Journal of Asia-Pacific Biodiversity 10 (2017) 39–43

Contents lists available at ScienceDirect

Journal of Asia-Pacific Biodiversity

journal homepage: http://www.elsevier.com/locate/japb

Original article

Three water scavenger beetle species (Coleoptera: Hydrophilidae) new to Korea

Dae-Hyun Lee [a], Kee-Jeong Ahn [b,*]

[a] Institute of Ecosystem Restoration Planning, Daejeon, South Korea
[b] Department of Biology, Chungnam National University, Daejeon, South Korea

ARTICLE INFO

Article history:
Received 19 September 2016
Received in revised form
1 October 2016
Accepted 9 December 2016
Available online 20 January 2017

Keywords:
Coleoptera
Hydrophilidae
Korea
new records

ABSTRACT

Three hydrophilid species [*Agraphydrus ishiharai* (Matsui), *Crenitis primorica* Hebauer, and *Laccobius formosus* Gentili] are identified for the first time in Korea. We also found that *Laccobius fragilis* Nakane previously recorded in Korea was an incorrect identification of *L. formosus.* Habitus photographs, diagnoses, and diagnostic characters with illustrations of the species are provided.

Introduction

The beetle family Hydrophilidae contains 41 species in 20 genera in the Korean peninsula (Cho and Park 2010). For an ongoing study of Korean aquatic beetles, we collected and borrowed the hydrophilid specimens. During their detailed comparative study using voucher specimens, we identified three small-sized water scavenger beetle species for the first time in Korea.

As a result, in this paper, we report three hydrophilid species [*Agraphydrus ishiharai* (Matsui), *Crenitis primorica* Hebauer, and *Laccobius formosus* Gentili] as new additions to the Korean fauna. We also found that *Laccobius fragilis* Nakane previously recorded in Korea was an incorrect identification of *L. formosus.* Habitus photographs, diagnoses, and diagnostic characters with illustrations of the species are provided.

Materials and methods

The specimens used in this study are deposited in Chungnam National University Insect Collection, Daejeon, Korea. The concept and arrangements of the subgenus was based on Fikáček et al (2015). Abbreviations of provinces are as follows: GG—Gyeonggi-do; GW—Gangwon-do; CB—Chungcheongbuk-do; CN—Chungcheongnam-do; GB—Gyeongsangbuk-do; GN—Gyeongsangnam-do; JN—Jeollanam-do.

Systematic accounts

Family Hydrophilidae Latreille

***Agraphydrus* (*Agraphydrus*) *ishiharai* (Matsui)**

(Figures 1A and 2)

Enochrus ishiharai Matsui, 1994: 215.
Agraphydrus ishiharai: Hansen 2004: 49.
Agraphydrus (*Agraphydrus*) *ishiharai*: Fikáček et al 2015: 60.

Diagnosis. Length 2.0–2.3 mm. Body long oval; dorsal surface yellowish brown with coarse punctures; ventral surface mostly covered with pubescence. Mentum (Figure 2A) subquadrate, with sparse setae, widest at middle; anteromedial margin emarginate; anterior corner rectangular; lateral margins slightly straight; posterior corner rectangular; posterior margin straight. Apex of mandible (Figure 2B) bifid. Maxillary palpomere 1 (Figure 2C) smallest; 2 longest, about 1.2 times as long as 3, broad apically; 3 broad apically; 4 elongated, slightly longer than 3, widest apical third, apex truncate. Metafemur (Figure 2D) with pubescence on basal three-fourth. Sternite VII (Figure 2E) with small emargination and a row of small spines on apical margin. Median lobe (Figure 2F) of aedeagus narrowed apically, apical part rounded, widest at base.

* Corresponding author. Tel.: +042-821-5492; fax: +042-822-9690.
E-mail address: kjahn@cnu.ac.kr (K.-J. Ahn).

