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Description of the pupae of *Philonthus corvinus* ERICHSON, 1839,
Ph. micans (GRAVENHORST, 1802), and *Ph. punctus* (GRAVENHORST,
1802)
(Coleoptera: Staphylinidae)

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ABSTRACT. The pupae of *Philonthus corvinus* ER., *Ph. micans* (GRAV.) and *Ph. punctus* (GRAV.) are described and illustrated for the first time. Description of the pupa of the genus *Philonthus* CURTIS, 1829 is provided. The differences in morphological structure between the examined pupae are presented. A modification of an identification key to known pupae of Polish *Staphylininae* is also proposed.

Key words: entomology, morphology, *Coleoptera*, *Staphylinidae* *Philonthus*, *corvinus*, *micans*, *punctus*, pupa.

INTRODUCTION

Within the genus *Philonthus* CURTIS only a dozen or so pupae were described (VERHOEFF 1918, MANK 1923, SZUJECKI 1965, EGHTEDAR 1970, TAWFIK et al. 1976a, b, c, PRINS 1984, BYRNE 1993, STANIEC 1999, 2001, 2002). The authors usually consider the total length, width, number of setiform projections on pronotum and abdomen as their diagnostic characters. However, the above features may be inadequate in the case of pupae of very closely related species, e. g. those belonging to the same subgenus. In that case also some of the following morphological details should be considered: structure of spiracles, length of antennae, length of hind legs and setiform projections on abdomen, microstructure of sclerites and measurements of other parts of the body.

Philonthus corvinus, *Ph. micans* and *Ph. punctus* are widely distributed, and known from almost whole Europe. Outside Europe the first taxon was recorded from eastern Russia, Azerbaijan, Kazakhstan and Fennoscandia, the second is known from Algeria, Morocco, Turkey, Kazakhstan and North America, *Ph. punctus* is distributed in Tunisia, Algeria, Morocco, Russia, Caucasus and Turkey. In Poland the mentioned species are not very rare, each known from about a dozen localities (BURAKOWSKI at al., 1980, HERMAN 2001, LUCHT 1987). The three examined taxa are similar in their habitat requirements, and are often found in similar habitats; they are defined as a stenotopic, higrophilous and phytodetriticolous species. They inhabit swamps, lowland bogs, riverbanks, lakes and shores of other water bodies. They occur in moist places, among plant remains (*Phragmites*, *Carex*, *Sphagnum*), moss, leaf-litter and under stones (BURAKOWSKI et al. 1980, KOCH 1989). The pupae of the three above mentioned species have not been described up to date.

MATERIAL EXAMINED

Philonthus corvinus: 9 pupae (3 females); *Ph. micans*: 7 pupae (2 females); *Ph. punctus*: 6 pupae (4 females).

All examined pupae were obtained by rearing adults at room temperature. Mature individuals of *Ph. corvinus* were collected on 26 April 2002 in the "Magazyn" peat swamp nature reserve near Sobibór (SE Poland, Podlasie region). The adults were collected by sifting plant remains accumulated in tufts of *Carex*. In laboratory pupation of *Ph. corvinus* was observed from 18 until 24 May. On 13 June one pupa of that species was also collected in the field. The adults of *Ph. micans* were caught on 15-17 May 2002 in Łańcuchów near Lublin (SE Poland). They were collected by sifting leaf-litter on the shore of a small water body in a riverside carr. In laboratory pupation of *Ph. micans* was observed on 19-20 June. Imagines of *Ph. punctus* were collected on 9 May 2002 in Wola Uhruska near Włodawa (SE Poland). They were collected on an oxbow shore in the Bug river valley. In the laboratory pupation of *Ph. punctus* was observed from 30 May until 5 June. Imagines of all the examined species were determined by the author. Total drawings of live pupae were made. For more detailed studies, fragments of exuvia of pupae were used.

