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First Record of *Pseudochelonarium japonicum* (Coleoptera: Byrrhoidea) in South Korea, with a Mitochondrial *COI* Sequence

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ABSTRACT

The beetle family Chelonariidae contains 11 described species in the Palaearctic region, belonging to two genera (*Chelonarium* and *Psedochelonarium*). However, no members of this family have been found in South Korea. We collected a single female specimen of *Pseudochelonarium japonicum* (Nakane) near a mountain stream in northern South Korea. Illustrations of the habitus with related Japanese species, diagnostic characteristics, and mitochondrial DNA sequence for *Pseudochelonarium japonicum* are provided.

Keywords: Chelonariidae, turtle beetles, *Pseudochelonarium*, taxonomy, new record

INTRODUCTION

The turtle beetle family Chelonariidae comprises approximately 300 described species worldwide that belong to three genera (Beutel and Leschen, 2016). Most species are primarily distributed in tropical regions, but 11 described species are recorded in the Palearctic regions, including Afghanistan, Bhutan, China, India, Japan, and Taiwan (Satô, 2006). The genus *Pseudochelonarium* was established by Pic (1916) based on *Pseudochelonarium hirsutum* from the north Sumatra, Indonesia. This genus is restricted to India, Southeast Asia, and New Guinea (Beutel and Leschen, 2016). However, there have been no records of *Psedochelonarium* or any other chelonariid beetles on the Korean Peninsula. This genus is characterized by the following morphological features: body ovoid, pronotum rounded at anterior and lateral margins, without marginal carina, hypomeron excavated receive forelegs. The biology of this family and their larvae is poorly known, but some adults are attracted to light and found from vegetation near streams (Spangler, 1980).

In this study, we report the family Chelonariidae for the first time with species of *Pseudochelonarium japonicum* (Nakane, 1963) as part of the Korean beetle fauna collected from northern South Korea. A diagnosis of the species is provided, along with habitus images comparing it with closely related Japanese species, *Chelonarium ohbayashii* Satô and *Psedochelonarium yakushimanum* (Nakane). Additionally, mitochondrial cytochrome c oxidase subunit I (*COI*) sequence data and habitat information are included.

MATERIALS AND METHODS

The genus *Pseudochelonarium* species was collected near the mountain stream using sweep net and forceps. The specimen was then preserved 80% Ethanol. One female specimen was dissected and illustrated using a Leica S Apo (Wetzlar, Germany) stereomicroscope with an image analyzer (Dhyana 400 DC; Tucsen, China). Female genitalia were dissected and treated with 10% KOH for three days prior to examination. The specimen described here are deposited in the National Institute of Biological Resources (NIBR) in Incheon, South Korea. Total genomic DNA was extracted from one female, using the tissue of thorax. The primer pair C1-J-2183 (5′-CAA CAT TTA TTT TGA TTT TTT GG-3′) and TL2-N-3014 (5′-TCC AAT GCA CTA ATC TGC CAT ATT A-3′) (Simon et al., 1994) was used to amplify the partial mitochondrial *COI* gene. We used the following polymerase chain reaction protocol by the genetic analysis of Jung et al. (2020). The obtained sequence was deposited in GenBank.

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Fig. 1. *Pseudochelonarium japonicum* (Nakane) and its habitat. A, Habitat, tributary of the Soyang river; B, C, Live habitus.

SYSTEMATIC ACCOUNTS

Order Coleoptera

[1]*Family Chelonariidae Blanchard, 1845

[2]***Genus Pseudochelonarium* Pic, 1916: 1**

Type species: *Pseudochelonarium hirsutum* Pic, 1916

[3]****Pseudochelonarium japonicum* (Nakane, 1963) (Figs. 1B, C, 2, 3)**

Chelonarium japonicum Nakane, 1963: 43 (orig. descr.); Satô, 1977: 1 (list).