Peer review under responsibility of National Science Museum of Korea (NSMK) and Korea National Arboretum (KNA).

http://dx.doi.org/10.1016/j.japb.2016.12.004

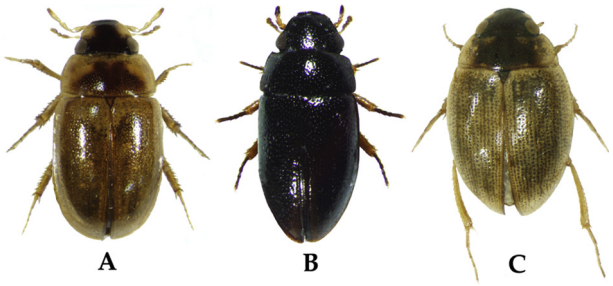

Figure 1. Habitus. A, *A. ishiharai*, 2.0 mm; B, *C. primorica*, 1.8 mm; C, *L. formosus*, 2.8 mm.

Paramere (Figure 2F) broad, as long as median lobe, subapical part narrowed, apical part T shaped.

Materials examined. 9 exx, under stone near stream blackish water zone, Ssang-stream, Daepo-dong, Sokcho-si, GW Prov., Korea, N38°09′37.74″ E128°36′28.17″, 3 m, 28 vii 2014 (DH Lee); 1♀, under stone beside stream, Hu-stream, Bukpyeong-ri, Seo-myeon, Yangyang-gun, GW Prov., Korea, N38°04′11.16″ E128°36′25.29″, 3 m, 4 vii 2013 (DH Lee); 1 ex, under stone near stream, Geumsan-ri, Gunseo-myeon, Okcheon-gun, CB Prov., Korea, N36°15′22″ E127°33′2″, 150 m (IS Yoo, JS Lee); 2♀, beside mountain stream, Nogok-ri, Naenam-myeon, Gyeongju-si, GB Prov., Korea, 30 vi 1991 (SH Lee); 2♂2♀, Jungsan-ri, Songra-myeon, Buk-gu, Pohang-si, GB Prov., Korea, 1 vii 1995 (SH Lee) (2♂, on slide); 1♂2♀, stream, Giseong-stream, Dancheon-ri, Giseong-myeon, Uljin-gun, GB Prov., Korea, 17 vii 1995 (SH Lee); 1 ex, under stone near stream, Dongmak 2-bridge, Dongmak-ri, Yeoncheon-eub, Yeoncheon-si, GG Prov., Korea, N38°05′25.76″ E127°06′35.11″, 70 m, 26 ix 2014 (DH Lee, SG Lee, JS Lee); 11 exx, under stone beside stream, Wonjibon-bridge, Jibon-ri, Suncheon-si, JN Prov., Korea, N35°00′23″ E127°30′22″, 51 m, 5 vi 2014 (DH Lee).

Distribution. Korea (new record), Japan.

Remarks. This species can be distinguished from *Agraphydrus narusei* (Satô) by the following features: yellowish brown body, apical part of maxillary palpi dark brown, and slender paramere.

***Crenitis* (*Acrenitis*) *primorica* Hebauer**

(Figures 1B and 3)

Crenitis primorica Hebauer, 1994: 27; Ji and Komarek 2003: 405; Hansen 2004: 45.

Crenitis (*Acrenitis*) *primorica*: Fikáček et al 2015: 55.

Diagnosis. Length 1.6–1.8 mm. Body long oval, slightly convex dorsally, subparallel, with compact punctures, without microreticulation, mostly black. Ventral surface flat, with pubescence, mostly dark brown. Antennae (Figure 3A) with eight antennomeres; 1 longest, about 2.5 times as long as 2; 2 about 1.2 times as long as 3, widest at middle; 3 subparallel; 4 transverse; 5 transverse dish shaped; 6–8 clubbed, with pubescence. Apex of mandible (Figures 3B and 3C) bifid; left mandible (Figure 3C) with a subapical tooth. Maxillary palpomere 1 (Figure 3D) smallest; 2 longest, about 2.0 times as long as 3, broad apically; 3 broad apically; 4 long oval, slightly longer than 2, widest at middle, apex truncate. Labial palpomere 1 (Figure 3E) smallest; 2 as long as 3, broad apically with a long seta on anterior part; 3 oval, apex truncate, with a long setae on anterior part. Metafemur (Figure 3F) with coarse setae, with pubescence on basodorsal part. Sternite VII (Figure 3G) without emargination and small spines on apical margin. Median lobe (Figure 3H) of aedeagus narrowed apically, apical part rounded, widest at base. Paramere (Figure 3H) slender, slightly shorter than median lobe, lateral margin bisinuate, apical margin rounded.