DESCRIPTION OF THE PUPA OF THE GENUS *PHILONTHUS* CURTIS, 1829

Pupa of obtect type, strongly sclerotized and motionless, colour from dark yellow to yellow brown or reddish brown with darker edges, becoming almost black, except for lighter wings just before emergence of imago. Head directed ventrally towards thorax, usually distinctly longer than broad. Antennae curved, protrude (slightly or distinctly) beyond apex of tibia of mid legs. Pronotum distinctly narrower than mesonotum; its anterior corners rounded; anterior margin of pronotum with long and often curved setiform projections (actually from 8 to

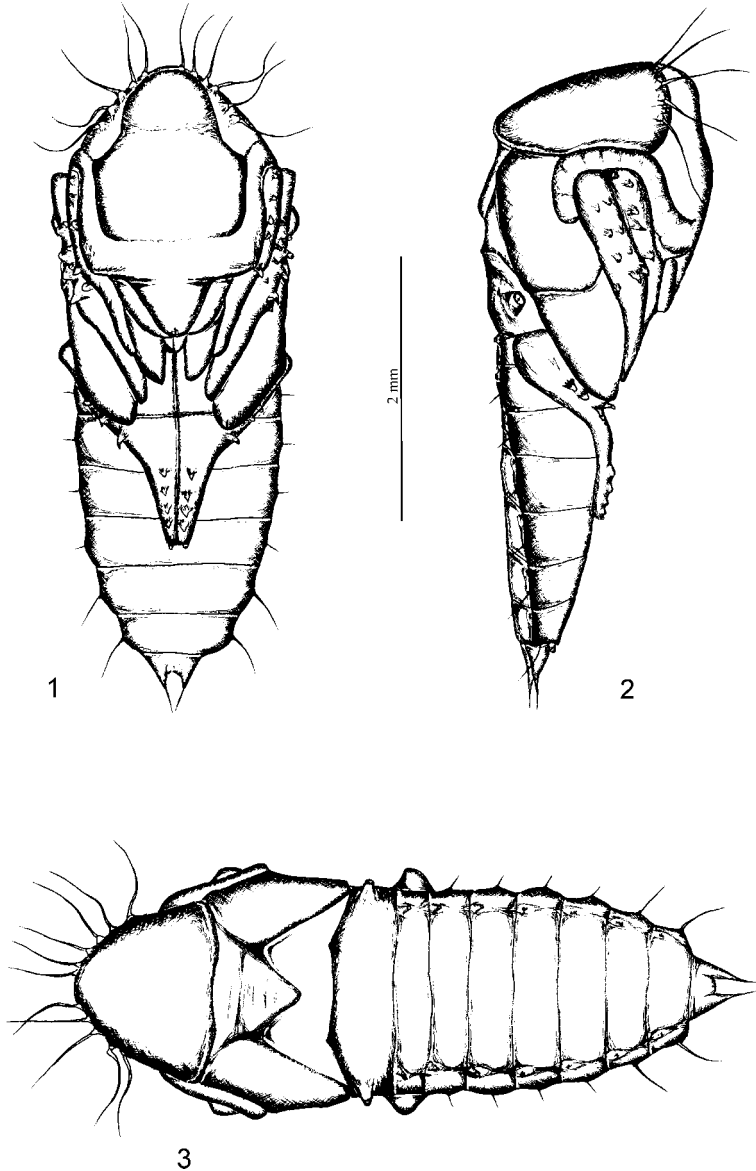
24), located on protuberances. Mesonotum distinctly broader than long. Metanotum narrower than mesonotum, with deeply bisinuate anterior margin. Wings extending to ventral side; hind margin of shortened elytra well visible in lateral view only. Tibiae and tarsi directed obliquely to middle of body. Tibiae of all legs and hind tarsi with well visible outlines of protuberances. Tibiae of hind legs always protrude beyond anterior margin of the 4th (actually 6th) well visible abdominal sternite. Abdomen distinctly dorso-ventrally flattened; with 9 tergites and 7 sternites well visible; narrowed below IV or V tergite. Abdominal tergite I distinctly longer and wider than others. Segments III-VIII or only VII and VIII each bearing a pair of setiform projections (6 or 2 pairs respectively), located on protuberances, situated at middle of lateral margin of segment. Setiform projection of segments VII and VIII always longer than others, usually curved. Terminal segment markedly sexually dimorphic; in female with double gonotheca and four prolongations, a pair of ventral (Vp) and a pair of terminal (Tp) prolongation, exceptionally ventral prolongations atrophied, e.g. in *Ph. corvinus* (Figs 17, 18); in male with single gonotheca and only two terminal prolongations (Fig. 19). All setiform projections and terminal prolongations usually with tiny, sharp cuticular processes (Figs 13-16, 20-22). Abdominal tergites I-IV with tuberculate, functional spiracles (4 pairs), the first pair situated more laterally than the rest; tergite V-VIII with externally visible, but apparently atrophied spiracles (4 pairs).

