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Article

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First record of the hygropetric genus *Oocyclus* Sharp (Coleoptera: Hydrophilidae) from Laos, with description of a new species

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Abstract

The genus *Oocyclus* Sharp, 1882 is recorded from Laos for the first time. Two species are recognized, including a new species: *O. rupicola* **sp. n.** and *O. thailensis* Short et Swanson, 2005. Male genital segments and female spermathecal organs are illustrated, and the latter is also described for each species. SEM photographs of several useful taxonomic features are provided. Digital photographs of the holotype of *O. rupicola* are provided (online version in color). A key to the species of the genus from the Indochina peninsula is given.

Key words: Coleoptera, Hydrophilidae, *Oocyclus*, new record, new species, Laos, hygropetric habitats, spermatheca, taxonomy

Introduction

The genus *Oocyclus* Sharp, 1882 (Hydrophilidae: Hydrophilinae: Laccobiini) is widely distributed in the Indo-Malayan and Neotropical Regions, comprising 31 species and a single subspecies (Hansen, 1999; Short & Hebauer, 2006). Species of the genus are generally restricted to hygropetric habitats, and it is perhaps for that reason that specimens of the genus are relatively rare in most museum collections (Short & Perkins, 2004). The hygropetric habitat is important for the development, or life cycle of some aquatic or semi-aquatic insects, such as Hemiptera, Trichoptera, Diptera, and Coleoptera (e.g., Ward, 1992; Vitheepradit & Sites, 2007). Therefore, a better understanding of the fauna of hygropetric habitats will add to our knowledge of the biodiversity and ecology of inland water biotopes. Several studies on the genus *Oocyclus* were published in recent years. Hebauer and Wang (1998) described eight species and a single subspecies from the Indo-Malayan Region and provided a key to all known species. Subsequently, Short & Perkins (2004) and Short & Swanson (2005) described eight and six new species from Mesoamerica and Thailand respectively. Moreover, Short & Perkins (2004) provided details on the habitat and collecting methods of representatives of this genus.

In 2008, I had an opportunity to conduct fieldwork in Laos, a landlocked Asian country located in the Indochina peninsula. Laos and adjacent region are well known to possess high biological diversity and endemism, and sadly, also a high rate of habitat loss rate; consequently, the region is considered a biodiversity hotspot (Mittermeier *et al*., 1998; Myers *et al*., 2000). I was able to collect *Oocyclus* species from a wet rock surface in central Laos. After careful examination, the individuals were confirmed to comprise two species: *O. thailensis* Short et Swanson, 2005, and an undescribed species which were cohabitating on the same rock face.

Material and methods

In this study I used dried or 80% ethanol preserved specimens. Observations and dissections were mainly carried out using Olympus SZ40 stereoscopic microscope and Olympus BX40 compound light microscope;

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illustrations were made with the aid of a drawing tube. SEM photographs were taken using a Hitachi S-2250N scanning electron microscope.

The body parts (except female spermathecal organs) were carefully removed and dissected with tweezers and placed into 10% KOH solution. They were subsequently warmed in the liquid for about 60–90 minutes at 60°C, rinsed with 80% ethanol, and dehydrated in 99% ethanol; some of them were stained in lactic acid containing acid fuchsine and warmed in the liquid for 60–120 minutes at 60°C before being rinsed. Observation in glycerol or Euparal (Chroma-Gesellschaft). Female spermathecal organs were examined as follows: the genital segment was carefully removed from the specimen, and placed into 10% KOH solution mixed with one or two drops of saturated solution of chlorazol black E dye (Wako Pure Chemical) in 70% ethanol. The parts were warmed in the liquid for about 30–90 minutes at 30–60°C, and then, were rinsed and dissected with same density KOH solution. The organ was examined in diluted 10% KOH solution or distilled water. Their parts were mounted in Euparal on a slide glass card, which was pinned under the specimen (Maruyama, 2004), or were preserved in a small glass tubes with glycerol, which was pinned under the specimen.

Body measurements were taken using a micrometric eyepiece at 20x magnification with an accuracy of ±0.025 mm; measurements of female spermathecal organ were performed with ImageJ image processing software (National Institutes of Health, USA) based on the digital photograph. Measurements were given in text in the order of range, arithmetic mean ± standard deviation; the latter two are in parenthesis. The abbreviations of measurements used in the present paper are as follows: HW—width of head; ED—distance of between eyes; PL—length of pronotum; PW—width of pronotum; EL—length of elytron along sutural line; EW—maximum width of elytra; TL—total length (PL plus EL).

Specimen data of holotype followed the original spellings between quotation marks. A forward slash (/) indicates a subsequent line of the label and a double forward slash (//) indicates separate labels.

The materials used for this study are deposited in the following collections:

EUMJ	Laboratory of Entomology, Ehime University, Matsuyama, Ehime, Japan (M. Sakai).
KSEM	University of Kansas, Lawrence, KS, USA (A.E.Z. Short).
MYC	Collection of Yûsuke Minoshima, Sapporo, Hokkaido, Japan.
SEHU	Systematic Entomology, Hokkaido University, Sapporo, Hokkaido, Japan (M. Ôhara).

Regarding the morphological terminology I generally follow Hansen (1991) and Komarek (2004). For the female spermathecal organ I also refer to Lindroth and Palmén (1970) and Bameul (1992).

