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The pupae of *Gyrohypnus fracticornis* (MÜLLER, 1776) and *Philonthus tenuicornis* MULSANT & REY, 1853 (Coleoptera: Staphylinidae: Staphylininae)

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ABSTRACT. The pupae of *Gyrohypnus fracticornis* (MÜLLER, 1776) and *Philonthus tenuicornis* MULSANT & REY, 1853 have been described and illustrated for the first time. Diagnostic characters of the examined pupae are mentioned. Modifications of an identification key to known pupae of the Central European *Staphylininae* are also proposed.

Key words: entomology, taxonomy, morphology, Coleoptera, Staphylinidae, *Gyrohypnus fracticornis*, *Philonthus tenuicornis*, pupa.

INTRODUCTION

The paper is the first report of the pupa stage for the *Gyrohypnus* LEACH, 1819 (15 species are known in the world). Among about 1280 species of *Philonthus* STEPHENS, 1829 described in the world, only the pupae of over 20 species are known actually (VERHOEFF 1918, MANK 1923, SZUJECKI 1965, TAWFIK et al. 1976a, b, c, PRINS 1984, BYRNE 1993, STANIEC 1999, 2001, 2002, 2003, 2004a, STANIEC and KITOWSKI 2004). Recently PIETRYKOWSKA & STANIEC (in press) have also provided a detailed description of the pupa of *Hypnogyra angularis* (GANGLBAUER, 1895) and STANIEC (2004b) described the pupa of *Hesperus rufipennis* (GRAVENHORST, 1802). These species were included in related genera belonging to the tribes Xantholinini and Staphylinini (Philonthina subtribe) respectively (HERMAN 2001).

Gyrohypnus fracticornis is a very widely spread cosmopolitan species, it occurs in the Azores, Madeira, Europe, Russia, Kazakhstan, Turkey, Afganistan,

India, New Zeland, Chatham Islands, Canada, USA, Argentina, and Chile. *Philonthus tenuicornis* is distributed in Europe, Iran and Canada. Both are defined as ubiquitous and phytodetriticolous species occurring in rotten plant remains and compost heaps in synantropic biotopes generally (BURAKOWSKI at al. 1980, KOCH 1989, HERMAN 2001).

The morphology of the immature stages of the mentioned species is known fragmentarily. HINTON (1981) described eggs of both species, and MULSANT and REY (1876) provided a little information about the larval stage of *Philonthus tenuicornis*. The pupae of *G. fracticornis* and *Ph. tenuicornis* have not been described to date.

MATERIAL EXAMINED

Gyrohypnus fracticornis - 4 pupae (1 ♀); *Philonthus tenuicornis* - 7 pupae (3 ♀♀).