DESCRIPTIONS

Philonthus corvinus ERICHSON, 1839

Body length: 4.55-5.18 mm (mean 4.88 mm); greatest width (between hind knees): 1.82-2.17 mm (mean 2.02 mm); head width (between of eyes): 1.1-1.2 mm (mean 1.16 mm), 1.3-1.4 times as long as broad; pronotum greatest width: 1.33-1.56 mm (mean 1.46 mm), almost as long as broad at the base. Colour from dark yellow just after pupation to amber in older pupae (Fig. 1-3). Antennae reaching half length of shortened elytra (Fig. 2). Anterior margin of pronotum with 9-11 setiform projections (looking from ventral side 5/5, 5/5, 5/4, 5/4, 6/5, 6/5 projections on sides). Wings slightly protrude beyond the posterior margin of the first (actually 3rd) well visible abdominal sternite. Hind tarsi reaching 1/3 or slightly protruding beyond half length of 4th (actually 6th) well visible abdominal sternite (Fig. 1). Abdomen narrowed below sternite V (Fig. 3). Abdominal tergites I-VII close to the hind margins with characteristic microstructure similar to fish scales (Fig. 10). Abdominal tergite I nearly twice longer than the second. Segments III-VIII each bearing a pair of setiform projections on sides. Abdominal segments III-VI with setiform projections short and smooth (without cuticular processes). Segments III-VI about 2.7 times as long as setiform projections on sides (Fig. 12). Segments VII and VIII slightly longer than setiform projections on sides; setiform projections with few cuticular processes situated only apically (Fig. 14). In female

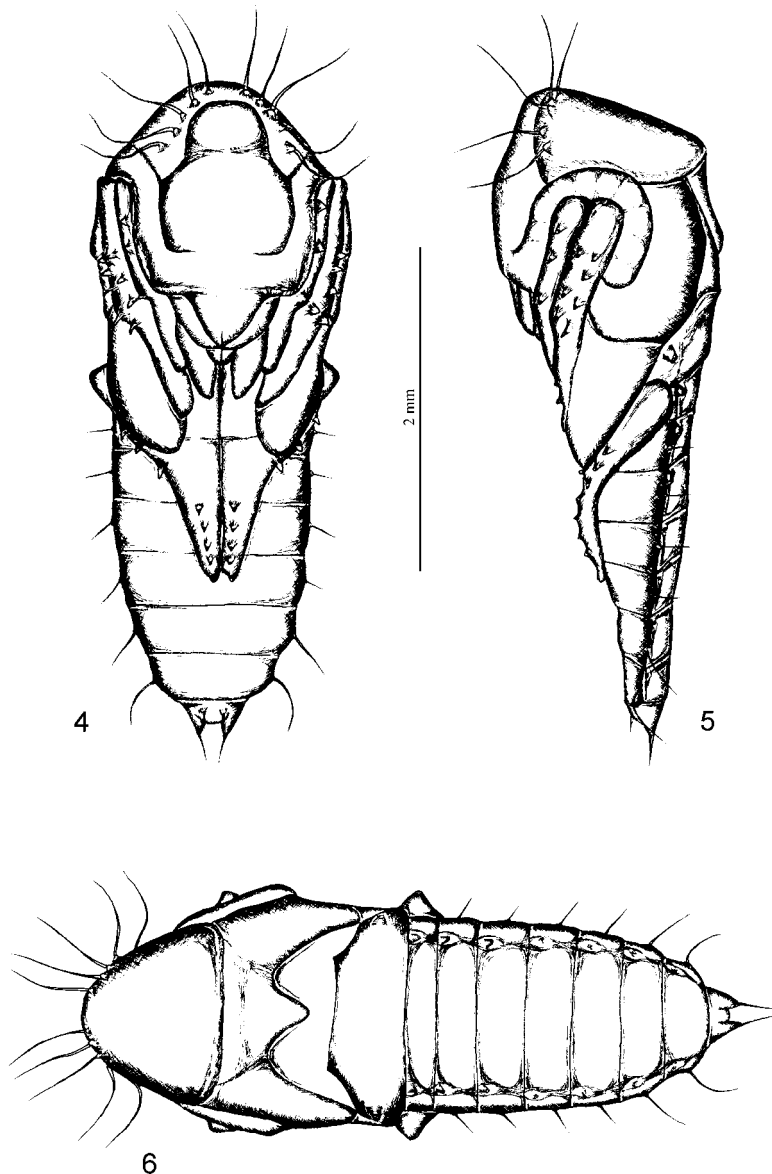
pupa ventral prolongations of sternite IX atrophied (Fig. 17); terminal abdominal prolongation slightly curved, in apical part with numerous, sharp cuticular processes (Fig. 20). Structure of IX sternite in male pupa similar as in Fig. 19. Spiracles of the first pair distinctly protruding (Fig. 3). Structure of functional and atrophied spiracle as in Figs 23, 26.