Results

Genus *Oocyclus* Sharp, 1882

Oocyclus rupicola Minoshima, sp. n.

(Figs. 1–3)

Type Locality. Laos: Bolikhamxai Province, 11km Southwest by West of Ban Pakha, Route 8, N18°11.83´, E104°36.19´, alt. 580 m.

Type material. Holotype: Male. “[LAOS: MiYu-L-08-039] Route 8,” / “11km SWbW of Ban Pakha,” / “Bolikhamxai prov.” / “(hygropetric: wet rock);” / “alt. 580m; N18°11.83´, E104°36.19´;” / “25.V.2008; MINOSHIMA Yûsuke leg.” // “MiYu-D-00140” / “MINOSHIMA Yûsuke” / “SEHU, Japan” // “HOLOTYPE” / “Oocyclus rupicola” / “Minoshima” / “det. MINOSHIMA Yûsuke” / “2009” // “0000007945” / “Sys.Ent.” / “Hokkaido Univ.” / “Japan [SEHU]” [“D-00140”, handwritten on a slide glass card](SEHU). **Paratypes:** 8 males and 10 females, same locality as holotype (EUMJ, KSEM, SEHU (7946–7952), MYC).

FIGURE 1. *Oocyclus rupicola* **sp. n.**, holotype, male: Habitus, dorsal and lateral view.

Description. Male. Body broadly oval, moderately convex (Fig. 1, 2A). **Color.** Dorsum black with greenish luster, slightly iridescent; but more vividly colored when wet condition. Ventral surface of head dark brown to black. Antennae, maxillary palpi, labial palpi rather light yellowish-brown; pubescent club of antennae brown; apex of maxillary palpomere 4 darkened. Mentum dark reddish-brown, anterior margin slightly paler; stipes reddish-brown, paler than ventral face of head. Lateral margins of prosternum, epipleura, and pseudepipleura reddish-brown, paler than median part of prosternum, mesoventrite, and metaventrite; epipleura slightly darker than pseudepipleura. Legs reddish brown; coxa and femora slightly darkened; tibia and tarsus paler. Abdominal ventrites dark reddish-brown to dark brown; posterior margins of ventrites slightly paler. **Head.** Labrum about 2.8 times as wide as long; punctation of labrum moderately fine, moderately densely distribution; systematic punctures of labrum composed of a row of coarse punctures bearing fine setae medially, dense mediolaterally, sparse medially. Clypeus with broadly and weakly rounded anterior margin; punctation of clypeus and frons composed of variously sized distinct punctures; interspaces between punctures about 0.5–1.0 times width of a puncture, sometimes more or less distance. Frontoclypeal suture fine, but distinct. Systematic punctures of frons bearing fine, short setae, present roundly along each eye. Antennal scape as long as the combined length of antennomeres 2–4; antennomere 3 short; antennomere 4 very short, about 0.5 times as long as antennomere 3; antennomere 5 moderately long, about the same length as antennomeres 6 and 7 combined; apical segment slightly longer than antennomere 7. Maxillary palpi short;

palpomere 3 slightly shorter than palpomere 2; palpomere 4 about 1.3 times as long as palpomere 2. Labial palpi short, slightly shorter than width of mentum; palpomere 2 about as long as palpomere 3; palpomeres 2 and 3 with a few fine setae. Mentum flat, rectangular, anterior margin rounded, about 1.3 times as wide as long; punctation of mentum very fine, sparse; anterolateral margin of mentum with fine, distinct punctures bearing fine, short setae (Fig. 2E). **Thorax.** Pronotal punctation moderately coarse, punctures of various sizes, finer and more densely distributed than those of clypeus and frons; interspaces between punctures about 0.5–1.0 times width of a puncture; a few sparse setiferous punctures bearing fine, short erect seta present on lateral margin. Systematic punctures of pronotum bearing fine short recumbent setae; anterior series distinct, composed of an irregular row, longer than posterior row; posterior series slightly indistinct, more irregular than anterior one. Posterolateral corners of pronotum angulate (Fig. 2C). Elytra longer than wide, subparallel on anterior half, broadly rounded apically; punctation of elytra moderately coarse, punctures of various sizes, more densely distributed than those of pronotum (Fig. 2D); a few sparse setiferous punctures bearing fine, short erect seta present on outer margin; elytra with five rows of coarse, sparse setiferous punctures bearing recumbent to erect fine setae; punctures of rows slightly undetectable; row 5 with very sparsely distributed punctures. Prosternum with median carina along entire length, slightly projecting anteriorly, with fine setae on anterior margin (Fig. 2F). Mesoventral process with a few fine setae on median carina; projecting ventrally, from lateral view slightly resembling bird's beak (Fig. 2G). Metaventrite with rather oblong oval glabrous area posteromedially, about 2.8 times as long as wide, length of glabrous area about 0.6 times total length of metaventrite. Procoxae with moderately fine, densely distributed setae, with a few indistinct spines (Fig. 2F); meso- and metacoxae with coarse setae. Profemur densely pubescent on about basal two-fifths, without distinct punctures; mesofemur with moderately coarse, irregularly and sparsely distributed punctures, interspaces between punctures about 1.0–4.0 times width of a puncture; punctation of metafemur finer, punctures sparser than those of mesofemur. Protarsal segments 1–4 small, subequal in length; apical segment about as long as combined length of segments 1–4. **Abdomen.** Abdominal ventrites with moderately dense pubescence. Aedeagus (Figs. 3A, D): parameres about as long median lobe, swollen at base, subparallel on basal half of outer margin thence narrowing apically; punctation of parameres fine, moderately densely distributed; median lobe slender, slightly narrowed apically, weakly curved dorsally from lateral view (Fig. 3D); punctation of median lobe very fine, punctures sparsely distributed; basal aphophysis moderately short; phallobase about 0.6 times as wide as long; punctation of phallobase fine, few sparsely distributed punctures present laterally; manubrium broadly rounded, indistinctly demarcated from phallobase.

