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First Record of the Velvet Snail, *Coriocella jayi* (Littorinimorpha: Velutinidae) from Korea

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ABSTRACT

The family Velutinidae is found in various intertidal and subtidal habitats worldwide including Arctic and Antarctic seas. They are characterized by possessing a fragile shell that is partially or entirely covered by the mantle. Eight valid species of the genus *Coriocella* have been reported mostly in the Indo-West Pacific. Here we report *Coriocella jayi* Wellens, 1996 from Korean waters for the first time and describe details of their external morphology and radula characteristics using scanning electron microscopy, and provide the mtDNA *cox1* sequence as a DNA barcode sequence information. This species is distinguished from other congeneric species by having six cylinder-shaped tubercular lobes of their dorsal part of mantle body and mantle color. Phylogenetic tree using the mtDNA *cox1* sequence data shows that two *Coriocella* species (*C. jayi* and *C. nigra*) are grouped as their respective sister among Velutinidae species, and these relationships are strongly supported by 100% bootstrap value. Despite the morphological similarities, further investigation will be needed to confirm whether the African and Korean populations can be justified as the same species with a disconnected distribution range, or represent morphologically similar but two distinct species.

Keywords: Velutinidae, *Coriocella*, *Coriocella jayi*, mtDNA *cox1*, Korea

INTRODUCTION

The family Velutinidae Gray, 1840 species are found in various intertidal and subtidal habitats with a worldwide distribution, including Arctic and Antarctic seas (Numanami and Okutani, 1991; Gulbin, 2005). This family is characterized by their external features that their shell is thin and fragile with a depressed spire and a very large body whorl that is completely or partially covered by non-retractile mantle (Gulbin and Golikov, 1997; Queiroz and Sales, 2016). Velutinid species are known to feed on ascidians or sponges, and some of this group have evolved closely associated with their prey (Lambert, 1980; Numanami and Okutani, 1991). They often camouflage the color and external tunic texture of their surrounding ascidians, making it hard to distinguish them from their prey (Lambert, 1980; Behrens, 1984; Queiroz and Sales, 2016; Sargent et al., 2019). In addition, velutinid species often resemble sea slugs or other velvet snails due to their velvety mantle (Behrens, 1984; Dias and Delboni, 2008). To date, six Velutinidae species have been reported in Korea (National Institute of Biological Resources, 2022): *Lamellaria kiiensis* Habe, 1944, *L. setoensis* Habe, 1944, *L. prolongate* (Carpenter, 1864), *Velutina cryptospira* Middendorff, 1848, *V. plicatilis* (O. F. Müller, 1776), and *V. pusio* A. Adams, 1860. In this study, we report morphological characters and taxonomic remarks of *Coriocella jayi* Wellens, 1996 from Korea for the first time, with scanning electron microscope (SEM) images of radula.

Specimens were collected by SCUBA diving and preserved in 95% ethanol solution (detailed information on sampling sites accompanies the following description of the species). For species identification, we observed external shell morphology and radula characters. The radula was incubated in dilute sodium hypochlorite solution for 1 min, then washed with distilled water. The shell and radula characters were examined using a stereoscopic microscope (Leica M205C, Wetzlar, Germany). Radula sample was coated with platinum ion after drying and photographed using a SEM (Ultra Plus; Zeiss, Germany). Voucher specimen was deposited at the National Institute of Biological Resources

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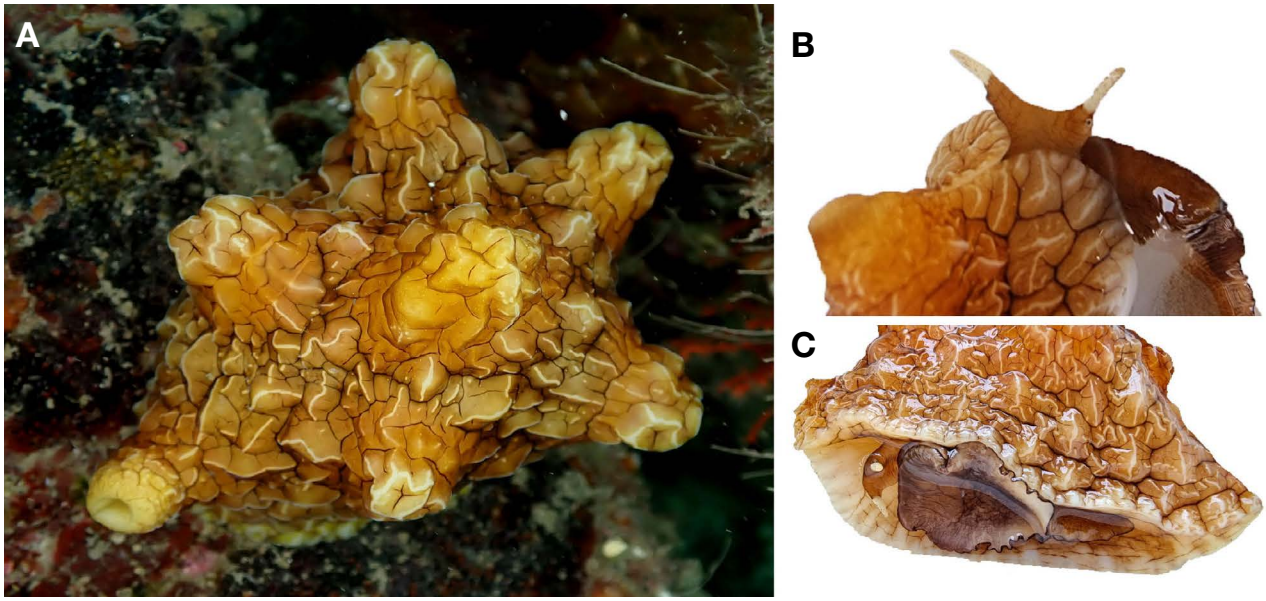