1-3. Pupa of *Philonthus corvinus*. 1 - ventral aspect; 2 - lateral aspect; 3 - dorsal aspect

Philonthus (= *Paragabrius*) *micans* (GRAVENHORST, 1802)

Body length: 3.8-4.13 mm (mean 3.98 mm); greatest width (between hind knees): 1.53-1.68 mm (mean 1.60); head width (between eyes): 0.78-0.87 mm (mean 0.81 mm), 1.3-1.4 times as long as broad; pronotum greatest width: 1.05-



4-6. Pupa of *Philonthus micans*. 4 - ventral aspect; 5 - lateral aspect; 6 - dorsal aspect

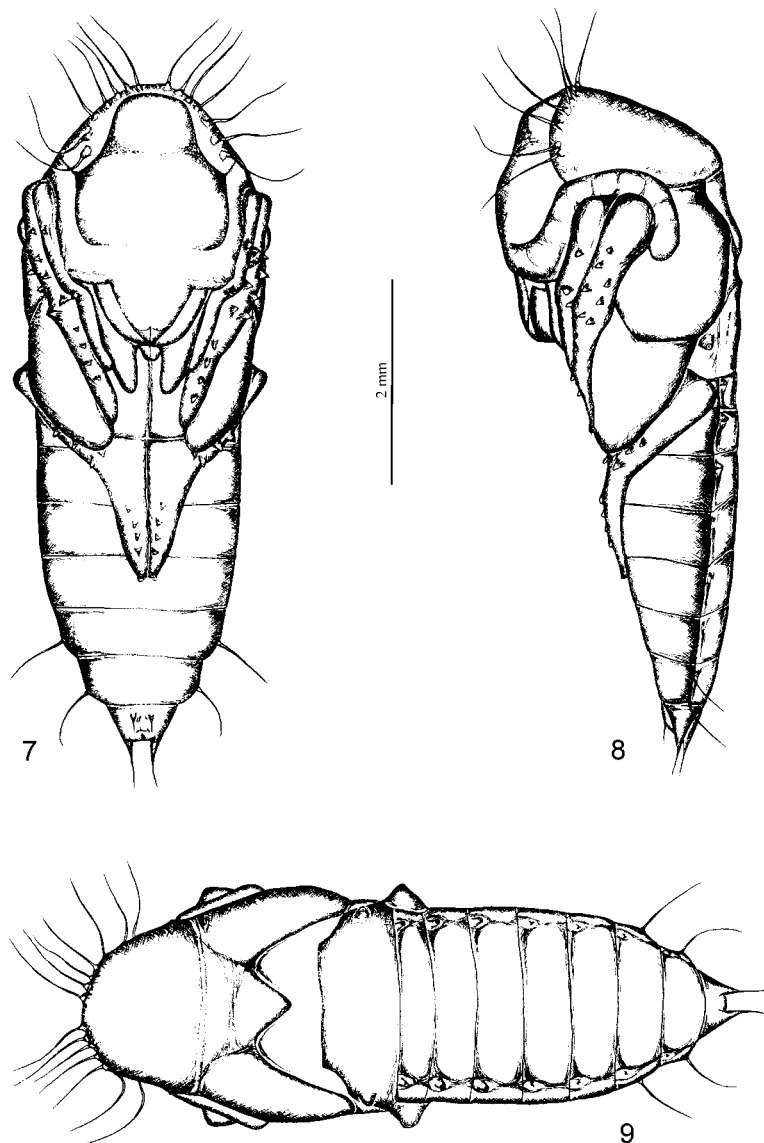
1.19 mm (mean 1.12 mm), almost as long as broad at the base (Figs 4-6). Colour yellow brown. Antennae relatively long, distinctly protrude beyond half length of shortened elytra (Fig. 5). Pronotum usually with 10, exceptionally with 11 setiform projections (looking from ventral side 5/5, 5/5, 4/6, 5/5, 5/5, 5/6, 5/5 projections on sides). Wings reaching posterior margin of the first (actually 3rd) well visible abdominal sternite. Hind tarsi reaching half length of 4th (actually 6th) well visible abdominal sternite (Fig. 4). Abdomen narrowed below sternite IV (Fig. 6). Abdominal tergites on all the surface with microstructure similar as in Fig. 11. Abdominal tergite I over twice longer than the second. Segments III-VIII each bearing a pair of setiform projections. Setiform projections on abdominal segments III-VI relatively long, with cuticular processes. Segments III-VI 1.3-1.4 times as long as setiform projections on sides (Fig. 13). Setiform projections of segments VII and VIII almost as long as segments, with numerous cuticular processes occurring on almost all length of projections (Fig. 15). Female pupa with well developed ventral prolongation of sternite IX, and terminal abdominal prolongation usually straight, in apical part with numerous, relatively densely arranged, sharp cuticular processes (Fig. 18, 21). In male pupa structure of sternite IX similar as in Fig. 19. Spiracles of the first pair moderately protruding. Structure of functional and atrophied spiracle as in Figs 24, 27.