Female. Body size slightly larger than male (see measurements); otherwise almost identical to male. **Spermathecal organ** (Fig. 3E). Spermathecal duct long (278–296 (286 ± 7) μm; n = 5), distinctly longer than duct of the spermathecal gland, slender, slightly swollen at base; infundibulum undetectable; spermatheca rather small, slightly oblong oval; cornu undetectable; duct of the spermathecal gland short (58–72 (66 ± 5) μm; n = 5), swollen at medially, slender at base; spermathecal gland slender, slightly swollen.

Measurements. Male (n = 8): TL: 4.93–5.55 (5.22 ± 0.21) mm; HW: 1.45–1.60 (1.53 ± 0.06) mm; ED: 0.90–1.00 (0.94 ± 0.04) mm; PL: 1.18–1.28 (1.22 ± 0.04) mm; PW: 3.03–3.35 (3.18 ± 0.12) mm; EL: 3.75–4.30 (4.01 ± 0.18) mm; EW: 3.40–3.75 (3.56 ± 0.14) mm; ED/HW: 0.59–0.63 (0.61 ± 0.01); PW/PL: 2.56–2.68 (2.62 ± 0.04); EL/EW: 1.10–1.15 (1.13 ± 0.02). Female (n=10): TL: 5.28–5.85 (5.50 ± 0.19) mm; HW: 1.53–1.70 (1.62 ± 0.05) mm; ED: 0.95–1.08 (1.00 ± 0.04) mm; PL: 1.20–1.35 (1.28 ± 0.05) mm; PW: 3.10–3.53 (3.31 ± 0.12) mm; EL: 4.05–4.50 (4.23 ± 0.16) mm; EW: 3.58–3.93 (3.75 ± 0.11) mm; ED/HW: 0.61–0.65 (0.62 ± 0.01); PW/PL: 2.53–2.69 (2.59 ± 0.05); EL/EW: 1.09–1.19 (1.13 ± 0.03).

Distribution. Laos. Known only from the type locality.

Biology. Collected at the hygropetric habitat (Fig. 6).

Etymology. The specific epithet is a combination of the Latin word “rupes”, meaning “rock”, and another Latin word “-cola”, meaning "inhabitant". The name was chosen in order to refer to the wet rock surface, which is the habitat of this new species.