Materials examined. 22 exx, Beside mountain stream, Seop-bridge, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, GW Prov.,

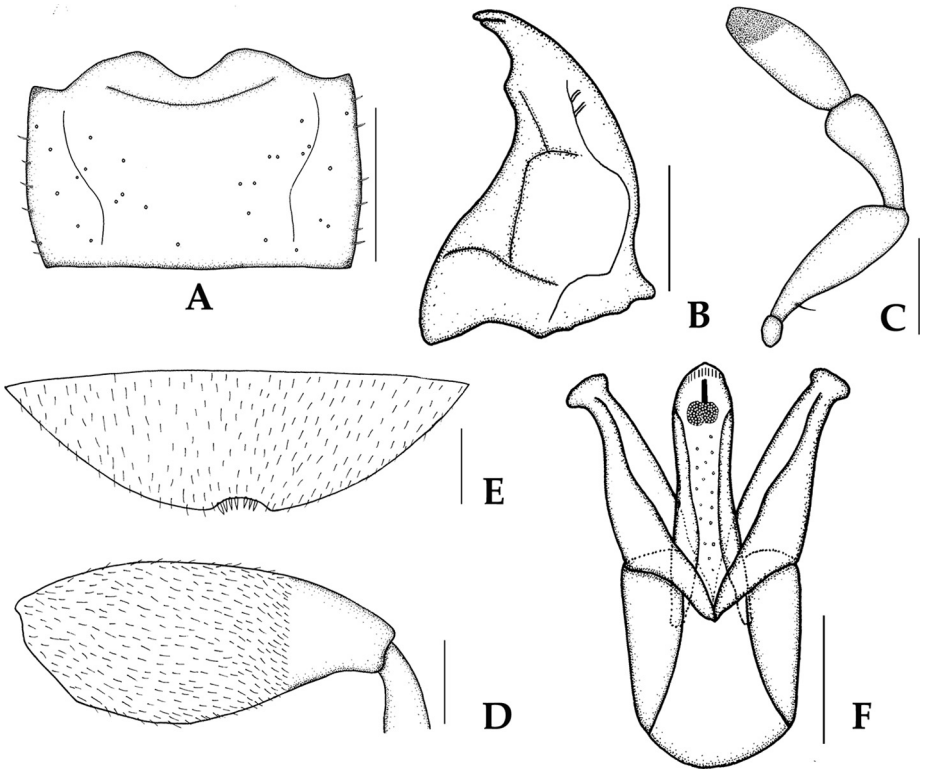

Figure 2. *A. ishiharai*. A, mentum (ventral aspect); B, mandible (ventral aspect); C, labial palpi (lateral aspect); D, metafemur (ventral aspect); E, sternite VII (ventral aspect); F, aedeagus (dorsal aspect). Scale = 0.1 mm.

