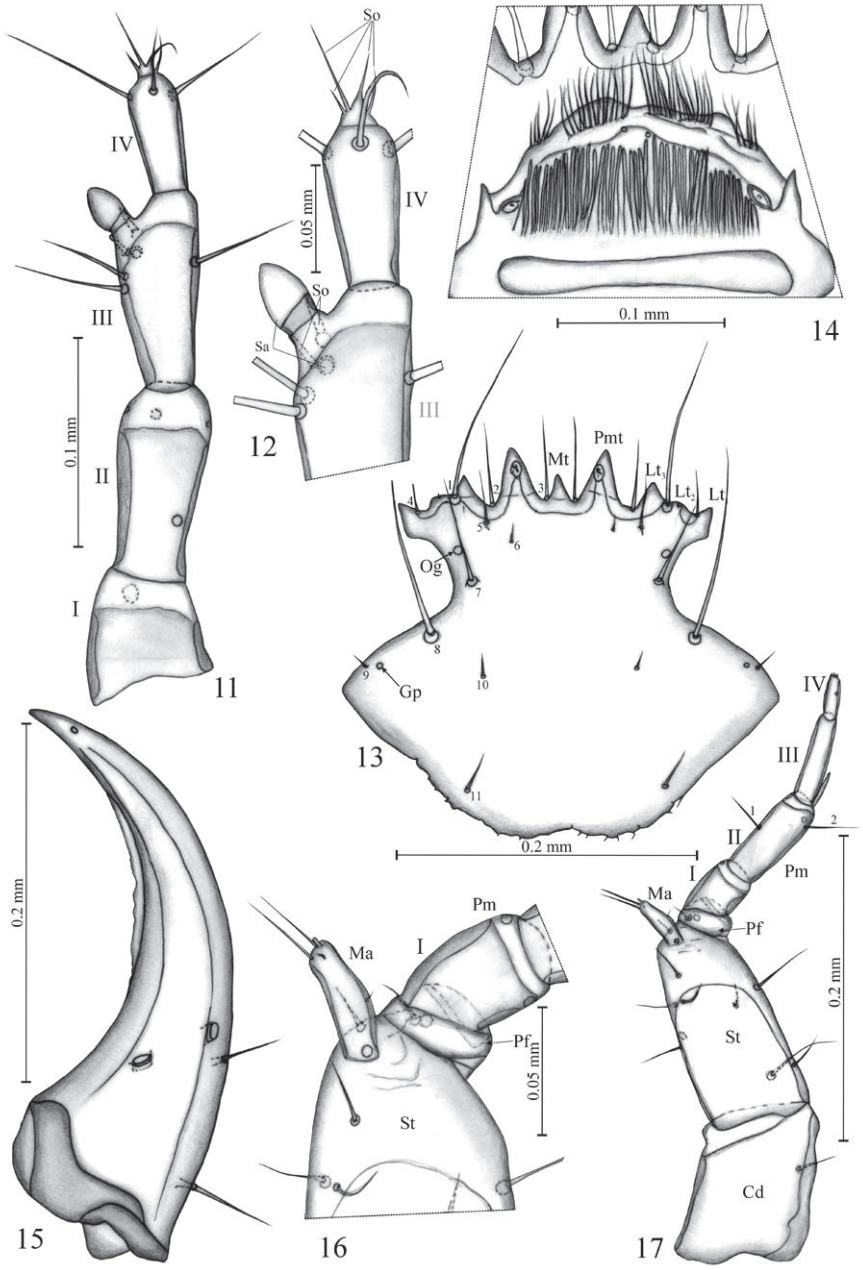
—, 2009. Immature stages of *Rabigus tenuis* (Fabricius, 1792) (Coleoptera, Staphylinidae, Staphylininae) with observation on its biology and taksonomic comments. Belg. Jurnal Zool., **138** (1): 22-39.

Staniec, B., Pietrykowska-Tudruj, E., (in press). A description of the mature larvae of *Philonthus lepidus* (Gravenhorst, 1802) - a stenotopic species. Polskie Pismo Entomologiczne.