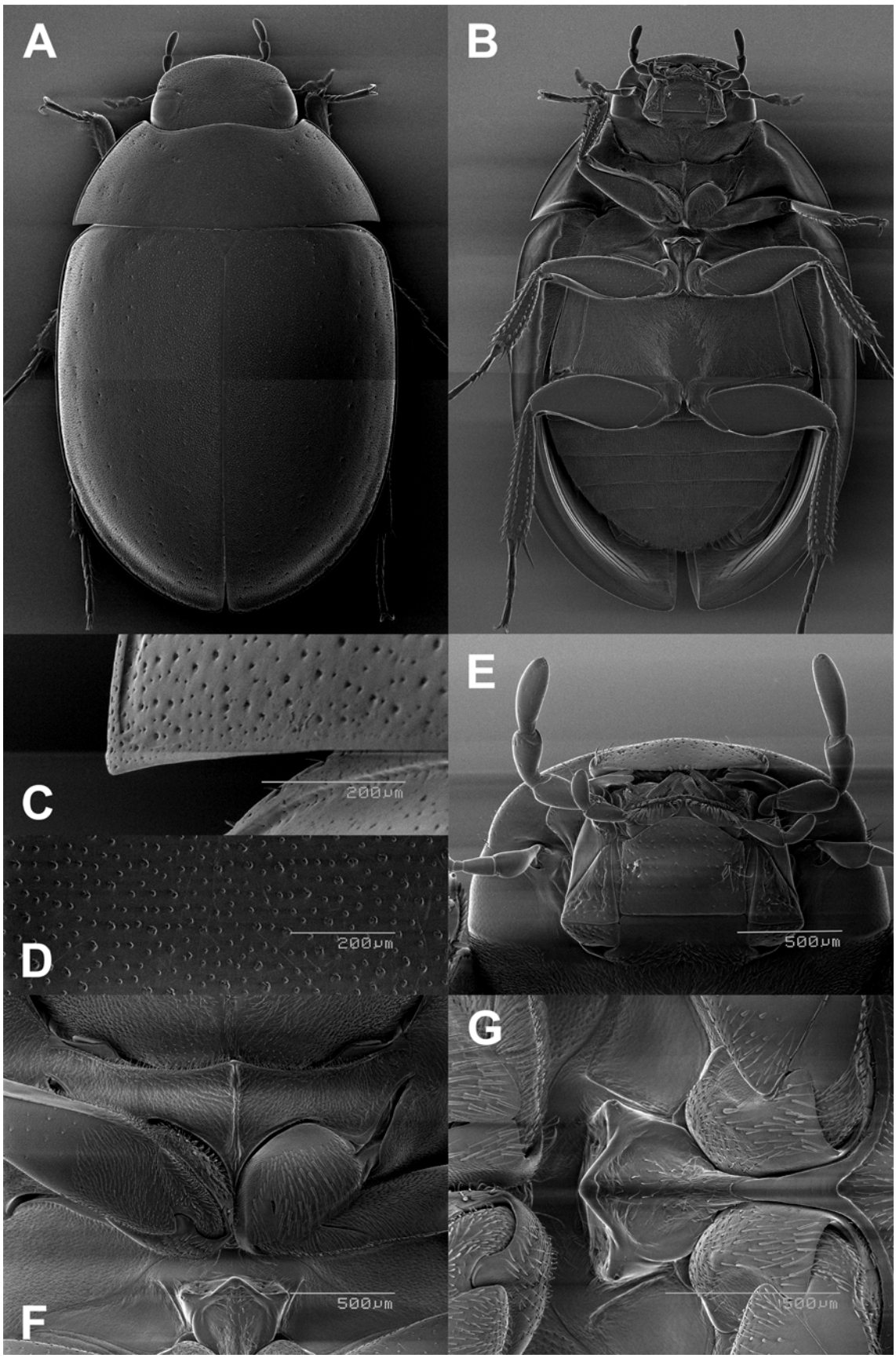

FIGURE 2. SEM photographs of *O. rupicola* **sp. n.**: A: Habitus, dorsal view; B: ditto, ventral view; C: posterolateral corner of pronotum, dorsal view; D: punctation of elytra; E: head, ventral view; F: prosternum, ventral view; G: mesoventrite, ventral view. [Holotype: MiYu-D-00140]