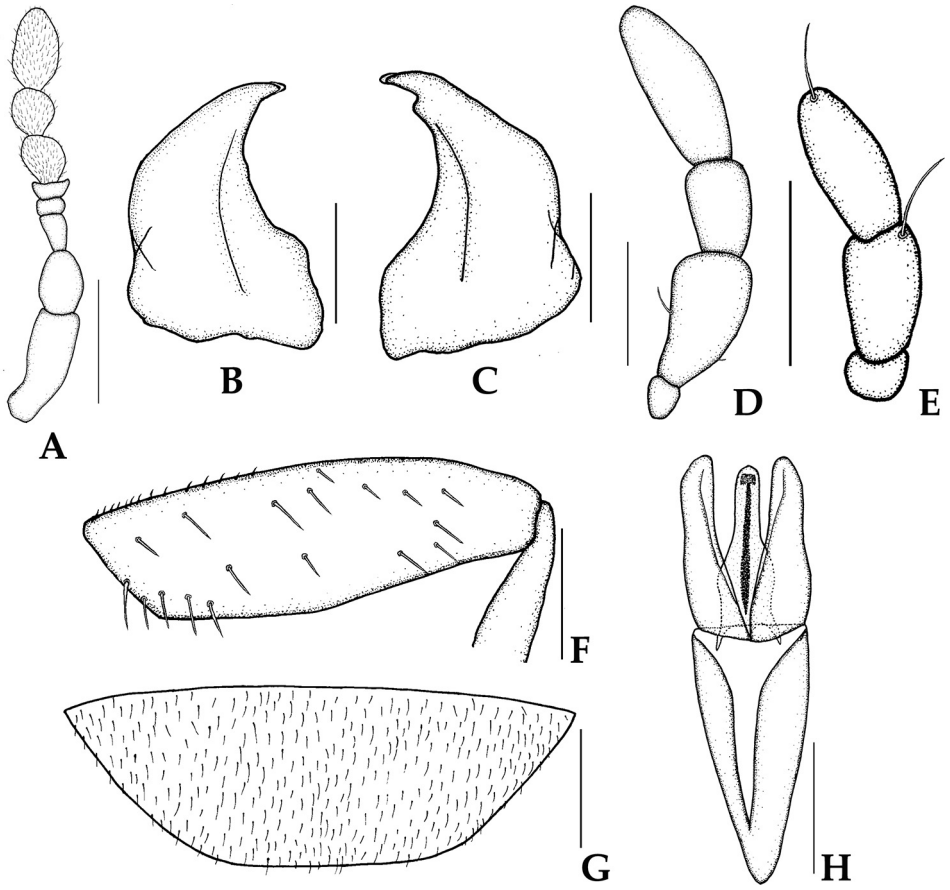

Figure 3. *C. primorica.* A, antennae (lateral aspect); B, right mandible (ventral aspect); C, left mandible (ventral aspect); D, maxillary palpi (lateral aspect); E, labial palpi (lateral aspect); F: metafemur (ventral aspect); G: sternite VII (ventral aspect); H, aedeagus (dorsal aspect). Scale = 0.1 mm.

Korea, N37°44′57.60″ 128°34′40.92″, 691 m, 22 v 2012 (DH Lee) (2♂1♀, on slide); 33 exx, under stone beside stream, Naeri-stream, Nae-ri, Kimsatkat-myeon, Yeongwol-gun, GW Prov., Korea, N37°6′00.39″ E128°40′57.83″, 299 m, 20 vi 2012 (DH Lee) (3♂2♀, on slide); 1 ex, under stone near blackish water zone, Ssang-stream, Daepo-dong, Sokcho-si, GW Prov., Korea, N38°09′37.74″ E128°36′28.17″, 3 m, 28 vii 2014 (DH Lee); 1 ex, under stone beside stream, Hu-stream, Bukpyeong-ri, Seo-myeon, Yangyang-gun, GW Prov., KOREA, N38°04′11.16″ E128°36′25.29″, 3 m, 4 vii 2013 (DH Lee); 1♀, under stone beside stream, Mt. Juwangsan, Sangeui-ri, Budong-myeon, Cheongsong-gun, GB Prov., Korea, 13 vi 2006 (DH Lee); 9 exx, Nogok-ri, Naenam-myeon, Gyeongju-si, GB Prov., Korea, 7 vii 1995 (SH Lee); 10 exx, Joreong-stream, Ocheon-ri, Maseong-myeon, Mungyeong-si, GB Prov., Korea, 13 vi 2009 (SH Lee) (1♂, on slide); 18 exx, Jungsan-ri, Songra-myeon, Buk-gu, Pohang-si, GB Prov., Korea, 1 vii 1995 (1♀, on slide); 4 exx, Bugu-stream, Bugu-ri, Seo-myeon, Uljin-gun, GB Prov., Korea, 7 vi 1995 (SH Lee); 24 exx, Wangpi-stream, Wangpi-ri, Seo-myeon, Uljin-gun, GB Prov., Korea, 27 vi 1995 (1♂, on slide); 23 exx, stream, Maehwa-ri, Wonnam-myeon, Uljin-gun, GB Prov., Korea, 6 vi 1995 (SH Lee) (1♂, on slide); 16 exx, Changsu-ri, Changsu-myeon, Yeongdeok-gun, GB Prov., Korea, 5 vi 1994 (SH Lee).