***Ph. punctus* (GRAVENHORST, 1802)**

Body length: 5.93-6.63 mm (mean 6.32 mm); greatest width (between hind knees): 2.24-2.59 mm (mean 2.44 mm); head width (between eyes): 1.33-1.54 mm (mean 1.43 mm), 1.2 times as long as broad; pronotum greatest width: 1.58-1.82 mm (mean 1.73 mm), almost as long as broad at the base (Figs 7-9). Colour from dark yellow to yellow brown. Antennae reaching half length of shortened elytra (Fig. 8). Pronotum with 14-17 setiform projections (looking from ventral side 7/7, 7/9, 7/7, 7/7, 7/7, 8/9 projections on sides). Wings slightly protrude beyond the posterior margin of the first (actually 3rd) well visible abdominal sternite. Hind tarsi reaching half length of 4th (actually 6th) well visible abdominal sternite (Fig. 7). Abdomen narrowed below sternite V (Fig. 9). Abdominal tergites on all the surface with microstructure as in Fig. 11. Abdominal tergite I about twice longer than the second. Segments VII, VIII each bearing a pair of long setiform projections (Fig. 9). Setiform projections of segments VII distinctly longer (about 1.2 times) than segment, with numerous, tiny cuticular processes occurring on the greater part of projections (Fig. 16). Sternite IX in female pupa with well developed ventral prolongation, similar as in Fig. 18. Terminal abdominal prolongation usually straight; in the apical part with few and relatively sparsely distributed cuticular processes (Fig. 22). Structure of sternite IX in male pupa as in Fig. 19. Spiracles of the first pair moderately protruding. Structure of functional and atrophied spiracle as in Figs 25, 28.

CONCLUDING REMARKS

The structural differences between the pupae of *Ph. corvinus*, *Ph. micans* and *Ph. punctus* involve the following features: (A) measurements - body length and

