

Genus	Vol. 16 (1): 19-28	Wroc ³ aw, 31 III 2005
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The pupae of *Tasgius* (= *Ocypus sensu lato*) *melanarius* (HERR, 1839) and *Quedius cruentus* (OLIVIER, 1795)
(Coleoptera: Staphylinidae)

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ABSTRACT. The pupae of *Tasgius melanarius* (HERR, 1839) and *Quedius cruentus* (OLIVIER, 1795) have been described and illustrated for the first time. The 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, Coleoptera, Staphylinidae, *Tasgius*, *Quedius*, *melanarius*, *cruentus*, morphology, pupa.

INTRODUCION

The paper is the first report of the pupa stage for the *Tasgius* STEPHENS, 1829 (44 species are known in the world). Among 789 (3 doubtful) species of *Quedius* STEPHENS, 1829 described in the world, only some information of the pupae of 10 species (*Q. brevicornis* [THOMSON], *Q. capucinus* [GRAVENHORST], *Q. curtipennis* BERNHAUER, *Q. fulgidus* [FABRICIUS], *Q. fuliginosus* [GRAVENHORST], *Q. fumatus* [STEPHENS], *Q. humeralis* STEPHENS, *Q. mesomelinus* (MARSHAM), *Q. molochinus* [GRAVENHORST], and *Q. plagiatus* MANNERHEIM) have been provided so far (BORDONI 1981, DRUGMAND 1988, OUTERELO 1978, STANIEC 1996, 1999, 2003a, VORIS 1939). The morphology of the pupa stage of other closely related genera was described by BOHÁÈ 1982, BYRNE 1993, ORTH et al. 1975, PRINS 1984, STANIEC 2001, 2002, 2003b, 2004a, b, in press a, b, STANIEC & KITOWSKI 2004, SZUJECKI 1960, 1965, and TAWFIK et al. 1976a, b, c. However, the existing descriptions are often

fragmentary and require detailed supplements. In order to determine the pupae of individual species correctly, the following diagnostic and morphological features should be considered: measurements and general view of the body; presence or absence, number, structure and length of setiform projections or spines on pronotum and abdomen; microstructure of abdominal segments; structure of terminal sternite in female and male; presence or absence and structure of ventral and terminal prolongations; structure of functional and atrophied spiracles (STANIEC 1996, 1999, 2001, 2002, 2003a, b, 2004a, b, in press a, b).

Tasgius melanarius and *Quedius cruentus* are widely distributed eurytopic rove-beetles. The first insect is phyto- and humicolous staphylinid occurring in Europe, Russia, Caucasus, Turkey, Kazakhstan, Canada, and USA. The second one is phyto- and corticolous species, known from Europe, Tunisia, Algeria, Morocco, Russia, Caucasus, Turkey, India, and recently it has been recorded from USA (New York State). In Poland the two mentioned staphylinids are not common species, and somewhat similar in their habitat requirements. They usually occur in rotten plant remains, compost heaps in forests, fields and meadows. *Q. cruentus* also inhabits aged, mouldered, deciduous trees, often with holes hollowed out in the trunk, growing in old forests, former-manor parks or separately. It occurs under bark, in rotting wood, birds' nests, and in the out-flowing juice from trees (BURAKOWSKI at al. 1980, GUSAROV 2001, HERMAN 2001, KOCH 1989).

The morphology of the immature stages of the mentioned species is poorly known. Only BOHÁĚ (1982) provided the description of the first and third larval instars of *Tasgius melanarius* based on single specimens examined, and HINTON (1981) described the egg of *Quedius cruentus*. The pupae of *T. melanarius* and *Q. cruentus* have not been described to date.

MATERIAL EXAMINED

Tasgius melanarius - 5 pupae (1 ♂); *Quedius cruentus* - 11 pupae (3 ♀♀).