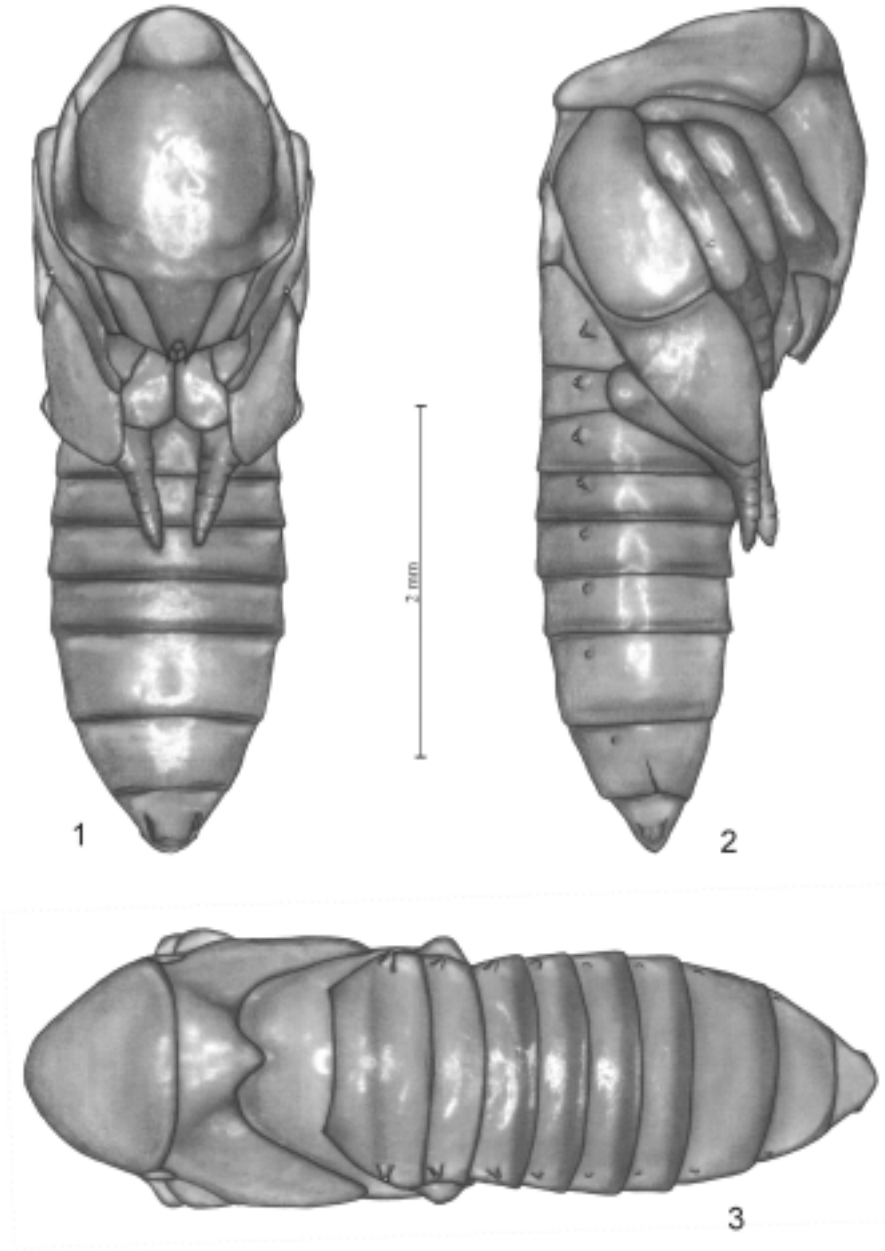
Seven larvae (L_3), two pupae together with several adults of *G. fracticornis* on the 19th of June 2004 and 20 adults of *Ph. tenuicornis* on the 4th of May 2004 were collected in Ciechanki Łańcuchowskie (SE Poland, Wyżyna Lubelska Upland).

They were obtained by sifting rotten plant remains in the meadow. Two larvae of *G. fracticornis* were reared to pupation, and one pupa reared to the adult. All examined pupae of *Ph. tenuicornis* were reared to adults. Imagines and different larval instars were fed with ant larvae daily. In laboratory the pupation of *Ph. tenuicornis* were observed on the 9th, 12th, 16-17th of June 2004. The development of this species from laid eggs to pupation lasts from 23 to 30 days (mean 27 days) at the temperature of 16-24°C. The first author determined imagines of both species. Total drawings of living pupae were made. For more detailed studies, fragments of pupal exuvia were used.

DESCRIPTION

Gyrohypnus fracticornis (MÜLLER)

Body length: 4.70-5.20 mm (mean 4.83 mm); width in widest place (between middle knees): 1.50-1.54 mm (mean 1.52 mm); head width: 0.98-1.02 mm (mean 1.00 mm); pronotum width: 1.10-1.20 mm (mean 1.12 mm). Pupa of obtect type; colour dark yellow with darker edges, becoming almost black just before the emergence of imago; body without spines or setiform projections (Figs 1-3). Head directed ventrally towards thorax about 1.4 times as long as wide, labrum about 1.1 x as wide as long at the base relatively slender (Fig. 1). Antennae curved, relatively short, reaching apex of middle tibia (Fig. 2). Pronotum 1.2 times as long as broad at the base. Wings extending to ventral side, almost reaching posterior margin of the 3rd abdominal segment (Fig. 2). Tibiae and tarsi directed obliquely to the middle of body. Each middle tibiae with one un-clearly visible outline of protuberance. Tarsi of hind legs reaching half of the length of 5th abdominal