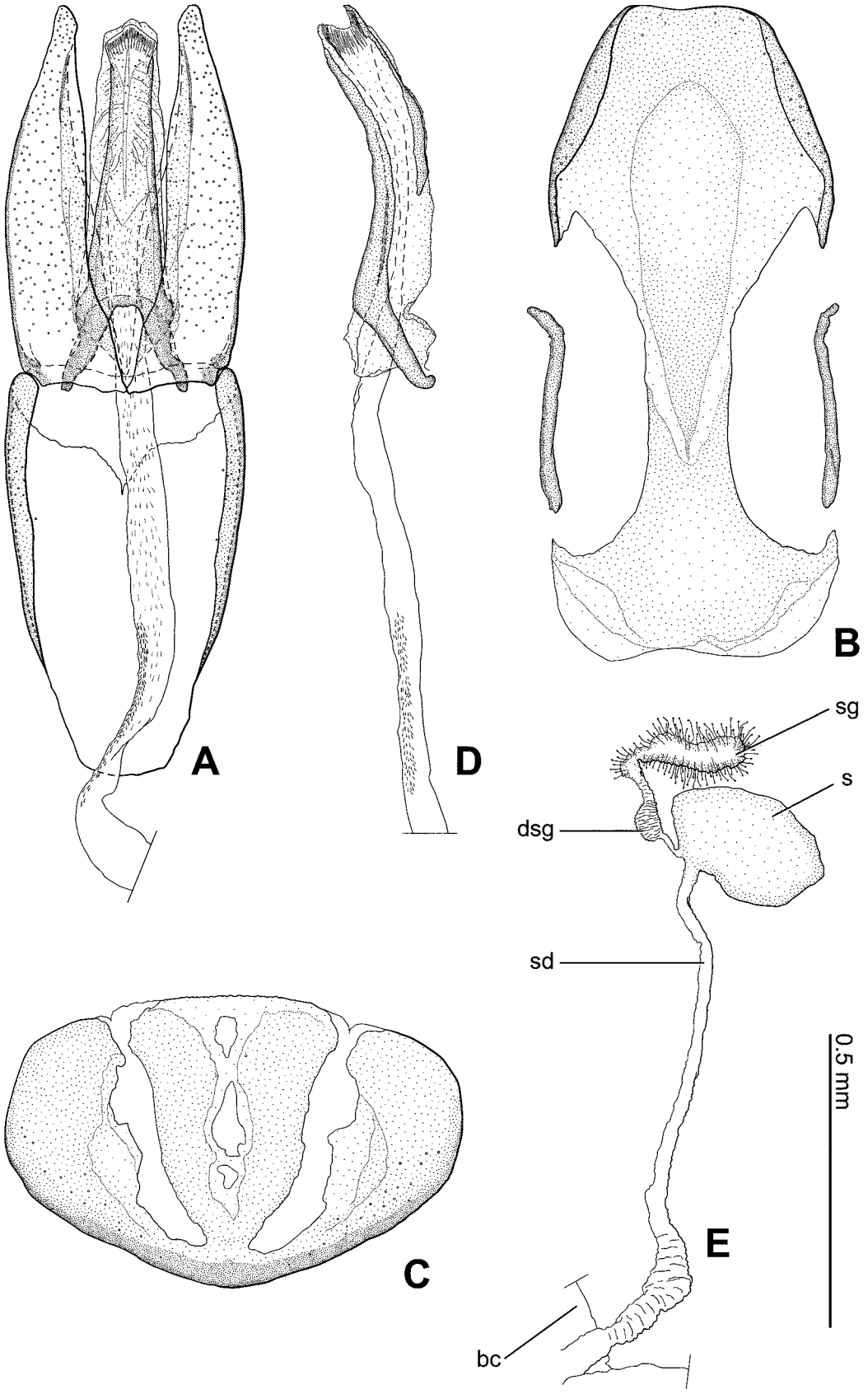

FIGURE 3. *Oocyclus rupicola* **sp. n.**: A: Aedeagus, dorsal view; B: 9th sternite, dorsal view; C: 9th tergite, ventral view; D: median lobe, lateral view; E: spermathecal organ. bc: bursa copulatrix; dsg: duct of the spermathecal gland; s: spermatheca; sd: spermathecal duct; sg: spermathecal gland. [Paratypes: A–C: male, MiYu-D-00107; D: male, MiYu-D-00105; E: female, MiYu-D-00127]

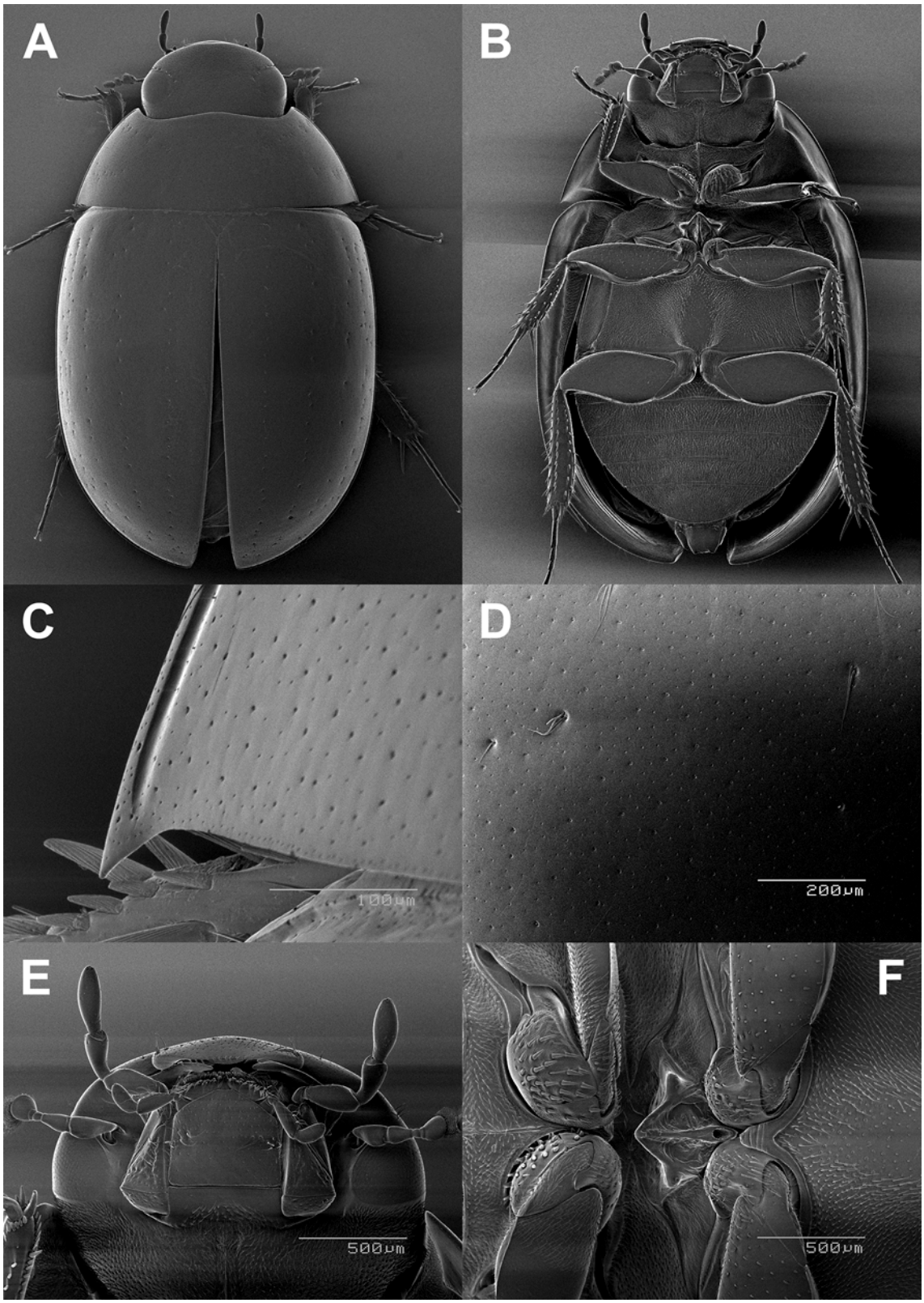

FIGURE 4. SEM photographs of *O. thailensis* Short et Swanson: A: Habitus, dorsal view; B: ditto, ventral view; C: posterolateral corner of pronotum, dorsal view; D: punctation of elytra; E: head, ventral view; F: prosternum and mesoventrite, ventral view. [A, C–D: male, MiYu-D-00136; B, E–F: male, MiYu-D-00138]

Remarks. Judging from descriptions and figures of Short & Swanson (2005), this new species is most similar to *O. sumatrensis* d'Orchymont, 1932; it can, however, be distinguished from it by the following

characters: 1) spines of procoxae thin, sparse and indistinct, resembling thickened, stiff setae (Fig. 2F); 2) ground punctation of elytra very coarse (Fig. 2D); 3) parameres narrowed apically (Fig. 3A).