Distribution. Korea (new record), China (Liaoning), Japan, Russia (Far East).

Remarks. This species can be distinguished from *Crenitis apicalis* (Reitter) by the antenna with eight antennomeres and from *Crenitis formosana* Hebauer by the rounded apical part of paramere.

***Laccobius* (*Microlaccobius*) *formosus* Gentili**

(Figures 1C and 4)

Laccobius formosus Gentili, 1979: 48.

Published Korean records. *Laccobius fragilis*: Lee et al 1988: 72; Kim et al 1994: 135; Lee 1994: 19; 1995: 15; Gentili 1995: 266; Hansen 2004: 58; Cho and Park 2010: 96; Fikáček et al 2015: 45 [misidentification].

Diagnosis. Length 2.4–2.8 mm. Head subtrapezoidal, brown to dark brown. Width of frons about 2.5 times as wide as eye. Antennae (Figure 4A) with eight antennomeres. Maxillary palpomere 2 (Figure 4B) as long as 4. Labial palpomere 2 (Figure 4C) with few long setae on lateral margin. Pronotum subquadrate, brown to dark brown except lateral one-fourth part yellow. Elytra rounded apically, yellowish brown, with sparse black marking. Profemur (Figure 4D) with pubescence on basal third. Mesoventral process strongly acute medially, with sparse setae; process weakly protruded, posterior part weakly rounded in lateral view. Metafemur (Figure 4E) with sparse small spines. Apical margin of sternite VII straight. Median lobe (Figure 4G) of aedeagus shorter than paramere, widest at base, narrowest at apical third, subapical part bulbous, apical margin rounded. Paramere (Figure 4G) bulbous subapically, slender, widest at base, narrowest at apical third, apical part acute, lateral margin straight, pallobase about 3.5 times shorter than paramere.

Materials examined. 6 exx, Idong-bridge, Jangam-ri, Idong-myeon, Pocheon-si, GG Prov., Korea, 18 vii 1992 (SH Lee); 5 exx,

