

Genus	Vol. 17(4): 483-492	Wrocław, 28 XII 2006
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The pupae of *Quedius brevis* ERICHSON, 1840 and *Quedius microps*
(GRAVENHORST, 1847)
(Coleoptera: Staphylinidae)

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ABSTRACT. The pupae of *Quedius brevis* ER. and *Quedius microps* (GRAV.) have been described and illustrated for the first time. The diagnostic characters of the examined pupae are mentioned. The modifications of an identification key to known pupae of the Central European subtribe *Quediina* are also proposed.

Key words: entomology, morphology, Coleoptera, Staphylinidae, Staphylininae, *Quedius brevis*, *Quedius microps*, pupa.

INTRODUCTION

Among 789 (three doubtful) species of *Quedius* STEPHENS, 1829 described in the world, actually some information on the pupae of 11 species only: *Q. brevicornis* (THOMSON), *Q. capucinus* (GRAVENHORST), *Q. cruentus* (OLIVIER), *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) has been provided so far (BORDONI 1981, DRUGMAND 1988, OUTERELO 1978, STANIEC 1996, 1999, 2003a, STANIEC & PIERYKOWSKA 2005, VORIS 1939). The morphology of the pupa stage of other closely related genera was also described by BOHÁČ 1982, BYRNE 1993, ORTH et al. 1975, PRINS 1984, STANIEC & KITOWSKI 2004, STANIEC 2001, 2002, 2003b, 2004a, b, 2005, in press, SZUJECKI 1960, 1965, and TAWFIK et al. 1976a, b, c. However, even the existing descriptions require detailed supplements. In order to determine the pupae of individual *Quedius* species correctly as well as the species of other

closely related genera, the following diagnostic, 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, absence or presence and structure of ventral and terminal prolongations, structure of functional and atrophied spiracles (STANIEC 1996, 1999, 2001, 2002, 2003a, b, 2004a, b, 2005, in press).

Quedius brevis is an eurytopic, myrmecophilous and silvicolous species distributed in Europe and Russia. It occurs in forests and their margins, where it inhabits ants' nests, generally of the genus of *Formica* and *Lasius*. In consideration of its myrmecophilous mode of life, the species is rather (also in Poland) rarely collected. *Q. microps* is a stenotopic, silvicolous, nidicolous and xylo-detriticolous rove-beetle occurring in Central Europe generally. Its numerous localities were recorded also in Great Britain, Denmark, France, Italy, Norway, Sweden, and Finland. The species inhabits aged, mouldered, deciduous trees (*Fagus*, *Quercus*, *Betula*, *Ulmus*, *Acer*, *Tilia*) often with holes hollowed out in the trunk, growing in old forests, former-manor parks or separately. It is recorded in rotting wood often in the neighbourhood of ants' nests of the genus *Lasius*, e.g. *L. brunneus*, *L. fuliginosus*, and in nests of small mammals rarely (e.g. *Talpa*, *Cricetus*) (BURAKOWSKI at al., 1980, KOCH 1989, HERMAN 2001). The pupae of both of the above mentioned staphylinids have not been described to date.

MATERIAL EXAMINED

Quedius brevis - 2 pupae (1m, 1f); *Quedius microps* - 4 pupae (3mm, 1f f).

All examined pupae of both species were obtained by rearing adults at the temperature of 5-15°C in 2004/2005. The adults of *Q. brevis* were collected by the authors in: Sosnowica (FC40) on the 1st of October (8 exx.); Klarów near Lublin (FB07) on the 3rd of October, and 18th, 27th of December (17 exx.); Wola Żarczycka near Leżajsk (FA06) on the 14th of December (3 exx., leg. M. ZAGAJA). They were obtained by sifting the building material of ants' nests of *Formica* sp.

The adults of *Q. microps* were collected by the authors in Bochothnica near Puławy (EB69) and Palikije near Lublin on the 3rd of November (13 exx., 7 exx., respectively). The beetles were extracted from moist wood dust of the lime-tree (*Tilia cordata* Mill.) and maple (*Acer platanoides* L.) with holes hollowed out in the trunk. These trees grow on the forest margin and in an ex-manor park.