Korean name: [1]*거북딱정벌레과, [2]*거북딱정벌레속, [3]*거북딱정벌레

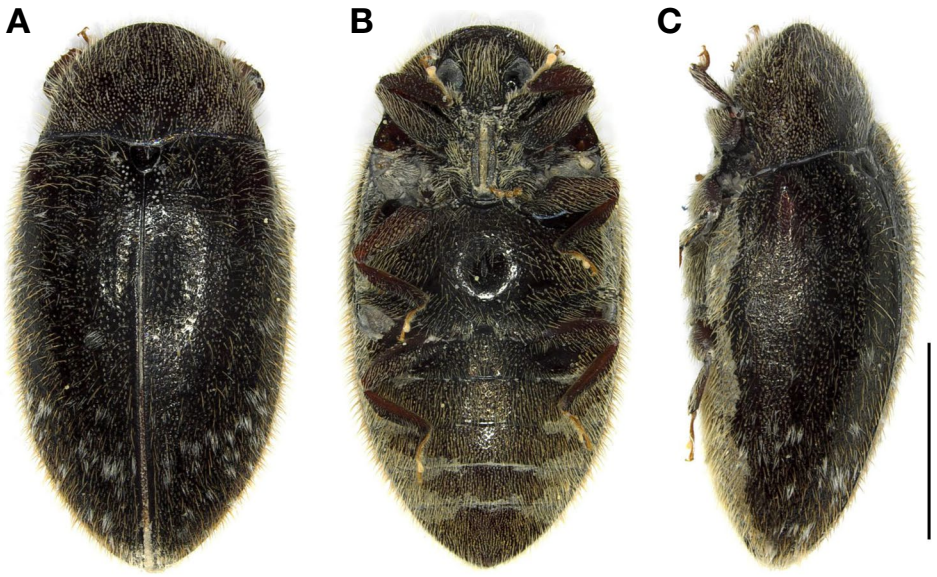

Fig. 2. *Pseudochelonarium japonicum* (Nakane), female, body length 5.7 mm. A, Habitus, dorsal view; B, Habitus, ventral view; C, Habitus, lateral view. Scale bar = 2.0 mm.

Pseudochelonarium japonicum (Nakane): Satô, 1985a: 430 (note); 1985b: 69.

Material examined. Korea: 1♀ (RORXIN0000005355), Gangwon-do, Inje-gun, Inje-eup, Nambuk-ri 718 (38°04′ 49.5″N, 128°07′41.5″E), 7 Aug 2021, leg. S.W. Jung (NIBR).

Diagnosis (female). Body length 5.7 mm; width 3.0 mm (n = one female). Body oblong to oval, strongly convex dorsally, and reddish-brown color, closely covered with brownish hairs and scattered distinct patches of white setae on pronotum and elytra. White setae more densely on lateral pronotum and elytra on lateral and posterior parts.

Head (Fig. 3A) concealed under pronotum. Dorsal surface large umbilicate punctures, with long setae except clypeus; antennal ridges present; anterior margin tridentate in middle part. Antennae 11-segmented; antennomere 1 very short; antennomere 2 about twice as long as antennomere 1; antennomere 3 longest; antennomeres 2 and 3 dark brown, flat and sclerotized; antennomere 4 light brown, shortest and narrow; antennomeres 5 to 7 more or less rounded like moniliform; approximate ratio of palpomeres 1 to 3 as 1.0 : 2.3 : 6.0. Mandibles very small, slightly longer than wide, blunt. Maxillary palp 5-segmented; palpomere 1 long and stout; palpomere 2 shortest and square; palpomere 3 longest and slender; palpomere 4 more or less stout, longer than palpomere 2; terminal palpomere apically wide and stout; galea and lacinia fused basally, long, apically bifurcate and acicular. Labial palp 4-segmented; palpomere 1 longer than wide and stout; palpomere 2 shortest and square; palpomere 3 oblong and longer than palpomere 2; terminal palpomere large and apically wide; paraglossa elongate and acicular.

Pronotum (Fig. 3B) convex, widest at base, rounded laterally and anteriorly, without carinae; dense large punctures on lateral and anterior parts; sparse small punctures on median disc; whitish setal patches on anterolateral and median areas; posterior margin crenulate, dark thick line; posterior angle acute at apex. Prosternal episternum large punctures, with long setae; prosternal process (Fig. 3C) elongated, flat, parallel-sided, rounded at apex, long and slender projection at base. Scutellum subshield-shaped, with white setae on the middle. Mesoventrite (Fig. 3G) short and wide, punctures with long setae, deeply grooved for reception of apices of antennomeres 3. Metaventrite wide, convex, shiny and smooth in middle part, widest posteriorly, large punctures at lateral parts, with long setae. Legs (Fig. 3E, F) dark brown, flattened femora, with large punctures; fore and middle coxae wide, transverse; hind coxae short, very transverse; fore tibiae broad, dentate, with small 13 spines on outer margin; middle tibiae slender, with small 11 spines; hind tibiae slender, with small 8 spines. Tarsi 5-segmented, light brown; tarsomere 1 long and slender; tarsomeres 2 and 3 short and wide; tarsomere 4 short and square, with distal long fleshy lobe between tarsomere 3 and 4; tarsomere 5 as long as tarsomere 1; two claws, with one tooth basally.