Twenty larvae (L_2 probably) and 4 adults (2 ♀♀) of *Tasgius melanarius* were collected by the authors in Lublin (SE Poland, Lubelska Upland) on the 13th of May 2004. The insects were obtained by sifting a compost heap in the urban park. Five larvae were reared ($T = 20^\circ\text{C} \pm 2$) to pupation (1 VI - 1 ex., 6 VI - 1 ex., 8 VI - 2 exx., 9 VI 2004 - 1 ex.), and one was brought to adult stage (12 VI 2004). Then the first author identified the species. Using living pupae the total drawings were made. For more detailed studies, fragments of exuviae of pupae were used.

Seven mature (L_3) larvae (26 IV - 4 exx., 6 V - 3 exx.), ten pupae (16 IV - 1 ex., 22 IV - 1 ex., 25 IV - 1 ex., 30 IV - 5 exx., 6 V - 2 exx.), and five adults (13 IV - 1 ex., 6 V 2004 - 4 exx.) of *Q. cruentus* were collected by the authors in Ciechanki Łañuchowskie (SE Poland, Lubelska Upland). They were obtained by sifting rotten plant remains that had been left in the meadow the previous autumn. Two mature larvae of *Q. cruentus* were reared ($T = 20^\circ\text{C} \pm 2$) to pupation (22nd and 25th of April) and coming out of the adults (2nd and 5th of May).