On the basis of laboratory observations, the pupation was observed on the 6th and 11th of February for *Q. brevis*, and 1st, 5th, 9th and 12th of March for *Q. microps*. At the temperature of 7-21°C the development of *Q. brevis* (from eggs to pupa) lasts 34-42 days (mean 38 days), while that of *Q. microps* 26-43 days (mean 35 days). Imagines and larval instars were fed with flies' (*Drosophila* sp.) larvae daily.

The total drawings of living pupae were made. For more detailed studies, fragments of pupal exuvia were used. The second author determined imagines of both species.

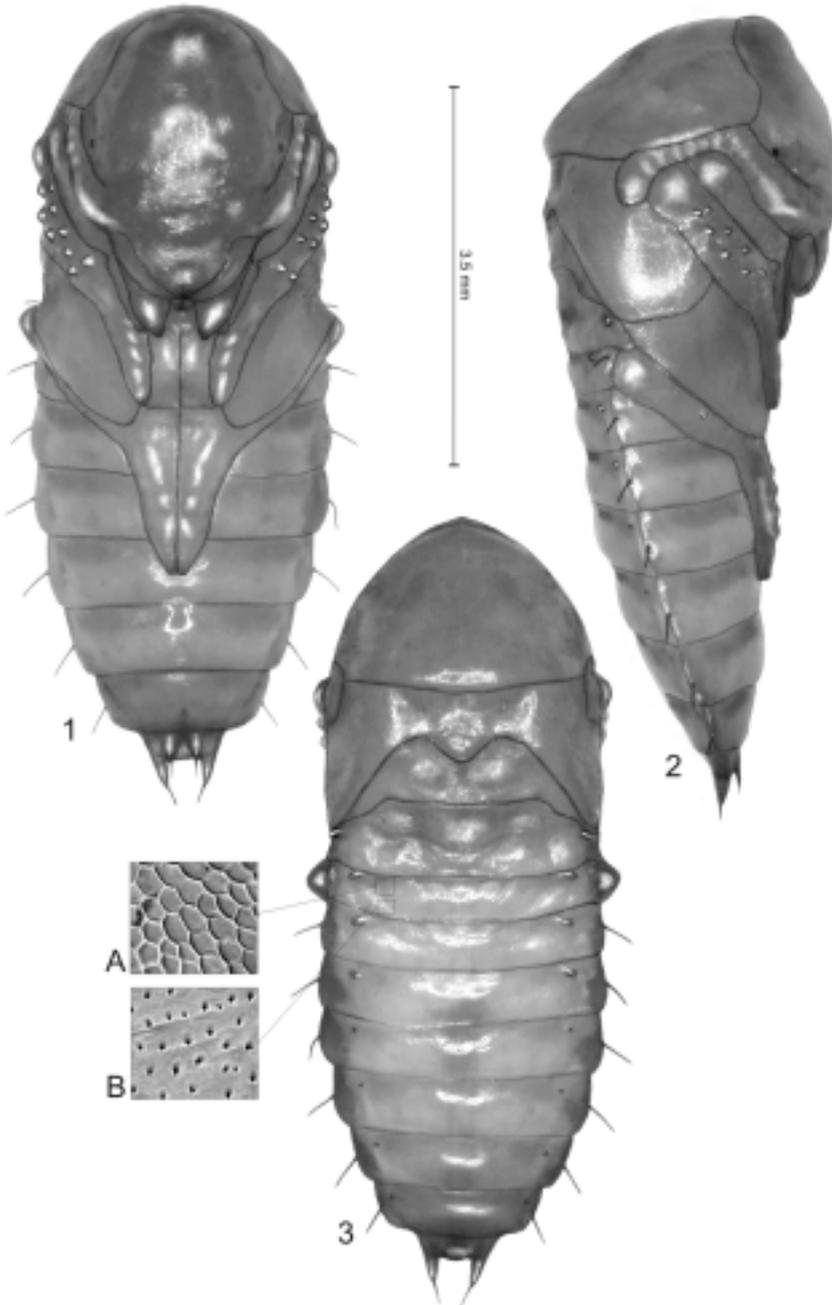
DESCRIPTION

***Quedius brevis* ERICHSON, 1840**

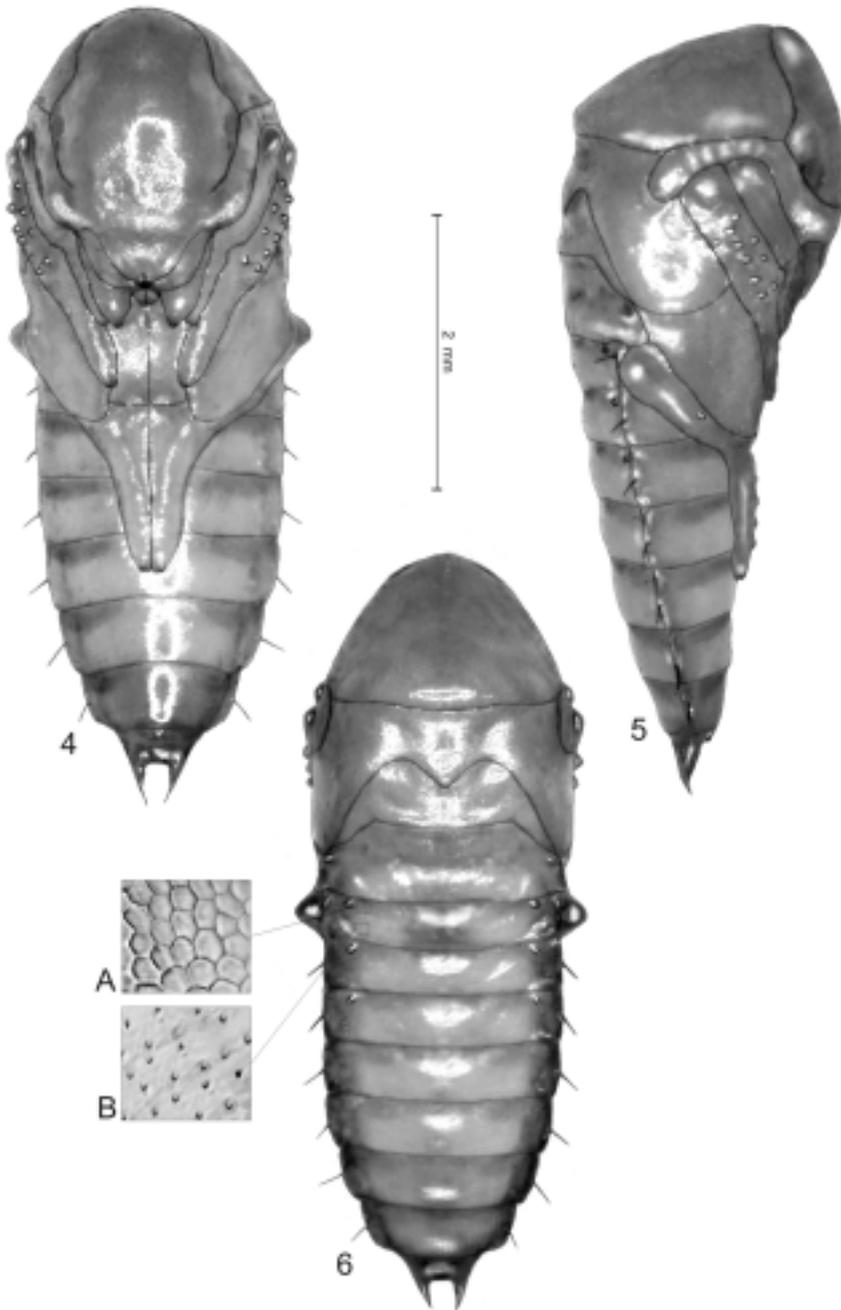
Body length (without abdominal process): 6.94-7.72 mm (mean 7.33 mm); body width in the widest place (between hind knees): 2.83-3.0 mm (mean 2.92 mm); head width 1.92 mm; pronotum: width 2.51 mm, about 1.5 times as broad (at the base) as long; body relatively stocky. Colour dark yellow. Head directed ventrally towards thorax, about 1.4 times as long as wide (Figs 1-3). Antennae curved, protruding beyond apex of mid tibia. Wings extending to ventral side, distinctly protruding beyond the posterior margin of 1st (actually 3rd) clearly visible, from ventral side, abdominal segment (Figs 1, 2). Tibiae and tarsi directed obliquely to the middle of the body. Each middle tibia with 8-9 outlines of protuberances, hind tibiae with one clearly visible and one tiny protuberance. Tarsi of hind legs reaching half of length of 4th (looking from ventral side) (actually 6th) well visible abdominal segment (Figs 1, 2). Abdomen with 9 segments, widest on the level of segments IV and V, gradually narrowed to the terminal segment below segment V (Fig. 3). Abdominal tergite I 1.7 times longer than tergite II. Segments with the microsculpture as in Figs 3A, B. Each of abdominal segments II-VIII bearing a pair of setiform projections on sides (Figs 1, 3, 7). Segment II only slightly longer (1.3 times) than setiform projections, segments III-VIII from 1.6 (segment III) to 2.3 (segment VIII) times longer than applicable projections. Terminal segment markedly sexually dimorphic (Figs 9, 11). Abdominal sternite IX with two ventral prolongations (Vp) in female pupa and terminal abdominal prolongation (Tp) as in Figs 9, 13. Abdominal tergites II-IV with tuberculate, functional spiracles (Fig. 14), tergites V-VIII with externally clearly visible but apparently atrophied spiracles (Fig. 16).