Elytra (Fig. 3D) convex, oblong, more or less slender, with long hairs, fine punctures, and whitish setal patches; long hair densely on lateral parts; scattered whitish setal patches more prominent on lateral and posterior parts.

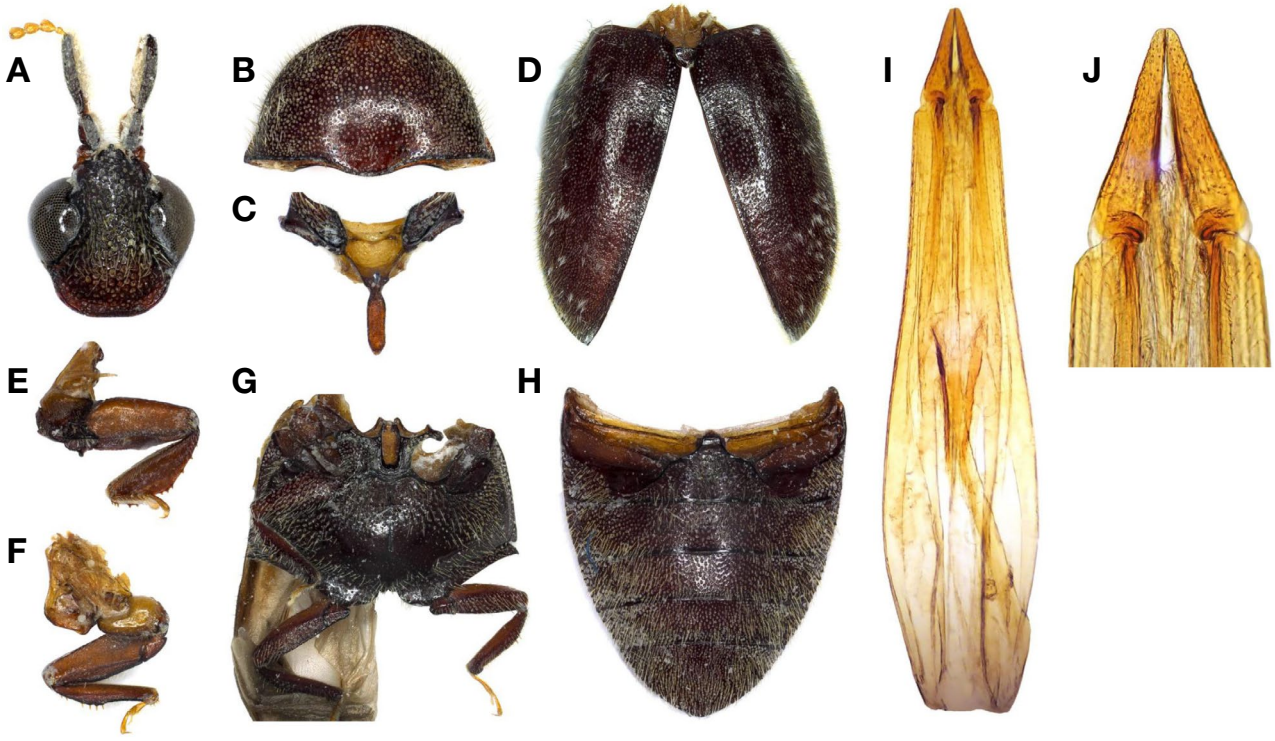

Fig. 3. *Pseudochelonarium japonicum* (Nakane), female. A, Head, dorsal view; B, Pronotum, dorsal view; C, Prosternal process, ventral view; D, Elytra, dorsal view; E, Fore leg, right, ventral view; F, Middle leg, left, dorsal view; G, Metaventrite, ventral view; H, Abdomen, ventral view; I, Ovipositor, ventral view; J, Tip of ovipositor, ventral view.