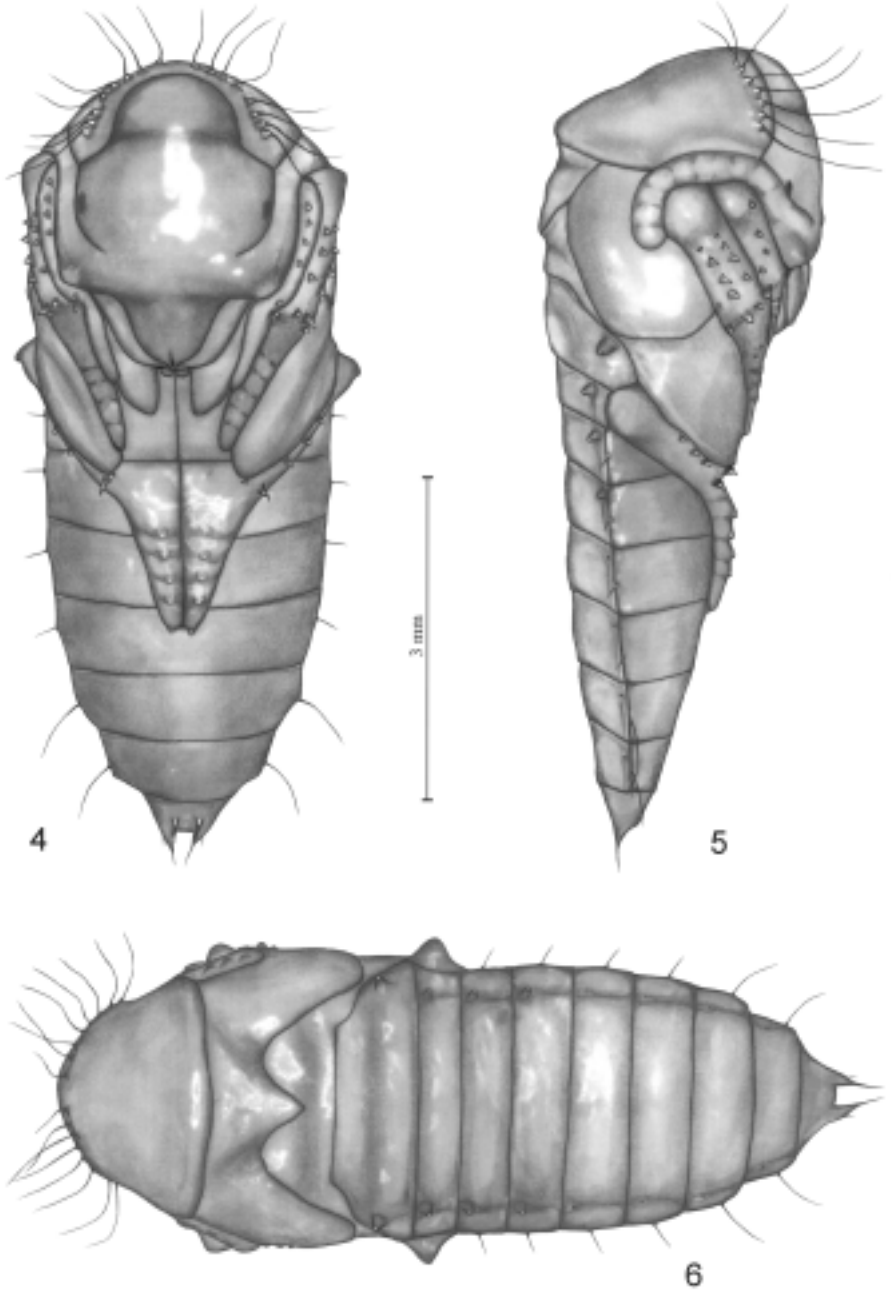


1-3. Pupa of *Gyrohypnus fracticornis*. 1 - ventral aspect; 2 - lateral aspect; 3 - dorsal aspect