***Quedius microps* (GRAVENHORST, 1847)**

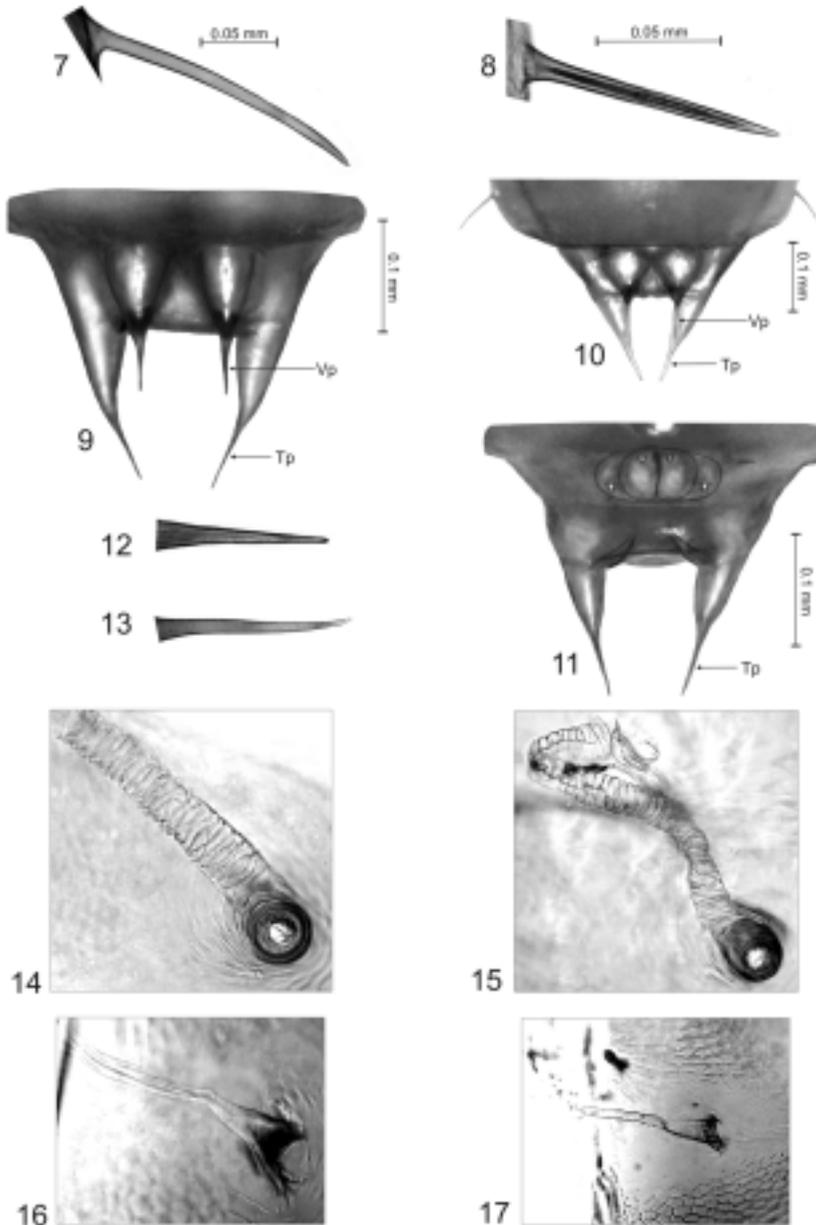
Body length (without abdominal process): 5.13-5.59 mm (mean 5.4 mm); body width in the widest place (between hind knees): 2.05-2.29 mm (mean 2.18 mm); head: width (between eyes), 1.30-1.40 mm (mean 1.35 mm), 1.4 times as long as broad; pronotum width in widest place: 1.62-1.84 mm (mean 1.76 mm), 1.2-1.4 times as broad (at the base) as long. Colour dark yellow, margins and bases of abdominal segments yellowish-brown, abdominal setae brown (Figs 4-6). Antennae distinctly curved, protruding the apex of mid tibia (Fig. 5). Wings extending to ventral side, distinctly protruding beyond the posterior margin of 1st (actually 3rd) clearly visible abdominal segment. Tibiae and tarsi directed obliquely to the middle of the body. Middle and hind tibiae with respectively 10-11 (6-8 tiny) and 1-2 visible outlines of protuberances. Hind tarsi reaching half of length of 4th (actually 6th) clearly visible from ventral side, abdominal segment (Figs 4, 5). First abdominal tergite about twice (2.0-2.2 times) longer than the second one. Abdomen narrowed to the terminal segment below abdominal segment V. Abdominal sclerites with microstructure as in Figs 6A, B. Segments II-VIII each bearing a pair of setiform projections on sides (Figs 4-6, 8). Segments