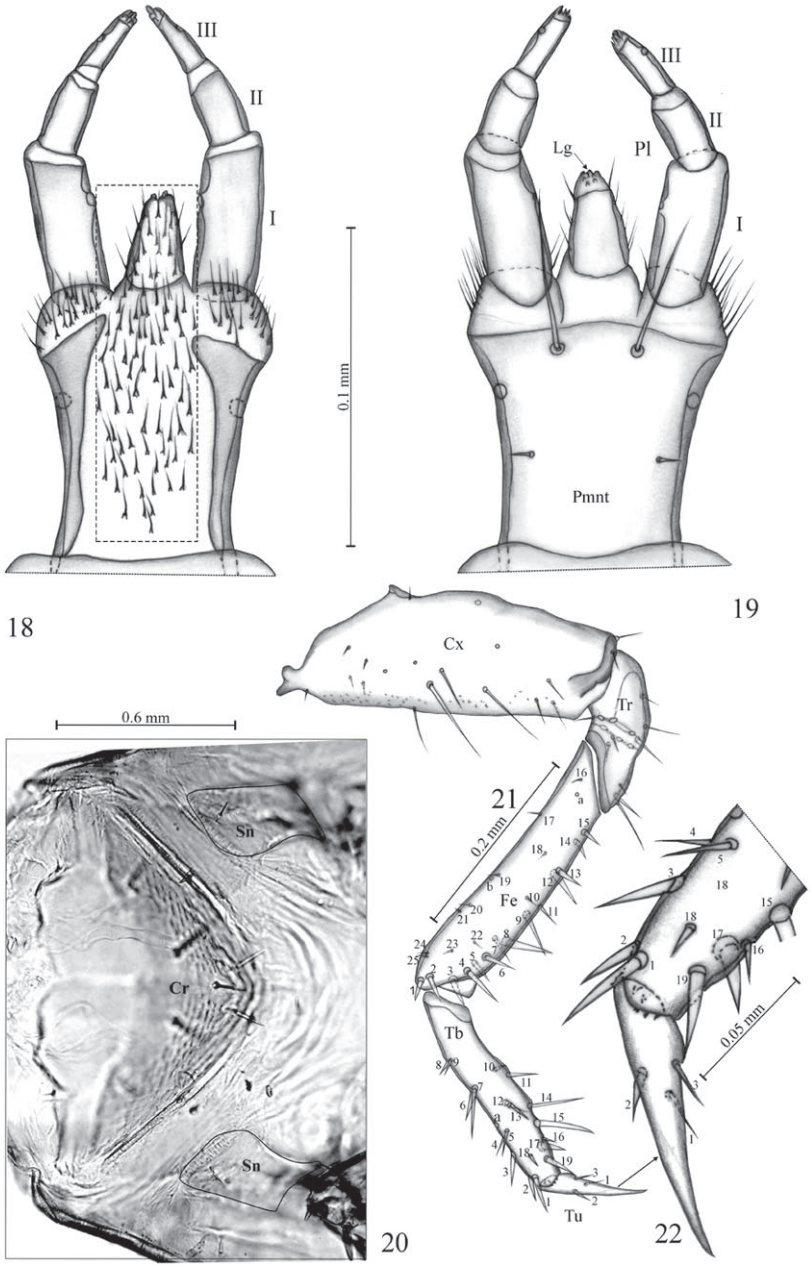
Xambeu, V., 1900. Moeurs et métamorphoses des insectes. Revue d'Entomologie, **19**: 1-56.