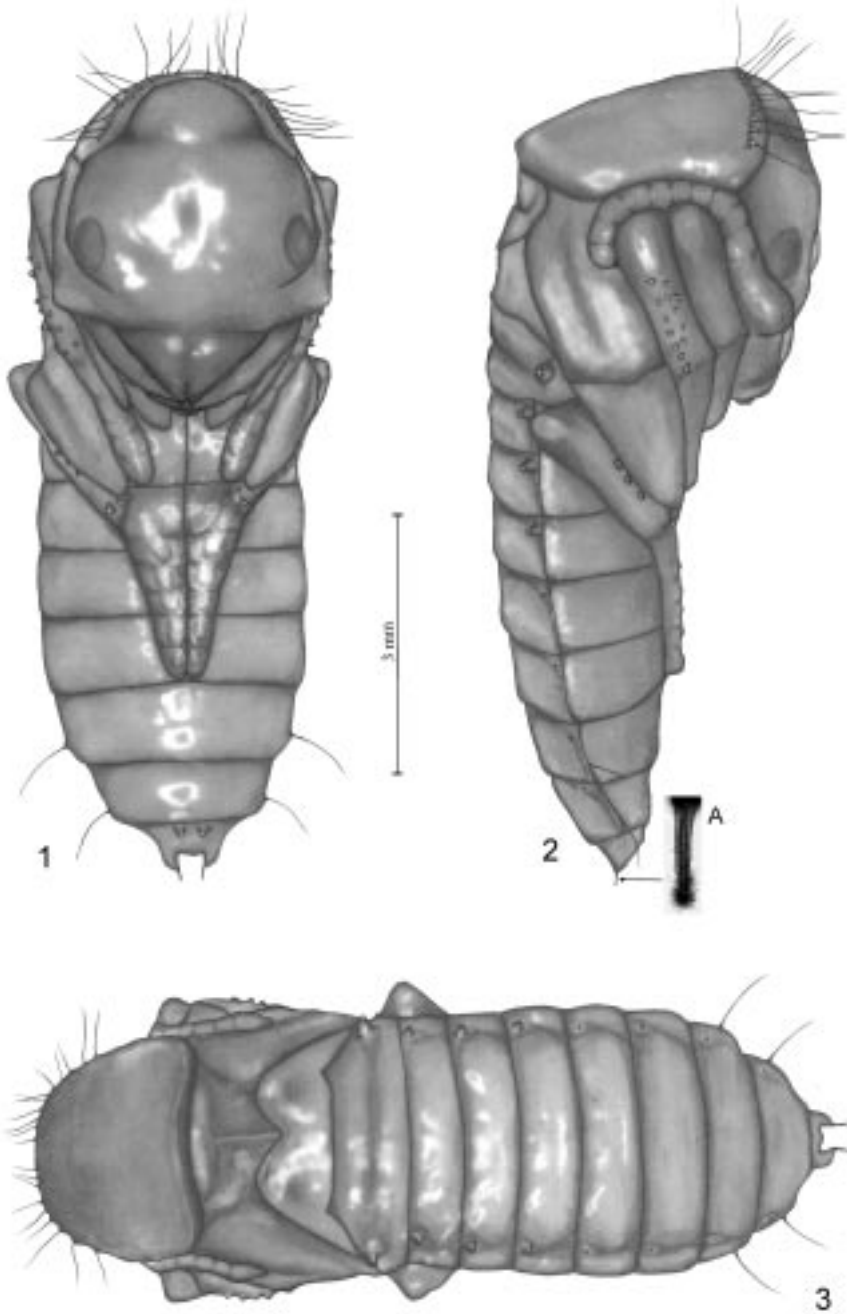
DESCRIPTION

Tasgius melanarius (HERR, 1839)

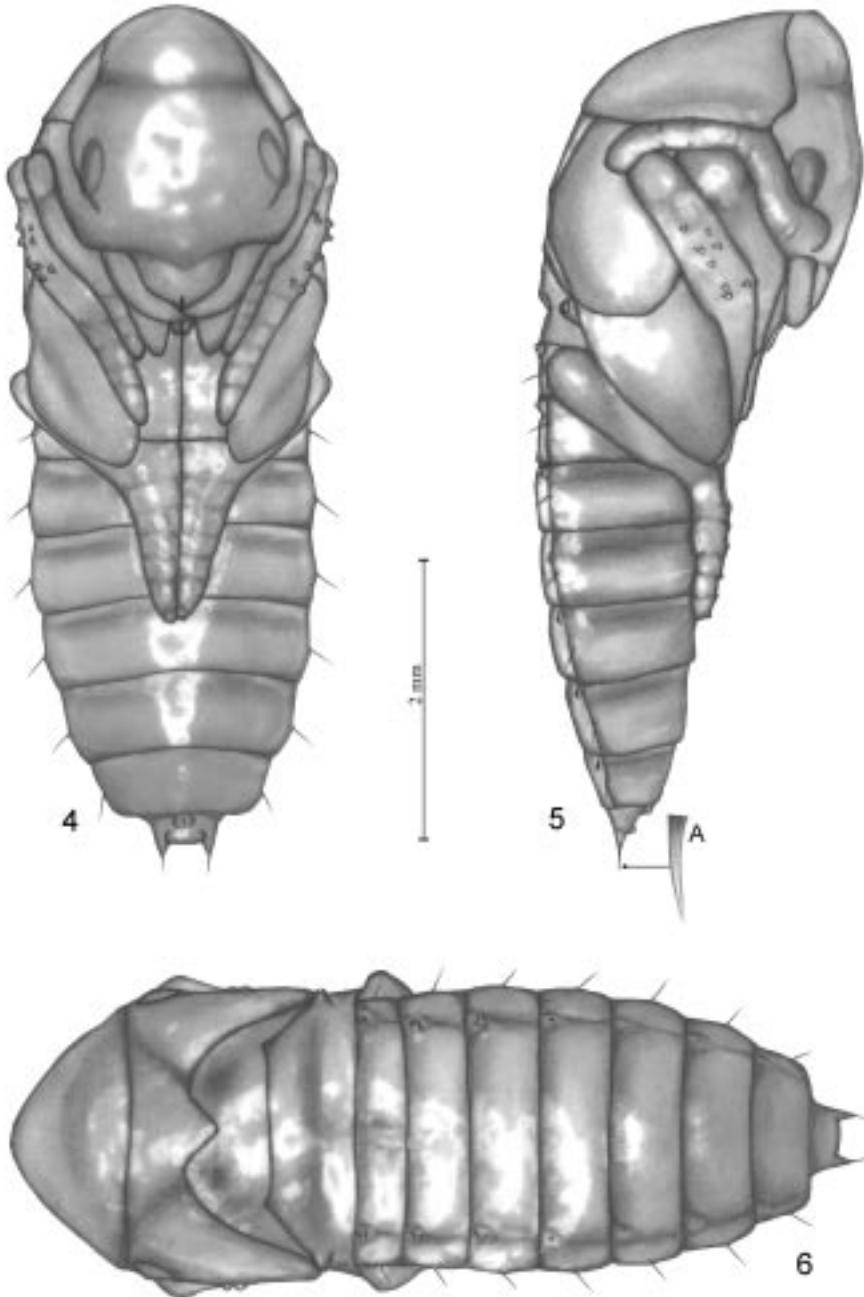
Body length: 8.75-9.33 mm (mean 9.02 mm); width in widest place (between hind knees): 3.65-3.88 mm (mean 3.76 mm); head width (the level of eyes): 2.73-2.93 mm (mean 2.82 mm); head length: 2.68-2.75 mm (mean 2.73 mm); pronotum width in widest place: 2.50-2.63 mm (mean 2.60 mm), 1.1 times as long as broad (at the base). Colour reddish brown with darker edges, turning into almost black just before the emergence of imago. Labrum triangular, about twice as wide (at the base) as long (Fig. 1); mandible distinctly crossed, long and relatively slender. Antennae curving backwards, around the base of middle leg, reaching a little over 1/3 the length of the shortened elytra (Fig. 2). Pronotum with 17 or 20 setiform projections (looking from ventral side 9/11, 8/9, 10/10, 10/10 projections on sides in the examined specimens). Wings extending to ventral side; slightly protruding posterior margin of 2nd (clearly visible as 1st) abdominal sternite (Figs 1, 2); hind margin of shortened elytra clearly visible only at lateral view. Tibiae and tarsi directed obliquely to the middle of the body. Middle and hind tibiae with 13 and 5 respectively well visible outlines of protuberances. Hind tarsi reaching posterior margin of 5th (clearly visible as 4th) abdominal sternite (Figs 1, 2). Abdomen dorso-ventrally flattened; with 9 tergites and 7 sternites visible; gradually and slightly widened from segment II to segment V, and then narrowed below this segment to the terminal part of the body (Fig. 3). Abdominal tergite I about 1.5 x longer than the 2nd tergite. Abdominal tergites and sternites with the reticulate microstructure as in Fig. 7. Both abdominal segments VII and VIII bearing a pair (2 pairs in all) of setiform projections on sides. Setiform projections with sparse, tiny cuticular processes occurring on the whole length of the projections. Abdominal segments VII and VIII at most slightly longer than setiform projections (Figs 1, 3, 7). Terminal sternite with marked sexual dimorphism (Figs 9, 10), a pair of relatively short, ventral prolongations (Vp) - only in female pupa, and a pair of terminal abdominal prolongations (Tp). Terminal prolongations with tiny cuticular processes concentrated generally in their apical parts (Fig. 2A). Abdominal tergites I-IV with tuberculate, functional spiracles, 1st pair situated more laterally than the rest (Figs 2, 3, 11); tergites V-VIII with externally visible but apparently atrophied spiracles (Figs 2, 3, 13).