1-3. Pupa of *Quedius brevis*. 1 - ventral aspect; 2 - lateral aspect; 3 - dorsal aspect; 3A - microstructure of anterior part of 2nd abdominal tergite; 3B - microstructure of posterior part of 2nd abdominal tergite



4-6. Pupa of *Quedius microps*. 4 - ventral aspect; 5 - lateral aspect; 6 - dorsal aspect, 6A - microstructure of anterior part of 2nd abdominal tergite; 6B - microstructure of posterior part of 2nd abdominal tergite



7-17. Pupa of *Quedius brevis* (7, 9, 11-14, 16) and *Quedius microps* (8, 10, 15, 17). Figs 7, 8. Abdominal, lateral, setiform projection of *Q. brevis* (7) and *Q. microps* (8). Figs 9-11. Terminal sternite of *Q. brevis* (9, 11) and *Q. microps* (10): 9, 10 - female (Vp - ventral prolongation, Tp - terminal prolongation); 11 - male (Tp - terminal prolongation). Figs 12, 13. Prolongations of *Q. brevis*, ventral (12), terminal (13). Figs 14-17. Functional (14, 15) and atrophied (16, 17) spiracles in pupae of *Q. brevis* (14, 16) and *Q. microps* (15, 17)

II-VI 2.8-3.6 times as long as setiform projections on sides, segments VII and VIII 2.3-2.4 times as long as setiform projections. Sternite IX (terminal) with sexual dimorphism. Ventral prolongations (Vp) of sternite IX in female pupa as in Fig. 10. Abdominal tergites I-IV with tuberculate, functional spiracles, first pair situated more laterally than rest (Figs 5, 6, 15); tergite V-VIII with externally visible, but apparently atrophied spiracles (Fig. 17).