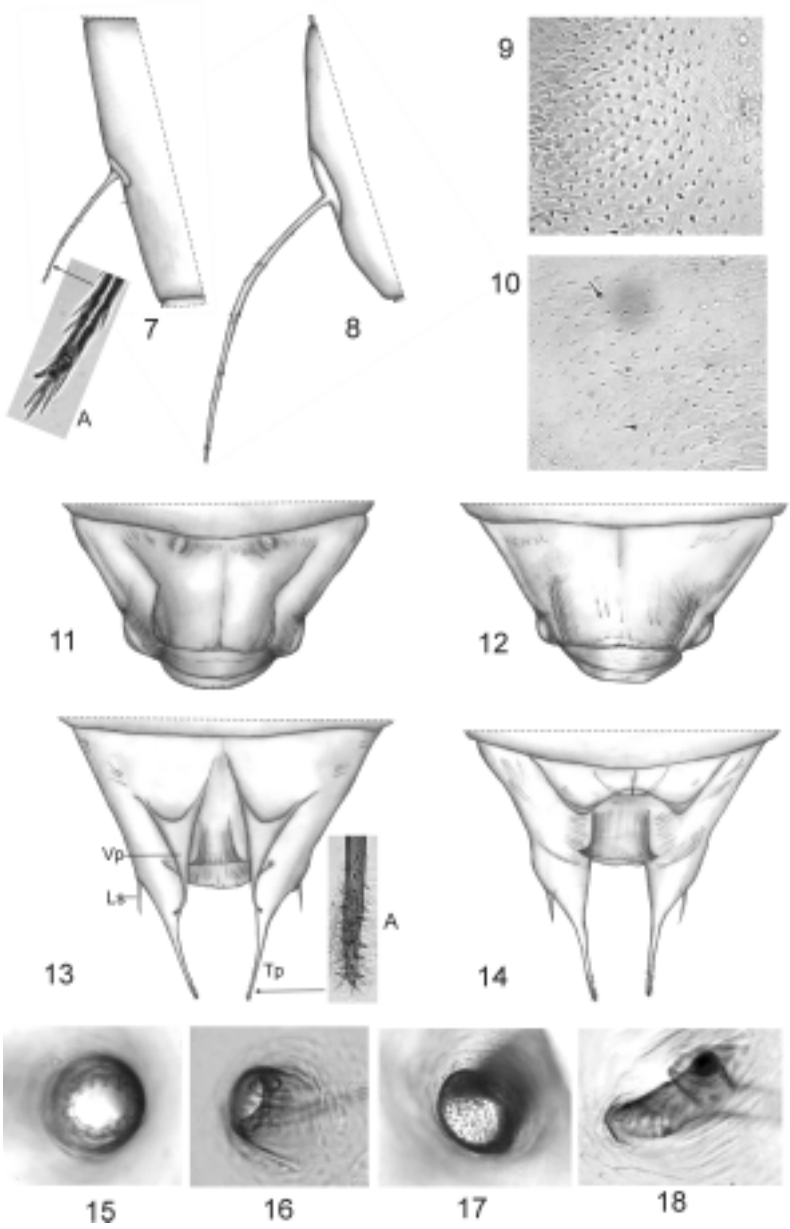
segment, looking from ventral side - 3rd visible segment (Figs 1, 2). Abdomen almost cylindrical, with 9 segments; abdominal tergites and sternites grown into uniform rings. Only cuticular ring of segment VIII still partly divided into ventral and dorsal sclerite by suture laterally. It runs from posterior margin of the segment to half of its length. Abdomen narrowed on the level of segment II, then gradually widened to segment V (broadest segment of abdomen), and finally narrowed to the terminal segment (below segment V) (Fig. 3). Abdominal segment I and VII of almost equal length, and distinctly longer than others. Abdominal segments with microsculpture as in Fig. 9. Terminal segment markedly sexually dimorphic (Figs 11, 12); in both sexes without any ventral and terminal prolongations. Abdominal tergites I-IV with tuberculate, functional spiracles (Fig. 15), tergites V-VIII with externally clearly visible but apparently atrophied spiracles (Fig. 16).