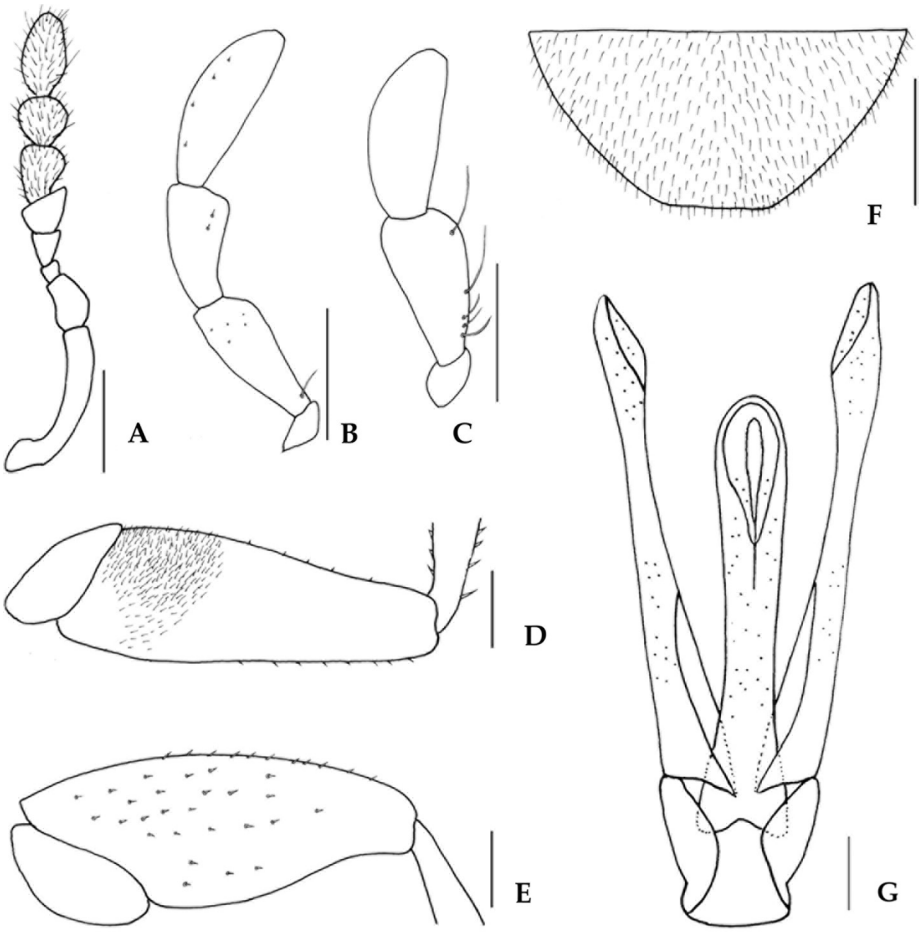

Figure 4. *L. formosus*. A, antennae (lateral aspect); B, maxillary palpi (lateral aspect); C, labial palpi (lateral aspect); D, profemur (ventral aspect); E, metafemur (ventral aspect); F, sternite VII (ventral aspect); G, aedeagus (dorsal aspect). Scale = 0.1 mm.

under stone near stream, Dongmak-2 bridge, Dongmak-ri, Yeoncheon-eub, Yeoncheon-si, GG Prov., Korea, N38°05′25.76″ E127°06′35.11″, 70 m, 26 ix 2014 (DH Lee, SG Lee, JS Lee); 12 exx, at light trap near stream, Namdae-stream, Haksa-ri, Kimhwa-eub, Cherwon-gun, GW Prov., Korea, 9 ix 2008 (DH Lee); 6 exx, at light near stream, Wasu-ri, Seo-myeon, Cheorwon-gun, GW Prov., Korea, 4 ix 2008 (DH Lee, YH Kim, TK Kim) (2♂, on slides); 4 exx, Mt. Odaesan, Jinbu-myeon, Pyeongchang-gun, GW Prov., Korea, 28 vii 1994 (SH Lee); 6 exx, near stream, Danwol-bridge, Dalcheon-dong, Chungju-si, CB Prov., Korea, N36°56′28.06″ E127°54′13.99″, 73 m, 19 ix 2014 (DH Lee, SG Lee); 1♂, river, Joryeong-ri, Dongi-myeon, Okcheon-gun, CB Prov., Korea, 26 ix 1996 (SH Lee); 1ex, Namgye-ri, Sagok-myeon, Gongju-si, CN Prov., Korea, 22 vii 2008 (DH Lee, YH Kim, JH Song, YG Ban) (2♂, on slides); 3 exx, stream, Seongdeok-ri, Geumnam-myeon, Yeongi-gun, CN Prov., Korea, 17 ix 1997 (US Hwang, SJ Park) (1♂, on slide); 1♂1♀, Seonggok-dong, Andong-si, GB Prov., Korea, 27 vii 1998 (SH Lee); 15 exx, at light, Cheongsong-eub, Cheongsong-gun, GB Prov., Korea, N36°26′00.53″ E128°03′46.11″, 195 m, 11 vii 2010 (DH Lee); 3♂1♀, Bugu-ri, Buk-myeon, Uljin-gun, GB Prov., Korea, 13 x 1994 (SH Lee); 4♂6♀, Changsu-ri, Changsu-myeon, Yeongdeok-gun, GB Prov., Korea, 5 vi 1994 (SH Lee); 2 exx, Jikjeon-ri, Bukcheon-myeon, Hadong-gun, GN Prov., Korea, 11 vi 2010 (SH Lee); 3 exx, stream, Hwalcheon-ri, Duseo-myeon, Uljugun, Ulsan-si, 14 vii 1991 (SH Lee); 1 ex, Ogok-myeon, Gokseong-gun, JN Prov., Korea, 3 viii 2009 (SH Lee).