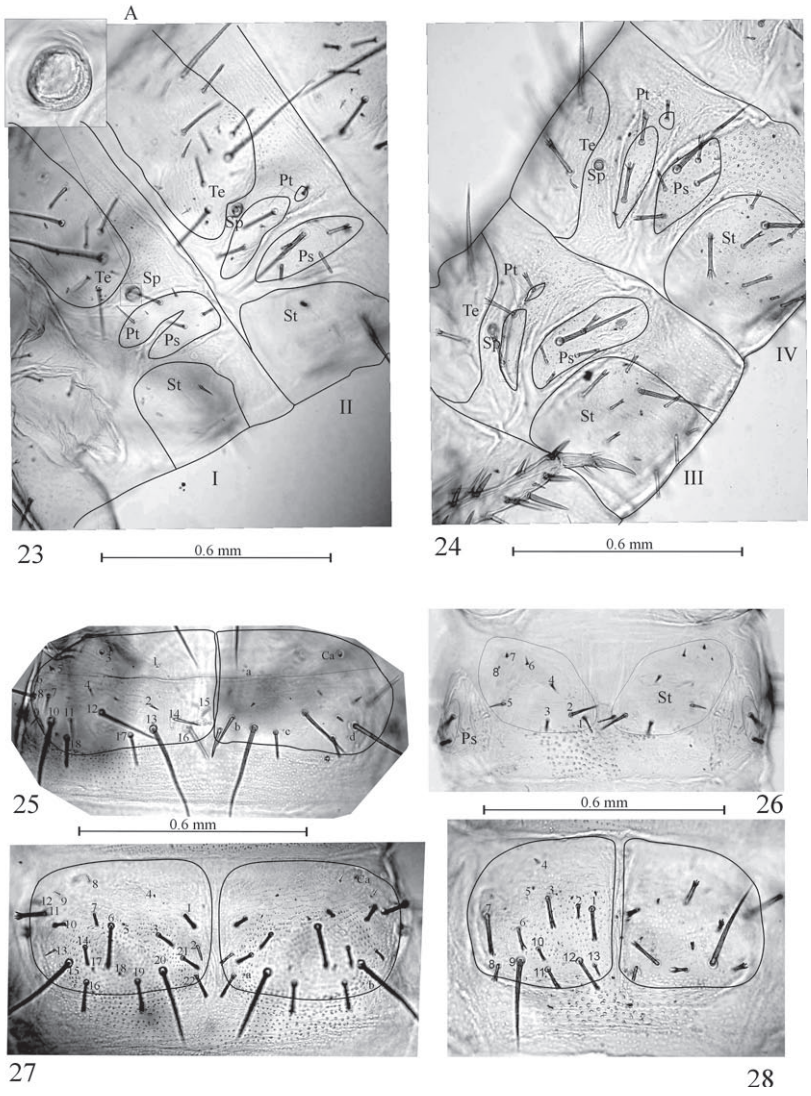
1-10. *Bisnius nitidulus*, mature larva. 1 - General aspect (A, B - microstructure of abdominal tergites); 2 - simple macro setae of pronotum; 3-7 - rod-shaped and frayed apically setae of abdominal tergite II (3), V (4, 5) and IX (6, 7); 8 - head in dorsal aspect; 8A - stemmata; 8B - gland; 9 - basal part of head in ventral aspect; 10 - apotome (Ap) and tentorial pits (Tp); 10A - tentorial pit. Abbreviations: Ap - apotome, E - epicranial part, Gl - gland, Gp - glandular pit, Na - nasale, P - posterior part, Tp - tentorial pit, 1, 2... - code of setae, a, b - code of pores