Quedius cruentus (OLIVIER, 1795)

Body length: 5.40-6.40 mm (mean 5.98 mm), width in widest place (between hind knees): 2.00-2.58 mm (mean 2.40 mm); head width (the level of eyes): 1.20-1.75 mm (mean 1.50 mm); head length: 1.26-2.10 mm (mean 1.77 mm); pronotum width in widest place: 0.94-1.19 mm (mean 1.11 mm), 1.1 times as broad (at the base) as long. Colour from yellowish brown with darker edges, to almost black just before the emergence of imago. Labrum more or less trapeziform, about twice



1-3. Pupa of *Tasgius melanarius*. 1 - ventral aspect; 2 - lateral aspect (A - terminal prolongation);
3 - dorsal aspect



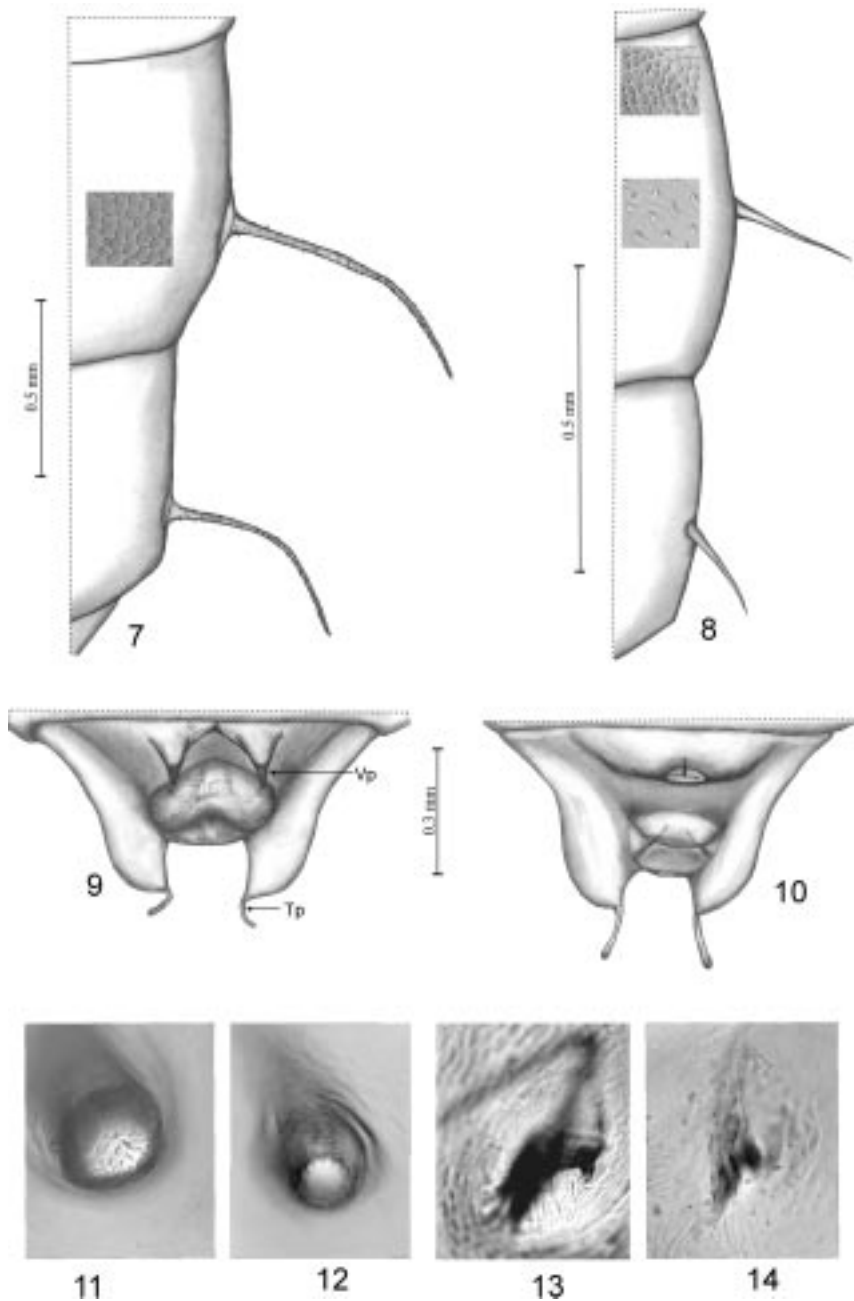
4-6. Pupa of *Quedius cruentus*. 4 - ventral aspect; 5 - lateral aspect (A - terminal prolongation); 6 - dorsal aspect