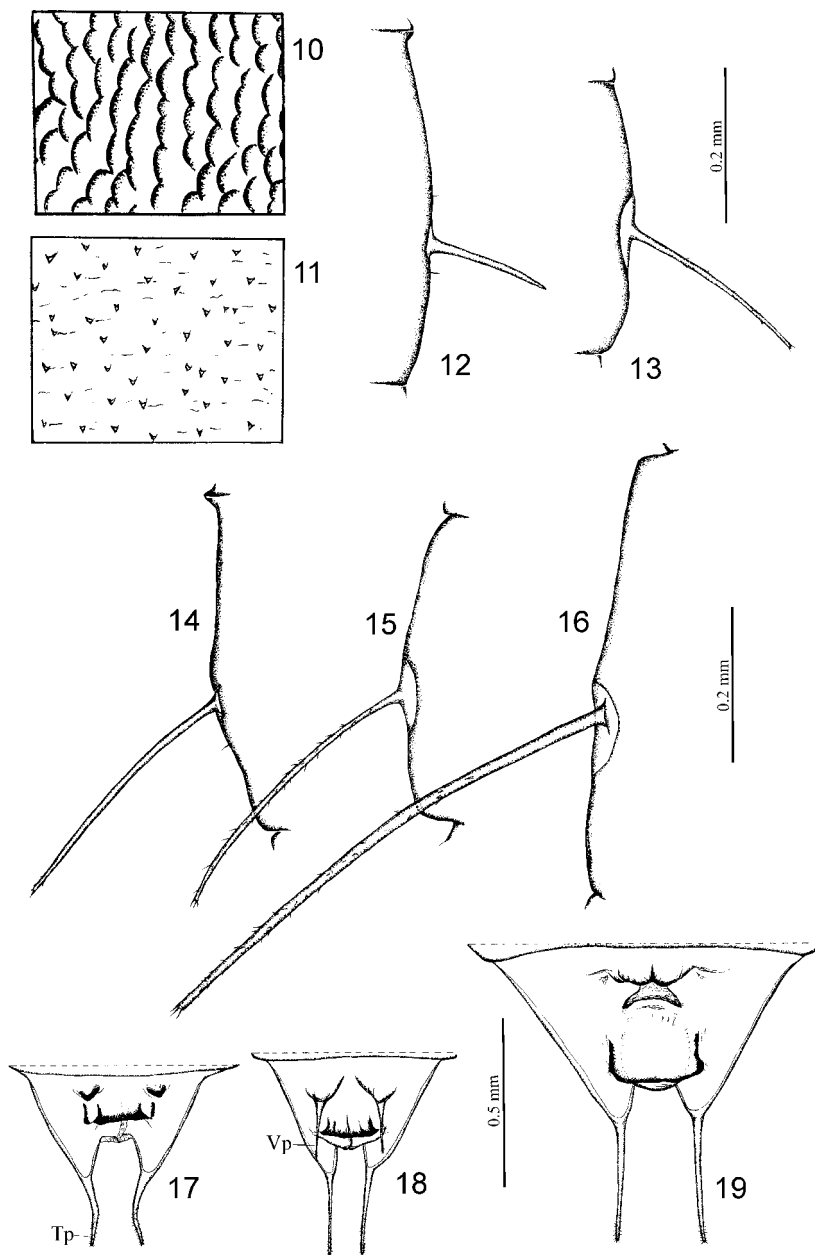


7-9. Pupa of *Philonthus punctus*. 7 - ventral aspect; 8 - lateral aspect; 9 - dorsal aspect

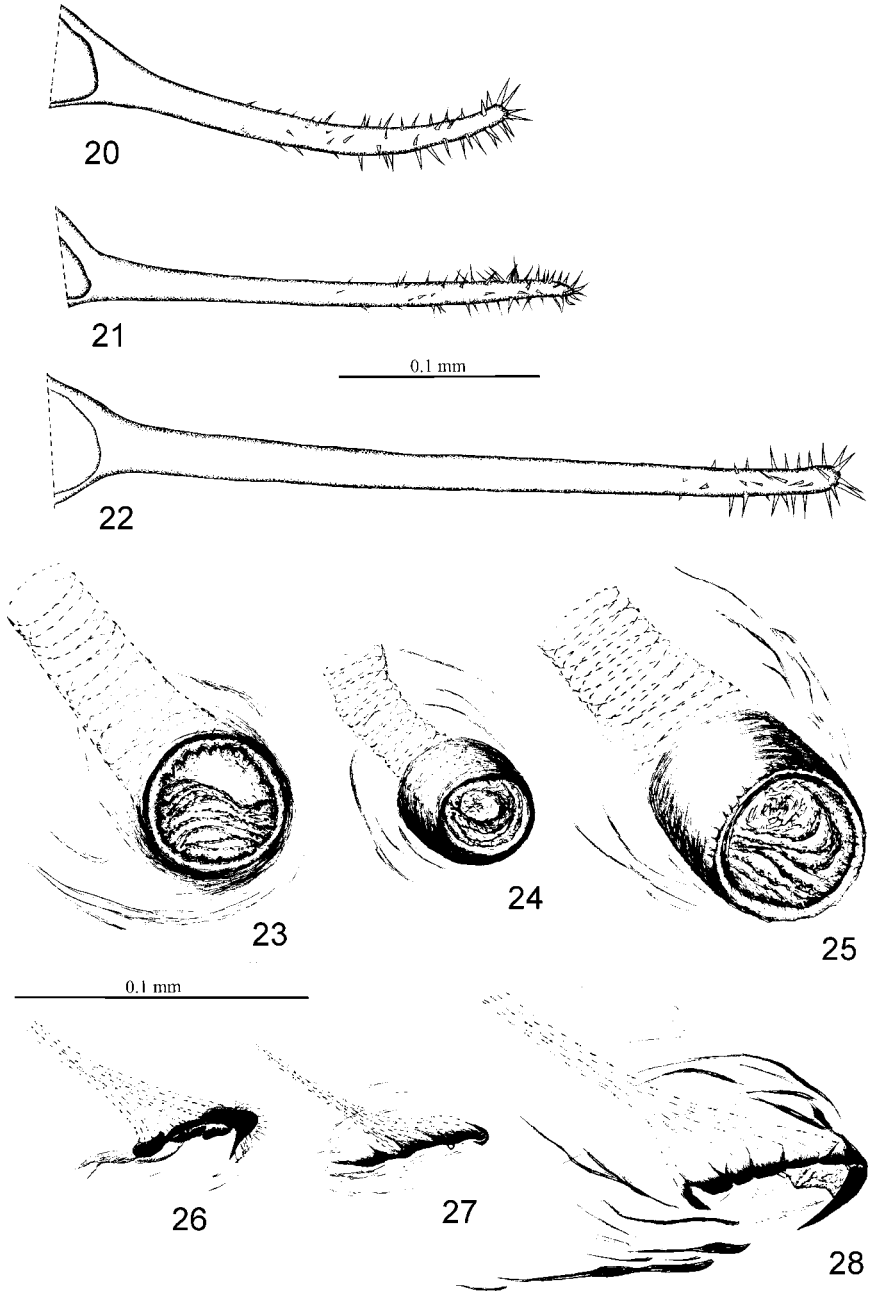
width, head and pronotum width, length of antennae and hind legs; (B) number of setiform projections located at the anterior margin of pronotum (Figs 1-9); (C) microstructure of abdominal tergites (Figs 10,11); (D) presence or absence and structure of setiform projection located laterally on abdominal segments III-VIII (Figs 1-9, 12-16); (E) presence or absence of ventral prolongations of terminal sternite in female pupa (Figs 17, 18); (F) structure of terminal abdominal prolongations (Figs 20-22); (G) structure of functional and atrophied spiracles (Figs 23-28).