Oocyclus thailensis Short et Swanson, 2005
(Figs. 4, 5)

Oocyclus thailensis Short et Swanson, 2005: 19 (original description); Short & Hebauer, 2006: 326 (corrections and additions of catalogue).

Type locality. Thailand: Phitsanulok Province, Phu Hin, Rongkla National Park, Namtok Romglao, Romglao Waterfall, 16°59N, 101°00E, 1190 m (Short & Swanson, 2005).

Material examined. 35 males, 19 females, and 22 exs., Route 8, 11 km Southwest by South of Ban Pakha, Bolikhamxai prov., Laos, 18°11.83´N, 104°36.19´E, 25. V. 2008, Y. Minoshima leg., MiYu-L-08-039 (EUMJ, KSEM, SEHU, MYC).

Additional description. Female. Body size slightly larger than male (see measurements); otherwise almost identical to male. **Spermathecal organ** (Fig. 5D). Spermathecal duct long (278–313 (294 ± 12) μm; n=6), distinctly longer than duct of the spermathecal gland, slightly slender; infundibulum undetectable; spermatheca rather large, oval; cornu undetectable; duct of the spermathecal gland short (63–86 (73 ± 8) μm; n=6), weakly swollen, slender at base; spermathecal gland slender, long.

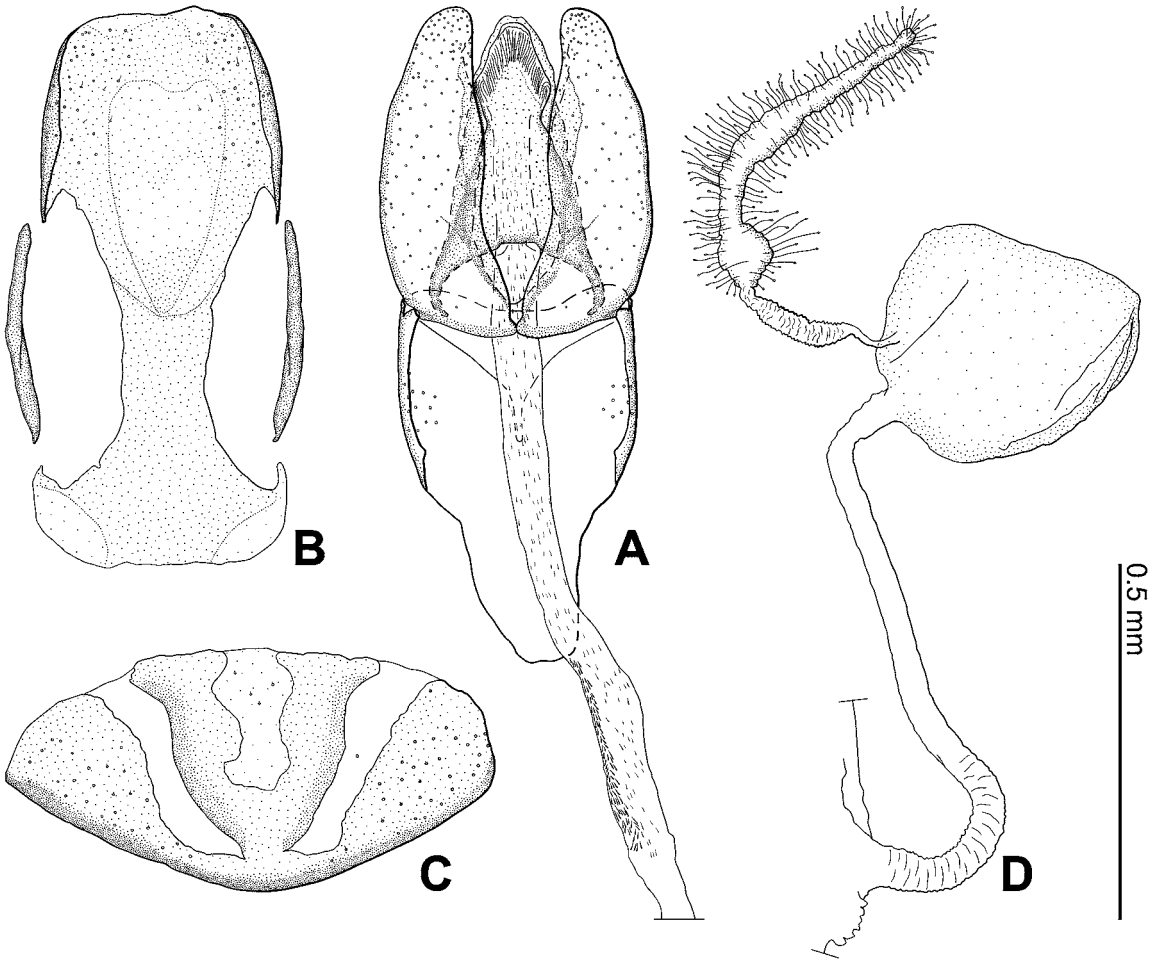

FIGURE 5. *Oocyclus thailensis* Short et Swanson: A: Aedeagus, dorsal view; B: 9th sternite, dorsal view; C: 9th tergite, ventral view; D: spermathecal organ. [A–C: male, MiYu-D-00101, D: female, MiYu-D-00126]