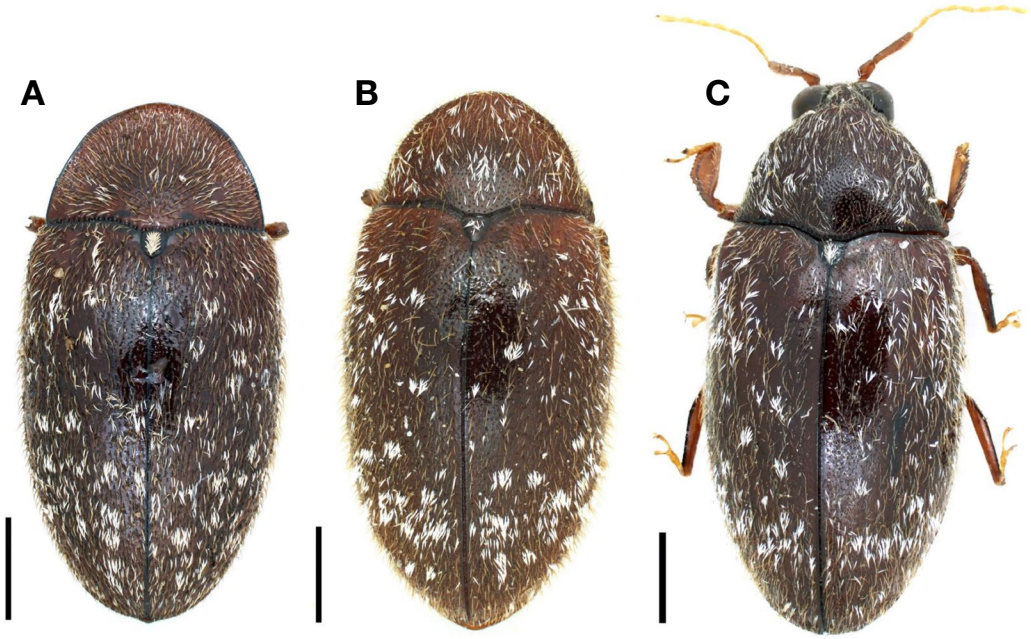

Fig. 4. Chelonariidae specimens from Japan. A, *Chelonarium ohbayashii* Satô; B, *Pseudochelonarium japonicum* (Nakane); C, *Pseudochelonarium yakushimanum* (Nakane). Scale bars: A–C = 1.0 mm.

Abdomen (Fig. 3H) with five ventrites, covered with long setae and densely punctures; ventrite 1 excavate to receive hind coxae, with post-metacoxal line; ventrites 2 and 3 similar in length; ventrite 4 smaller than ventrite 3; ventrite 5 twice as long as ventrite 4. Ovipositor (Fig. 3I) very long and slender; 2.5 mm long; coxites 0.3 mm, bacula 2.2 mm, lightly sclerotized; styli absent; coxites well sclerotized (Fig. 3J), elongated triangular.

Larva. Unknown.

Habitat. This species was collected from the northern South Korea, near a tributary of the Soyang river (Fig. 1A).

Distribution. South Korea (new record), Japan.

Remarks. This species is similar to *P. yakushimanum* (Nakane) (Fig. 4C) from Japan, but it can be distinguished by the following characteristics: body more or less slender, whitish setae on median disc of pronotum (Fig. 4B), elytra more narrowed towards apex, densely clustered patches of white setae on posterior area of elytra, sparse fine punctures on elytra. The latter species is endemic to Japan and is distributed on the Amami and Yakushima islands, as well as in Kagoshima (Nakane, 1963; Satô, 1964, 1985a, 1985b).

Mitocondrial DNA sequence of *Psedochelonarium japonicum*. The *COI* sequence was obtained for the first time in this study (GenBank accession No. PV061139).

Chelonariidae species known from South Korea and Japan

1. *Chelonarium ohbayashii* Satô, 1964 (Japan) (Fig. 4A)
2. *Pseudochelonarium japonicum* (Nakane, 1963) (South Korea, Japan) (Figs. 2, 4B)
3. *Pseudochelonarium yakushimanum* (Nakane, 1963) (Japan) (Fig. 4C)

Key to the adults of Chelonariidae in South Korea and Japan

1. Prontum widely rounded (Fig. 4A) with marginal carina laterally ····· *Chelonarium ohbayashii* Satô
− Pronotum rounded without marginal carina (Fig. 2C) ····· 2
2. Pronotum with whitish setae on median disc, densely clustered whitish patches on posterior area of elytra (Fig. 4B) ····· *Pseudochelonarium japonicum* (Nakane)
− Pronotum without whitish setae on median disc, scattered whitish patches on posterior area of elytra (Fig. 4C) ····· *Pseudochelonarium yakushimanum* (Nakane)

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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