Philonthus tenuicornis Mulsant & Rey

Body length: 6.83-7.60 mm (mean 7.24 mm); width in widest place (between hind knees): 2.70-3.13 mm (mean 2.95 mm); head width (between eyes): 1.50-1.82 mm (mean 1.71 mm), 1.1-1.2 times as long as broad; pronotum width in widest place: 1.82-2.18 mm (mean 2.08 mm). Colour from dark yellow just after pupation to yellowish-brown with darker edges in older pupae (Figs 4-6). Antennae distinctly curved, reaching to almost half of length of shortened elytra (Fig. 5). Pronotum 1.2 times as broad as long at base. Anterior margin of pronotum with 16-20 setiform projections (looking from ventral side - 7/9, 8/8, 8/9, 9/9, 8/11, 10/10, 10/10 projections on sides in examined individuals). Wings extending to ventral side, distinctly protruding beyond the posterior margin of 1st clearly visible (actually 3rd) abdominal segment. Tibiae and tarsi directed obliquely to the middle of body. Each fore, middle and hind tibiae with respectively 5, 12-13 and 5 clearly visible outlines of protuberances. Hind tarsi distinctly protruding beyond hind margin of 3rd (actually 5th) clearly visible abdominal segment (Figs 4, 5). First abdominal tergite nearly two times longer than the second one. Abdomen narrowed to the terminal segment below abdominal segment V (Fig. 6). Abdominal sclerites each with tiny cuticular processes and sparse micro setae (Fig. 10). Segments III-VIII each bearing a pair of setiform projections on sides (Figs 4-8). Segments III-VI 2.2-2.3 times longer than setiform projections on sides (Figs 4, 6, 7). Segments VII and VIII at most slightly longer than setiform projections on sides (Fig. 8). All setiform projections with a few tiny cuticular processes occurring on the greater part of projections (Figs 7-8). Terminal segment with a pair of short, sharpened spines (Ls), located at the base of terminal abdominal prolongation (Tp) laterally. Sternite IX (terminal) with sexual dimorphism as in Figs 13, 14. Ventral prolongations (Vp) of sternite IX in female pupa relatively long, and usually distinctly curved centrifugally (Fig. 13). Terminal abdominal prolongation (Tp) in the apical part with numerous, sharp cuticular processes (Fig. 13A). Abdominal tergites I-IV with tuberculate, functional spiracles, first pair situated



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



7-18. Pupa of *Gyrohypnus fracticornis* (9, 11, 12, 15, 16) and *Philonthus tenuicornis* (7, 7A, 8, 10, 13, 13 A, 14, 17, 18). Figs 7-10. Lateral margin of abdominal segments VI (7) and VII (8) with structure of setiform projection on side (7A) in *Ph. tenuicornis*. Microsculpture of abdominal segment in *G. fracticornis* (9) and *Ph. tenuicornis* (10). Figs 11-14. Terminal sternite of *G. fracticornis* (11, 12) and *Ph. tenuicornis* (13, 14): 11, 13 - female (Vp – ventral prolongation, Ls – lateral spine, Tp – terminal prolongation); 12, 14 - male. Figs 15-18. Functional (15, 17) and atrophied (16, 18) spiracles in pupae of *G. fracticornis* (15, 16) and *Ph. tenuicornis* (17, 18)

more laterally than rest (Figs 5, 6, 17); tergite V-VIII with externally visible, but apparently atrophied spiracles (Fig. 18).

CONCLUDING REMARKS

The combination of the most important, diagnostic characters of the pupae of *Gyrohypnus fracticornis* (G.f) and *Philonthus tenuicornis* (P.t) is as follows: (1) body length: 4.70-5.20 mm (G.f), 6.83-7.60 mm (P.t); (2) body width: 1.50-1.54 mm (G.f), 2.70-3.13 mm (P.t); (3) head width: 0.98-1.02 mm (G.f), 1.50-1.82 mm (P.t); (4) pronotum width: 1.10-1.20 mm (G.f), 1.82-2.18 mm (P.t); (5) number of setiform projections on pronotum: 0 (G.f), 16-20 (P.t); (6) number of pairs of setiform projections on abdomen: 0 (G.f), 6 (P.t); (7) length ratio of abdominal segments and projections on sides: segments III-VI 2.2-2.3 times and segments VII-VIII at most slightly longer than setiform projections on sides respectively (P.t); (8) antennae length: reaching apex of middle tibia (G.f), reaching almost half the length of the shortened elytra (P.t); (9) number protuberances of fore, middle and hind tibiae: 0, 1 and 0 respectively (G.f), 5, 12-13 and 5 (P.t); (10) length of hind leg: tarsi reaching half the length of 3rd abdominal segment (looking from ventral side) (G.f), distinctly protruding beyond hind margin of 3rd clearly visible abdominal segment (looking from ventral side), but not reaching half the length of 4th abdominal segment (P.t); (11) structure of ventral side of terminal segment as in Figs 11, 12 (G.f) and in Figs 13, 14 (P.t); (12) structure of spiracles as in Figs 15, 16 (G.f) and in Figs 17, 18 (P.t).