as wide (at the base) as long (Fig. 4); mandible crossed only in the apical parts, relatively short. Antennae relatively short, curving backwards, protruding slightly beyond apex of middle tibia (Fig. 5). Wings extending to ventral side, protruding slightly beyond the posterior margin of the 2nd (clearly visible as 1st) abdominal sternite (Figs 4, 5); hind margin of shortened elytra clearly visible in lateral view only (Fig. 5). Tibiae and tarsi directed obliquely to the middle of the body. Middle tibiae with 8 clearly visible outlines of protuberances. Tarsi of hind legs with 5 protuberances, protruding distinctly beyond anterior margin of the 4th (clearly visible as 3rd) abdominal sternite (Figs 4, 5). Abdomen flattened dorso-ventrally; with 9 tergites and 7 sternites visible; gradually and slightly widened from segment II to segment IV, and then narrowed below this segment to the terminal part of the body (Fig. 6). Abdominal segment I wider and longer than others. Each segments II-VIII bearing a pair of spines (7 pairs in all), situated closely to middle of lateral margin. Abdominal segments 2.2-2.7 x as long as spines, with different microsculpture on anterior and remaining parts (Fig. 8). Terminal sternite with sexual dimorphism marked similarly as in Figs 7, 8: STANIEC 1999. Abdominal tergites I-IV with tuberculate, functional spiracles, the first pair situated more laterally than the rest (Figs 5, 6, 12); tergites V-VIII with externally visible but apparently atrophied spiracles (Figs 5, 6, 14).

CONCLUDING REMARKS

The combination of the most important, diagnostic characters of the pupae of *Tasgius melanarius* (T.m) and *Quedius cruentus* (Q.c) is as follows: (1) body length: 8.75-9.33 mm (T.m), 5.40-6.40 mm (Q.c); (2) body width: 3.65-3.88. mm (T.m), 2.00-2.58 mm (Q.c); (3) head width: 2.73-2.93 mm (T.m), 1.20-1.75 mm (Q.c); (4) pronotum width: 2.50-2.63 mm (T.m), 0.94-1.19 mm (Q.c); (5) number of setiform projections on pronotum: 20 or exceptionally 17 (T.m), 0 (Q.c); (6) number of pairs of setiform projections on abdomen: 2 (T.m), 7 (Q.c); (7) length ratio of abdominal segments and projections (spines) on sides: segments VII and VIII at most slightly longer than projections (T.m), segments 2.2-2.7 times as long as spines (Q.c); (8) antennae length: reaching a little over 1/3 the length of the shortened elytra (T.m), protruding slightly beyond apex of middle tibia (Q.c) (Figs 2, 5); (9) number of protuberances of middle and hind tibiae: 13 and 5 respectively (T.m), 8 and 0 respectively (Q.c); (10) length of hind leg: tarsi reaching posterior margin of 5th abdominal sternite (T.m), protruding beyond anterior margin of the 4th abdominal sternite, but not reaching its half length (Q.c) (Figs 1, 2, 4, 5); (11) structure of ventral and terminal prolongation as in Figs 9, 10 (T.m) and respectively as in Figs 7, 8 (STANIEC 1999) (Q.c); (12) structure of spiracles as in Figs 11-14.

In the key to the known pupae of the Central European Staphylininae (STANIEC 2003b), including the pupa of *Tasgius melanarius*, the following modifications are proposed to the couplets 15 and 20:



7-14. Lateral margin of abdominal segments VII and VIII of *T. melanarius* (7) and *Q. cruentus* (8). Terminal sternite of *T. melanarius*: 9 - female (Vp - ventral prolongation, Tp - terminal prolongation), 10 - male. Functional (11, 12) and atrophied (13, 14) spiracles in pupae of *T. melanarius* (11, 13) and *Q. cruentus* (12, 14)

15. Anterior margin of pronotum with 10, 14-17 or 18 setiform projections 16-19
 [here *Philonthus quisquiliarius* (GYLL.), *Ph. nigrita* (GRAV.), *Ph. punctus* (GRAV.), *Ocypus nero semilatus* MÜLL., *O. fuscatus* (GRAV.)]
 –. Anterior margin of pronotum with more than 18 setiform projections. Exceptionally pronotum with 17 setae, then body length over 8.5 mm 20.
 20. Anterior margin of pronotum with 20 setiform projections..... 20a
 –. Anterior margin of pronotum with more than 20 setiform projections 21.
 20a. Body length 7.5 mm. Antennae reaching apex of middle legs.
 *Abemus chloropterus* (Payk.)
 –. Body length 8.6-9.3 mm. Antennae protruding distinctly beyond apex of middle legs, reaching a little over 1/3 of the length of the elytra
 *Tasgius melanarius* HERR

A key to the well-known pupae of the Central European *Quedius* species (STANIEC 1996, 1999, 2003a), including the pupa of *Quedius cruentus* is given below.