CONCLUDING REMARKS

The combination of the most important, diagnostic characters of the pupae of *Q. brevis* (Q.b) and *Q. microps* (Q.m) is as follows: (1) body length: 6.94-7.72 mm (Q.b), 5.13-5.59 mm (Q.m); (2) body width: 2.83-3.0 mm (Q.b), 2.05-2.29 mm (Q.m); (3) head width: 1.92 mm (Q.b), 1.30-1.40 mm (Q.m); (4) pronotum width: 2.51 mm (Q.b), 1.62-1.84 mm (Q.m); (5) pronotum, the ratio of width (at the base) to length: 1.5 (Q.b), 1.2-1.4 (Q.m); (6) antennae length: protruding apex of middle tibia (Q.b), (Q.m); (7) length of hind leg: tarsi reaching half of length of 4th abdominal segment (looking from ventral side) (Q.b), (Q.m); (8) length ratio of abdominal segments to projections on sides: segments II-VI: 1.3-2.0 (Q.b), 2.8-3.6 (Q.m), segments VII-VIII: 1.9-2.3 (Q.b), 2.3-2.4 (Q.m); (9) number of protuberances on middle tibiae: 8-9 (Q.b), 10-11 (Q.m); (10) structure of ventral side of terminal segment in female as in Fig. 9 (Q.b) and Fig. 10 (Q.m); (11) structure of functional and atrophied spiracles as in Figs 14, 16 (Q.b) and Figs 15, 17 (Q.m).

A key to the well-known pupae of the Central European subtribe *Quediina* species (STANIEC 1996, 1999, 2003a), including the pupa of *Q. brevis* and *Q. microps* is given below.

KEY TO THE KNOWN PUPAE OF THE *QUEDIINA* SPECIES

1. Body surface without any spines or projections *Acylophorus wagenschieberi* KIESENW.
- . Abdomen with spines or projections 2.
2. Anterior margin of pronotum with 2 spines 3.
- . Anterior margin of pronotum without spines 5.
3. Body length 3.9-5.0 mm, head width 1.0-1.3 mm, surface of abdominal spines smooth 4.
- . Body length 5.5-6.0 mm, head width 1.5-1.6 mm, surface of abdominal spines with numerous protuberances. Body width 2.0-2.2 mm. 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.
4. 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 clearly 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.).
5. Body length 5.13-6.40 mm 6.
- . Body length (6.4)6.8-8.25 mm 8.
6. Hind tarsi distinctly protrude beyond half of 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 reaching at most the middle of length of 4th abdominal clearly visible sternite. 7.
7. Hind tarsi protruding beyond anterior margin of the 4th clearly visible abdominal sternite, but not reaching half of its length (Figs 4, 5; STANIEC & PIETRYKOWSKA 2005). 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 11, 13 (STANIEC & PIETRYKOWSKA 2005) *Quedius cruentus* (OLIVIER).
- . Hind tarsi reaching the middle of length of the 4th clearly visible abdominal sternite (Figs 4, 5). Pronotum width 1.62-1.84 mm (mean 1.76 mm), body length 5.13-5.59 mm, body width 2.05-2.29 mm. Functional and atrophied spiracles as in Figs 15, 17. Pupae inhabit aged, mouldered, deciduous trees, often with holes hollowed out in the trunk *Quedius microps* (GRAV.).
8. Hind tarsi distinctly protruding beyond half of length of the 4th clearly visible abdominal sternite. 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 as long as spines on sides. Functional and atrophied spiracles as in Figs 25, 26 (STANIEC 1999). Pupae usually occur in leaf litter of the moist leafy forests *Quedius fuliginosus* (GRAV.).
- . Hind tarsi reaching half of length of 4th clearly visible abdominal sternite ... 9.
9. Segments III-VI each 2.4-2.5 times as long as spines on sides. Antennae slightly protrude beyond the apex of the middle tibiae (Fig. 34; STANIEC 2003a). Functional and atrophied spiracles as in Figs 37, 38 (STANIEC 2003a). Pupae always occur in the tree hollows *Quedius brevicornis* (THOMS.).

- Segments III-VI each at most two times as long as spines on sides. Antennae protrude beyond the apex of the middle tibiae (Fig. 2). Functional and atrophied spiracles as in Figs 14, 16 *Quedius brevis* ER.

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