In the key to the known pupae of European Staphylininae (STANIEC 2001), in order to include *Hypnogyra angularis* (PIETRYKOWSKA & STANIEC, in press), and *Gyrohypnus fracticornis* the following modifications are proposed at couplets 1 and 2.

1. Body surface without any setiform projections, spines and (except legs) protruding protuberances (Figs 38-40). Length 4.53-5.50 mm ..... 2.
-. Body surface with setiform projections or spines located on the abdomen laterally and/or on pronotum anteriorly. Pronotum and thorax sometimes with protruding protuberances ..... 3.
2. Terminal abdominal prolongations of segment IX present [Fig. 58; PIETRYKOWSKA & STANIEC (in press)]. Structure spiracles as in Figs 59-61 [PIETRYKOWSKA & STANIEC (in press)]. In moist wood dust of old deciduous trees. Length 4.53-5.50 mm ..... *Hypnogyra angularis* (GANGLBAUER).
-. Terminal abdominal prolongations of segment IX absent (Figs 11, 12). Structure spiracles as in Figs 15, 16. In rotten plant remains and compost heaps generally. Length 4.70-5.20 mm ..... *Gyrohypnus fracticornis* (MÜLLER).
3. (Formerly it was 1.). Anterior margin of pronotum bearing 0 or 2 spines. Lateral margin of abdomen with 7 pairs of spines .....

In the key to the known pupae of the Central European Philontina, including pupa of *Philonthus tenuicornis* the following modifications are proposed at couplets 1, 3 and 10 (STANIEC and KITOWSKI 2004).

KEY TO THE PUPAE OF THE CENTRAL EUROPEAN PHILONTINA

1. Lateral margins of abdomen with 6 pairs of setiform projections ..... 2.
-. Lateral margins of abdomen with 2 pairs of setiform projections ..... 10. (formerly it was 11).
2. Anterior margin of pronotum with at least 9 setiform projections. If pronotum with 8 setiform projections, then its width 1.26-1.38 mm, and head width 0.87-0.95 mm ..... 3.
-. 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 of length of the shortened elytra. Tarsi of hind legs almost reaching half of 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.).
3. Body length 6.83-8.00 mm. Anterior margin of pronotum with 16-24 setiform projections (previously it was: Anterior margin of pronotum with 8-13 or 18-22 setiform projections) ..... 3a.
-. Body length 3.42-6.70 mm ..... 4.
3a. Anterior margin of pronotum with 16-20 (exceptionally 22) setiform projections ..... 3b.
-. Anterior margin of pronotum with 22-24 setiform projections .... *Philonthus decorus* (GRAV.).
3b. Hind tarsi not reaching half the length of 4th clearly visible abdominal sternite (Fig. 4). Anterior margin of pronotum with 16-20 setiform projections. In rotten plant remains and compost heaps generally. Body length 6.83-7.60 mm ..... *Philonthus tenuicornis* MULSANT & REY.
-. Hind tarsi at least slightly protruding half the length of 4th clearly visible abdominal sternite ..... 3c.
3c. Hind tarsi slightly protruding half the length of 4th abdominal sternite (SZUJECKI 1965). Anterior margin of pronotum with 16 setiform projections. Body length 7.00-8.00 mm ..... *Philonthus cognatus* STEPH.
-. Hind tarsi reaching anterior margin of 5th clearly visible abdominal sternite (Fig. 1; STANIEC 1999). Anterior margin of pronotum with 16-20 (exceptionally 22) setiform projections (STANIEC 2004). Body length 7.00-8.50 mm .... *Philonthus succicola* THOMS.
4. Body length 3.42-4.60 mm .....