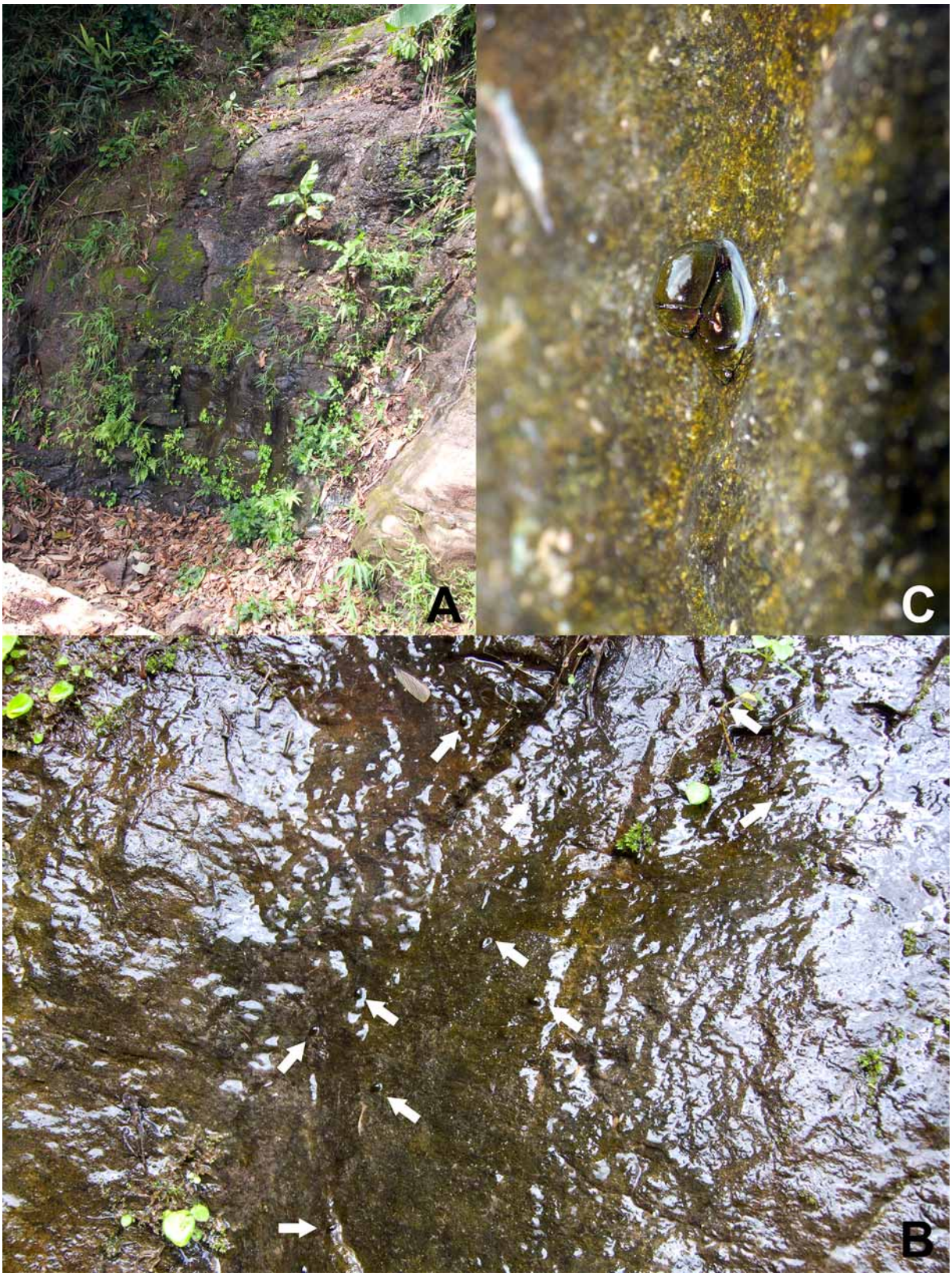

FIGURE 6. A: Type locality and habitat of *O. rupicola* **sp. n.**, and collecting locality of *O. thailensis* Short et Swanson, Laos: Route 8, 11 km Southwest by South of Ban Pakha, Bolikhamxai Province, 25 May 2008; B, C: *Oocyclus* species, same data as Fig. 6A. Photographs by the author.