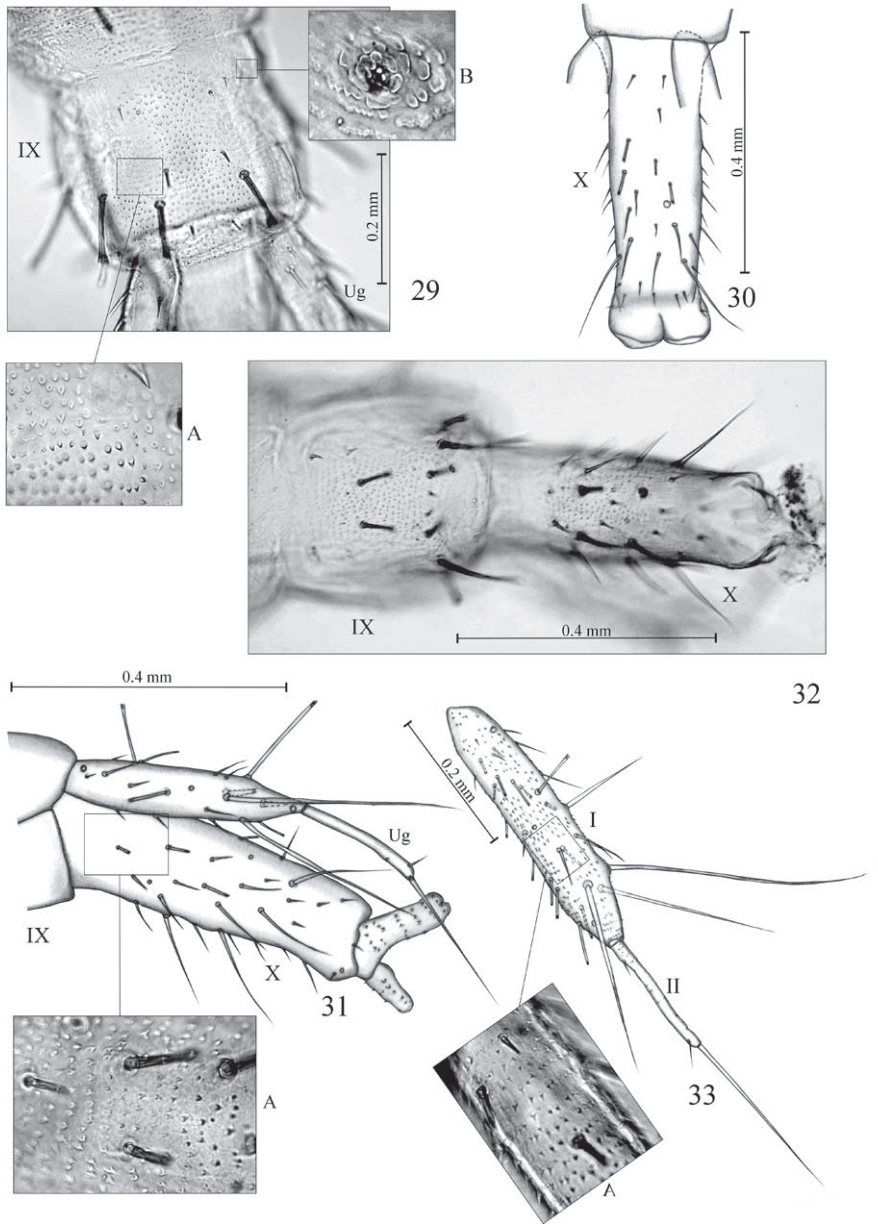
11-17. *Bisnius nitidulus*, mature larva. 11 - Right antenna in dorsal aspect; 12 - apical part of right antenna in dorsal aspect; 13 - nasale in dorsal aspect; 14 - epipharynx; 15 - right mandible in dorsal aspect; 16 - anterior part of stipes in dorsal aspect; 17 - right maxilla in dorsal aspect. Abbreviations: Cd - cardo, Gp - glandular pit, Lt_1 - Lt_3 - lateral teeth, Ma - mala, Mt - median tooth, Og - olfactory organ, Pf - palpifer, Pm - maxillary palp, Pmt - paramedian tooth, Sa - sensory appendage, So - solenidia, St - stipes, I-III - antennal segments, I-IV - segments of maxillary palp, 1, 2... - code of setae



18-22. *Bisnius nitidulus*, mature larva. 18 - Hypopharynx; 19 - labium; 20 - anterior part of prothorax in ventral aspect; 21 - fore leg in anterior aspect; 22 - apical part of fore tibia with tarsungulus. Abbreviations: Cr - cervicosternum, Cx - coxa, Fe - femur, Lg - ligula, Pl - labial palp, Pmnt - prementum, Sn - sternite, Tb - tibia, Tr - trochanter, Tu - tarsungulus, I-III - segments of labial palp, 1, 2 … - code of setae, a, b - code of pores



23-28. *Bisnius nitidulus*, mature larva. 23 - Abdominal segments I and II in lateral view; 23A - spiracle of abdominal segment I; 24 - abdominal segments III and IV in lateral aspect; 25 - abdominal tergite I; 26 - abdominal sternite I; 27 - abdominal tergite II; 28 - abdominal sternite II. Abbreviations: Ca - coeloconic sensilla, Ps - parasternite, Pt - paratergite, Sp - spiracle, St - sternite, Te - tergite, 1, 2, … - code of seta, a, b … - code of pores



29-33. *Bisnius nitidulus*, mature larva. 29 - Abdominal segment IX in dorsal aspect with microstructure (29A) and coeloconic sensilla (29B); 30 - abdominal segment X in dorsal aspect; 31 - abdominal segments X in lateral aspect with microstructure (31A); 32 - abdominal segments IX and X in ventral aspect; 33 - right urogomphus with microstructure of segment I (33A) in dorsal aspect. Abbreviations: Ug - urogomphus