REFERENCES

BURAKOWSKI, B., MROCZKOWSKI, M., STEFAŃSKA, J., 1980. Chrząszcze Coleoptera, Kusakowate Staphylinidae, część 2. Katalog Fauny Polski, Warszawa, XXIII, 7: 1-272.

BYRNE, M., 1993. The immature stages of *Philonthus sanamus* TOTTENHAM (Coleoptera: Staphylinidae). African Entomol., **1**: 229-234.

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

HINTON, H. E., 1981. Biology of insects eggs. Vol. 2. Pergamon Press, Oxford: 475-778.

KOCH, K., 1989. Die Käfer Mitteleuropas. Ökologie, 1. Goecke und Evers Verlag, Krefeld: 440 pp.

MANK, H. G., 1923. The biology of the Staphylinidae. Ann. Ent. Soc. America, **16**: 220-237.

MULSANT, E., REY, C., 1876. Tribu des brevipennis. [Staphyliniens]. Annales de la Société d'Agriculture Histoire Naturelle et Arts utiles de Lyon, **(4) 8** [1875]: 145-856.

PIETRYKOWSKA, E., STANIEC, B., (in press). Morphology of the developmental stages of *Hypnogyra angularis* (GANGLBAUER, 1895) (Coleoptera, Staphylinidae). Dtsch. entomol. Z.

PRINS, A. J., 1984. Morphological and biological notes on some South African arthropods associated with decaying organic matter. Part. 2. Ann. South African Mus., **92**: 295-356.

STANIEC, B., 1999. A description of the pupae of *Quedius fumatus* (STEPHENS), *Quedius humeralis* STEPHENS, *Quedius mesomelinus* (MARSHAM) and *Quedius fuliginosus* (Gravenhorst) (Coleoptera: Staphylinidae: Staphylininae). Genus, **10**: 47-57.

—, 2001. A description of the pupa of *Philonthus quisquiliarius* (GYLL.) and *Ph. nigrita* (GRAV.) (Coleoptera: Staphylinidae). Pol. Pismo entomol., **70**: 39-49.

—, 2002. A description of the pupae of *Philonthus albipes* (GRAVENHORST, 1802) and *Ph. varians* (PAYKULL, 1789) (*Coleoptera*: Staphylinidae: Staphylininae). Genus, **13**: 337-343.

—, 2003. Description of the pupa of *Philonthus corvinus* ERICHSON, 1839, *Ph. micans* (GRAVENHORST, 1802), and *Ph. punctus* (GRAVENHORST, 1861) (Coleoptera: Staphylinidae). Genus, **14**: 15-26.

—, 2004a. The pupae of *Ontholestes murinus* (LINNAEUS, 1758), *Philonthus rectangulus* SHARP, 1874 and a supplement to the pupal morphology of *Philonthus succicola* THOMSON, 1860 (Coleoptera: Staphylinidae). Genus, **15**: 37-46.

—, 2004b. Description of the developmental stages of *Hesperus rufipennis* (GRAVENHORST, 1802) (Coleoptera, Staphylinidae), with comments on its biology. Ann. Zool., **54**: 287-500.

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

SZUJECKI, A., 1965. Obserwacje nad rozwojem i biologią *Philonthus fuscipennis* MANN. (Coleoptera, Staphylinidae). Fragm. Faun., **12**: 165-175.

TAWFIK, M. F. S., AWADALLAH, K. T., AMMAR, E. D., ABUL-ELA, S. M., 1976a. The life-history of *Philonthus misor* TOTT. (Coleoptera, Staphylinidae). Bull. Soc. ent. Egypte, **60**: 345-356.

—., 1976b. Life-history of the Staphylinid *Philonthus turbidus* ER. Bull. Soc. ent. Egypte, **60**: 357-366.

—, 1976c. On the bionomics of *Philonthus longicornis* STEPH. (Coleoptera: Staphylinidae). Bull. Soc. Entomol. Egypte, **60**: 379-387.

VERHOEFF, K. W., 1918. Studien Über die Organisation der Staphylinoidea. III. Zur Kenntnis der Staphyliniden-Pappen. Zeit. wiss. Insekt. Biol., **14**: 42-47, 167-171.