Measurements. Male (n=10): TL: 4.35–4.80 (4.63 ± 0.15) mm; HW: 1.43–1.58 (1.51 ± 0.05) mm; ED: 0.90–0.95 (0.92 ± 0.02) mm; PL: 1.05–1.20 (1.10 ± 0.04) mm; PW: 2.73–3.05 (2.90 ± 0.10) mm; EL: 3.25–3.70 (3.53 ± 0.14) mm; EW: 3.00–3.40 (3.24 ± 0.13) mm; ED/HW: 0.59–0.63 (0.61 ± 0.02); PW/PL: 2.48–2.81 (2.63 ± 0.09); EL/EW: 1.04–1.18 (1.09 ± 0.04). Female (n=10): TL: 4.63–5.20 (4.92 ± 0.18) mm; HW: 1.45–1.65 (1.57 ± 0.05) mm; ED: 0.93–1.03 (0.99 ± 0.03) mm; PL: 1.05–1.25 (1.17 ± 0.05) mm; PW: 2.80–3.20 (3.06 ± 0.11) mm; EL: 3.58–4.03 (3.75 ± 0.14) mm; EW: 3.13–3.50 (3.39 ± 0.12) mm; ED/HW: 0.59–0.65 (0.63 ± 0.01); PW/PL: 2.56–2.69 (2.62 ± 0.04); EL/EW: 1.06–1.15 (1.11 ± 0.03).

Distribution. Thailand, new to Laos.

Biology. Found together with the newly described species (Fig. 6).

Remarks. This species is found together with *O. rupicola* on the same rock surface in Laos; however, in Thailand, this species is collected with *O. melinoventris* Short et Swanson, 2005, *O. viridescens* Short et Swanson, 2005, or both in some localities (Short & Swanson, 2005).

Discussion

Bameul (1992) studied the female genitalia and spermathecal organs of the terrestrial hydrophilid genus *Psalitrus* (Omicrini). In his revision, features of spermathecal organ were considered an important taxonomic character for the identification of species that are generally difficult to tell apart, except for their male genitalia. Although the spermathecal organ is recognized as an important systematic character and has been studied in Histeridae (e.g. DeMarzo & Vienna, 1982; Ôhara, 1994), a comparatively closely related family in the Staphyliniformia, spermathecal organs of Hydrophilidae have hitherto been much less studied.

Species of the genus *Oocyclus* are relatively well defined by external characters, however, for some species male genital features are required for correct identification (Hebauer & Wang, 1998; Short & Perkins, 2004; and Short & Swanson, 2005). In this study, I examined spermathecal organs of two presumably closely related species, *O. rupicola* **sp. n.** (Fig. 3E) and *O. thailensis* (Fig. 5D), and recognized interspecific differences: 1) length of spermathecal duct; 2) size of spermatheca; 3) length and shape of duct of the spermathecal gland; 4) size of spermathecal gland.

Key to the *Oocyclus* species from the Indochina peninsula (modified from Short & Swanson, 2005)

1 Procoxae pubescent, without distinct spines. Posterolateral corners of pronotum evenly rounded or angulate (e.g. Fig. 2C). Abdominal ventrites evenly and finely pubescent or each with two rows of long hairs (e.g. Fig. 2B). Size usually less than 4.0 mm (except *O. bhutanicus)* 2

\- Procoxae covered with short, coarse distinct spines (spines present but indistinct in *O. rupicola* **sp. n.**). Posterolateral corners of pronotum angulate or spinose (e.g. Figs. 2C, 4C). Abdominal ventrites evenly covered with fine pubescence (Fig. 4B). Size usually larger than 4.0 mm (except some *O. sumatrensis*) 4

2 Abdominal ventrites with two or three irregular rows of long hairs 3

\- Abdominal ventrites covered with fine, dense pubescence (e.g. Figs. 2B, 4B) ..... *O. bhutanicus* Satô, 1979

3 Elytra without distinct rows of systematic punctures; setiferous punctures present but almost indistinguishable from coarse general punctation..... *O. viridescens* Short et Swanson, 2005

\- Elytra with five distinct rows of setiferous punctures; general punctation fine ..... *O. sitesi* Short et Swanson, 2005

4 Central metaventral glabrous area extending to the entire length of the metaventrite. Abdominal ventrites uniformly pale, distinctly paler than sternum. Posterolateral corners of pronotum angulate but not spinose..... ..... *O. melinoventris* Short et Swanson, 2005

\- Central metaventral glabrous area not extending the entire length of the metaventrite (ca. one-third to two-thirds). Abdominal ventrites variously colored. Posterolateral corners of pronotum angulate or spinose 5

5 Posterolateral corners of pronotum slightly prolonged, spinose (Fig. 4C)..... 6

\- Posterolateral corners of pronotum angulate ..... 5’

5’ Size small (3.7–4.3 mm). Spines on procoxae coarse and distinct. Ground punctation on elytra fine .... *O. sumatrensis* d’Orchymont, 1932

- Size large (4.9–5.6 mm). Spines of procoxae thin, sparse and indistinct, more resembling thickened, stiff setae. Ground punctation of elytra very coarse ..... *O. rupicola* **sp. n.**

6 Abdominal ventrites uniformly pale. General punctation of elytra coarse..... *O. foxae* Short et Swanson, 2005
- Abdominal ventrites variously colored, but never uniformly pale. General punctation of elytra not as coarse 7

7 Size 4.7–5.1 mm. Parameres only slightly tapered, more broadly rounded at tip (Fig. 5A). General punctation of elytra slightly more coarse.....*O. thailensis* Short et Swanson, 2005
- Size 4.0–4.5 mm. Parameres evenly tapered to a narrow, blunt tip. General punctation of elytra more fine .... *O. namtok* Short et Swanson, 2005

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