In the key to known pupae of the Polish *Staphylininae* (STANIEC 2001), including pupae of *Ph. albipes* (GRAVENHORST) and *Ph. varians* (PAYKULL) (STANIEC 2002), *Ph. corvinus*, *Ph. micans* and *Ph. punctus* the following modifications are proposed from couplet 7.

7. Lateral margins of abdomen with 6 pairs of setiform projections 8.
- Lateral margins of abdomen bearing 2 pairs of setiform projections 15.
8. Anterior margin of pronotum at least with 9 setiform projections 9.
- Anterior margin of pronotum with 8 setiform projections. Body length 3.4-3.5 mm, body width 1.50-1.55 mm, head width 0.7 mm, pronotum width 0.90-0.94 mm. Antennae slightly protrude beyond half length of shortened elytra. Tarsi of hind legs reaching almost half length of 4th visible abdominal sternite. Structure of setiform projections of abdomen, terminal prolongations (spines) and spiracle as in figs 7, 9, 11, 12 (STANIEC 2002) *Philonthus albipes* (GRAV.).
9. Anterior margin of pronotum with 9-11 setiform projections 10.
- Anterior margin of pronotum with 16, 19, 22-24 13.
10. Body length 3.80-4.38 mm 12.
- Body length 4.55-6.7 mm 11.
11. Body length 4.55-5.18 mm, width 1.82-2.17 mm, head width 1.1-1.2 mm, pronotum greatest width 1.33-1.56 mm. Anterior margin of pronotum with 9-11 setiform projections. Hind tarsi reaching 1/3 or half length of 4th well visible abdominal sternite. Abdominal tergites I-VII close to hind margins with microstructure similar to fish scales (Fig. 10). Segments III-VI about 2.7 times as long as setiform projections on sides. In female pupa ventral prolongation of sternite IX atrophied (Fig. 17). Structure of setiform projections of abdomen, terminal prolongations and spiracle as in figs 12, 14, 20, 23, 26 *Philonthus corvinus* ER.
- Body length 5.2-6.7 mm, width 2.3-2.8 mm. Anterior margin of pronotum with 10 setiform projections *Philonthus longicornis* STEPH.
12. Body length 3.80-4.13 mm, width 1.53-1.68, head width 0.78-0.87 mm, pronotum width 1.05-1.19 mm. Anterior margin of pronotum with 10 (exceptionally 11) setiform projections. Hind tarsi reaching half length of 4th well visible abdominal sternite. Abdominal segments III-VI 1.3-1.4 times as long



10-19. Pupa. Microstructure of hind part of abd. tergites V of *Ph. corvinus* (10) and *Ph. punctus* (11). 12, 13. Lateral margin of abd. segment VI of *Ph. corvinus* (12) and *Ph. micans* (13). 14-16. Lateral margin of abd. segment VII of *Ph. corvinus* (14), *Ph. micans* (15) and *Ph. punctus* (16). 17-19. Terminal sternite: 17 - female of *Ph. corvinus* (Tp - terminal prolongation), 18 - female of *Ph. micans* (Vp - ventral prolongation), 19 - male of *Ph. punctus*