Key to the known pupae of the *Quedius* species

1. Anterior margin of pronotum with 2 spines 2.
 –. Anterior margin of pronotum without spines 4.
 2. Body length 3.9-5.0 mm, head width 1.0-1.3 mm, surface of abdominal spines smooth 3.
 –. Body length 5.5-6.0 mm, head width 1.5-1.6, body width 2.0-2.2 mm, surface of abdominal spines with numerous protuberances, tarsi of hind legs almost reaching hind margin of visible abdominal sternite III, colour dark yellow. Functional and atrophied spiracles as in Figs 2c, 2d (STANIEC 1996). Pupae always occur under the bark of trees. *Quedius plagiatus* MANN.
 3. Body length 3.9-4.5 mm, head width 1.0-1.1 mm, body width 1.7-1.9 mm. Pronotum: width 1.3-1.4 mm, length 1.2-1.3 mm. A pair of spines on pronotum well visible; length 144 mm each. Tarsi of hind legs distinctly protrude beyond the middle of the length of the 4th visible abdominal sternite. Medial abdominal segments (III-VI) each about 2.8 times as long as lateral abdominal spines. Colour dark yellow to yellowish brown. Functional and atrophied spiracles as in Figs 21, 22 (STANIEC 1999) *Quedius humeralis* STEPH.
 –. Body length 4.7-5.0 mm, head width 1.2-1.3, body width 2.1-2.3 mm. Pronotum: width 1.6-1.7 mm, length 1.5-1.6 mm. A pair of spines on pronotum very short; length 45 mm each. Tarsi of hind legs slightly protrude beyond posterior margin of the 3rd visible abdominal sternite. Medial abdominal segments (III-VI) each about 7.3 times as long as lateral abdominal spines. Colour reddish brown. Functional and atrophied spiracles as in Figs 19, 20 (STANIEC 1999). *Quedius fumatus* (STEPH.).
 4. Body length 5.4-6.4 mm. 5.
 –. Body length (6.4) 6.8-8.2 mm 6.

5. Hind tarsi distinctly protrude beyond half of the length of the 4th clearly visible abdominal sternite (Figs 9, 10; STANIEC 1999). Pronotum width (in the widest place) 2 mm, body length 5.9-6.4 mm, body width (between hind knees) 2.5-2.6 mm. Functional and atrophied spiracles as in Figs 23, 24 (STANIEC 1999).
..... *Quedius mesomelinus* (MARSH.).
- . Hind tarsi protruding beyond anterior margin of the 4th clearly visible abdominal sternite, but not reaching half of its length (Figs 4, 5). Pronotum width 0.94-1.19 mm, body length 5.40-6.40 mm, body width 2.00-2.58 mm. Functional and atrophied spiracles as in Figs 12, 14
..... *Quedius cruentus* (OLIVIER).
6. Body length 6.8-7.0 mm, head width 1.8-1.9, body width 2.8-2.9 mm, pronotum width 2.3-2.5 mm. Antennae distinctly protrude beyond the apex of the middle tibiae. Segments III-VI each 3 times longer than spines on sides. Functional and atrophied spiracles as in Figs 25, 26 (STANIEC 1999). Pupae always occur in leaf litter of the moist leafy forests.
..... *Quedius fuliginosus* (GRAV.).
- . Body length 6.93-8.25 mm (6.4 mm by DRUGMAND [1988]), body width 2.74-3.38 mm, pronotum width 2.25-2.80 mm. Antennae slightly protrude beyond the apex of the middle tibiae. Segments III-VI each 2.4-2.5 times longer than spines on sides. Functional and atrophied spiracles as in Figs 37, 38 (STANIEC 2003a). Pupae always occur in tree hollows
..... *Quedius brevicornis* (THOMS.).

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