Distribution. Korea (new record), China (Gansu, Liaoning, Shaanxi, Shandong), Russia (Far East), Taiwan.

Remarks. L. fragilis Nakane was first recorded by Lee et al (1988). After studying those specimens, we found that the previous Korean record was incorrect and it is actually *L. formosus* Gentili. *L. formosus* can be distinguished from *L. fragilis* by the following features: apical part of median lobe rounded and apical part of paramere expanded inward.

Conflicts of interest

The authors declare that there is no conflict of interest.

Acknowledgments

We thank S.H. Lee (Acheon Elementary School, Gimcheon) and H. Yoshitomi (EUMJ, Matsuyama) for providing many specimens and literature data. This study was supported by a grant from the National Institute of Biological Resources, funded by the Ministry of Environment of the Republic of Korea (NIBR 201601203).

References

Cho YB, Park SW. 2010. Coleoptera. In: Paek MK, editor. *Checklist of Korean insects*. Seoul: Nature and Ecology. pp. 83–157 (in Korean).

Fikáček M, Angus RB, Gentili E, et al. 2015. Family Hydrophilidae. In: Löbl I, Löbl D, editors. *Catalogue of Palaearctic Coleoptera. Revised and updated edition, Hydrophiloidea–Staphylinoidea*, Vol. 1. Leiden: Brill. pp. 37–76.

Gentili E. 1979. I. Laccobius della regione orientale (Coleoptera, Hydrophilidae). *Annuario Osservatorio di Fisica Terrestre e Museo Antonio Stoppani del Seminario Arcivescoville di Milano (N.S)* 1 (1978):27–50.

Gentili E. 1995. Hydrophilidae: 3. The genus *Laccobius* Erichson in China and neighboring areas. In: Jäch MA, Ji L, editors. *Water beetles of China. Wein: Zoologisch-Botanische Gesellschaft in Österreich and Wiener Coleopterologenverein*, Vol. I; 1995. pp. 245–286.

Hansen M. 2004. Family Hydrophilidae. In: Löbl I, Smetana A, editors. *Catalogue of Palaearctic Coleoptera. Hydrophiloidea, Histeroidea, Staphylinoidea*, Vol. 2. Stenstrup: Apollo Books. pp. 44–68.

Hebauer F. 1994. The *Crenitis* of the old world (Coleoptera, Hydrophilidae). *Acta Coleopterologica* X:3–40.

Ji L, Komarek A. 2003. Hydrophilidae: the Chinese species of *Crenitis* Bedel, with descriptions of two new species. In: Jäch MA, Ji L, editors. *Water beetles of China. Wein: Zoologisch-Botanische Gesellschaft in Österreich and Wiener Coleopterologenverein*, Vol. 3; 2003. pp. 397–409.

Kim JI, Kwon YJ, Paek JC, et al. 1994. Order 23. Coleoptera. In: The Entomological Society of Korea and Korean Society of Applied Entomology, editor. *Check list of insects from Korea*. Seoul: Kon-Kuk University Press. pp. 117–214.

Lee SH. 1994. Water beetles of Hyeong San river. *Corentomon* 5:14–21.

Lee SH. 1995. Water beetles of Bulyeong valley. *Corentomon* 6:11–16.

Lee SH, Lee CE, Park HC. 1988. A taxonomy of the aquatic Hydrophilidae of South Korea (Coleoptera). *Nature and Life* 18:79–91.

Matsui E. 1994. Three new species of the genus *Enochrus* from Japan and Taiwan (Coleoptera: Hydrophilidae). *Transactions of the Shikoku Entomological Society* 20:215–220.