20-22. Terminal abdominal prolongation in pupae of *Ph. corvinus* (20), *Ph. micans* (21) and *Ph. punctus* (22). 23-28. Functional (23-25) and atrophied (26-28) spiracles in pupae of *Ph. corvinus* (23, 26), *Ph. micans* (24, 27) and *Ph. punctus* (25, 28)

- as setiform projections on sides. Structure of setiform projections of abdomen, terminal prolongations (spines) and spiracle as in figs 13, 15, 21, 24, 27
 *Philonthus micans* (GRAV.).
- Body length 4.30-4.38 mm, with 1.85-1.90 mm, head width 0.80-0.84 mm, pronotum width 1.33 mm. Anterior margin of pronotum with 10 or 11 setiform projections. Hind tarsi almost reaching posterior margin of 4th visible abdominal sternite. Abdominal segments III-VI at most twice as long as setiform projections on sides. Structure of setiform projections of abdomen, terminal prolongations (spines) and spiracle as in figs 8, 10, 13, 14 (STANIEC 2002)
 *Philonthus varians* (PAYK.).
13. Anterior margin of pronotum with 16 setiform projections. Body length 7.0-8.0 mm *Philonthus cognatus* STEPH.
- Anterior margin of pronotum with 19, 22-24 setiform projections 14.
14. Anterior margin of pronotum with 22-24 setiform projections
 *Philonthus decorus* (GRAV.).
- Anterior margin of pronotum with 19 or 22 (previously only 19 were observed) setiform projections. Body length 7.0-7.2 mm, width 3.1-3.3 mm, head width 1.8-1.83 mm, pronotum width 2.0-2.2 mm
 *Philonthus succicola* THOMS.
15. Anterior margin of pronotum with 10, 14-17 or 18 setiform projections
 16.
- Anterior margin of pronotum with more than 18 setiform projections
 20.
16. Anterior margin of pronotum with 10 setiform projections 17.
- Anterior margin of pronotum with 14-17 or 18 setiform projections 18.
17. Body length 3.9-4.3 mm, greatest width (between hind knees) 1.57-1.74 mm, head width (between eyes) 0.84-0.91 mm, pronotum width 1.12-1.33 mm. Antennae reaching almost half length of shortened elytra. Pronotum about 1.15 x as long as broad at the base. Microstructure of abdomen, structure of terminal prolongations and spiracles as in figs. 3, 5a, 9, 11, 12 (STANIEC 2001)
 *Philonthus quisquiliarius* (GYLL.).
- Body length 4.55-4.70 mm, greatest width (between hind knees) 1.92-1.96 mm, epicranium width 0.91-0.94 mm, pronotum width 1.36-1.40 mm. Antennae distinctly protrude beyond half length of shortened elytra. Pronotum about 1.3 x as broad at the base as long. Microstructure of abdomen, structure of terminal prolongations and spiracles as in figs 5b, 10, 13, 14 (STANIEC 2001)
 *Philonthus nigrita* (GRAV.).
18. Anterior margin of pronotum with 14-17 setiform projections. Body length 5.93-6.63 mm, width 2.24-2.59 mm, head width 1.33-1.54 mm, pronotum 1.58-1.82 mm. Structure of setiform projections of abdomen, terminal prolongations and spiracle as in figs 16, 22, 25, 28
 *Philonthus punctus* (GRAV.).

- . Anterior margin of pronotum with 18 setiform projections. Body length 8 or 11 mm 19.
- 19. Body length about 8.0 mm. Pronotum as long as broad. Colour dark brown *Ocypus nero* (FALD.) *semialatus* MÜLL.
- . Body length about 11.0 mm. Ratio of length to width of pronotum 3 : 3.5. Colour yellowish brown *Ocypus fuscatus* (GRAV.).
- 20. Anterior margin of pronotum with 20 setiform projections. Body length 7.5 *Abemus chloropterus* (PANZ.)
- . Anterior margin of pronotum with more than 20 setiform projections 21.
- 21. Anterior margin of pronotum with 26 setiform projections. Body length 14.7 mm *Staphylinus caesareus* CED.
- . Anterior margin of pronotum with 27 setiform projections *Ocypus aeneocephalus* (DEGEER).

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