Fig. 1. Image of living individual of *Coriocella jayi* Wellens, 1996. A, Dorsal view; B, Cephalic tentacles; C, Foot.

(NIBRIV0000909806).

To obtain *cox1* sequence, total genomic DNA was extracted using an E.Z.N.A. mollusk DNA extraction kit (Omega Bio-tek, Norcross, USA) following the manufacturer's instructions. The mitochondrial *cox1* gene fragment was amplified using LCO1490/HCO2198 primer set (Folmer et al., 1994). PCR reactions were carried out in a total reaction volume of 50 μL, which included 2 μL of template DNA, 36.75 μL of distilled water, 5 μL of 10× Ex Taq buffer, 1 μL of each primer, 4 μL of dNTP, and 0.25 μL of TaKaRa Ex Taq DNA polymerase (Takara, Japan). The reaction conditions were as follows: initial denaturation at 95°C for 3 min followed by 40 cycles of denaturation at 94°C for 30 s, annealing at 42°C for 30 s, elongation at 72°C for 1 min, and a final extension at 72°C 10 min. PCR product was purified using a QIAquick gel extraction kit (Qiagen, Valencia, CA, USA) and then sequenced using an ABI PRISM 3730xl DNA analyzer (Applied Biosystems, Foster City, CA, USA). Phylogenetic analysis was performed based on mtDNA *cox1* sequences of 11 Velutinidae species with *Trivia arctica* as an outgroup available on GenBank. Sequence alignment was conducted using Clustal Omega (Sievers et al., 2011) with default option in Geneious prime 2021.0.1 (Biomatters, Auckland, New Zealand). The molecular phylogenetic tree was reconstructed in MEGA X (Kumar et al., 2018) using the neighbor-joining method with 1,000 bootstrap replications.

SYSTEMATIC ACCOUNTS

Phylum Mollusca Linnaeus, 1758
Class Gastropoda Cuvier, 1795
Order Littorinimorpha Golikov and Starobogatov, 1975
Family Velutinidae Gray, 1840
Genus *Coriocella* Blainville, 1824

[1]***Coriocella jayi* Wellens, 1996 (Figs. 1–3)**

Coriocella jayi Wellens, 1996: 369–376, figs. 1–10, tables 1–3.

Material examined. Korea: 1 individual (NIBRIV0000909806): Jeju-do, Jeju-si, Chuja-myeon (33°57′59.08″N, 126°17′31.34″E), 1 Sep 2021; 1 individual (Marine Research Center, National Park Research Institute, KNPS-00100255): Gyeongsangnam-do, Tongyeong-si, Hansan-myeon, Maejuk-ri (34°32′07.10″N, 128°43′54.23″E), 26 May 2022.

Description. Body oval shaped. Mantle rather thick, completely covering the entire shell, and brown in color; mantle surface covered by irregular vaulted tubercles and fringed with black or dark brown margins; top of tubercles appears as very pale beige line; six very large cylinder-shaped tubercular lobes evident on dorsum, with one of them positioned at center of other five and higher than others (Fig. 1A). Cephalic tentacles acuminate, stout, and brown in color but a half of tentacles toward terminal tips becoming pale yellow.

Korean name: [1]*큰돌기배고둥붙이 (신칭)

Fig. 2. Internal shell of *Coriocella jayi* Wellens, 1996. Left, ventral view; right, dorsal view. Scale bar = 10 mm.

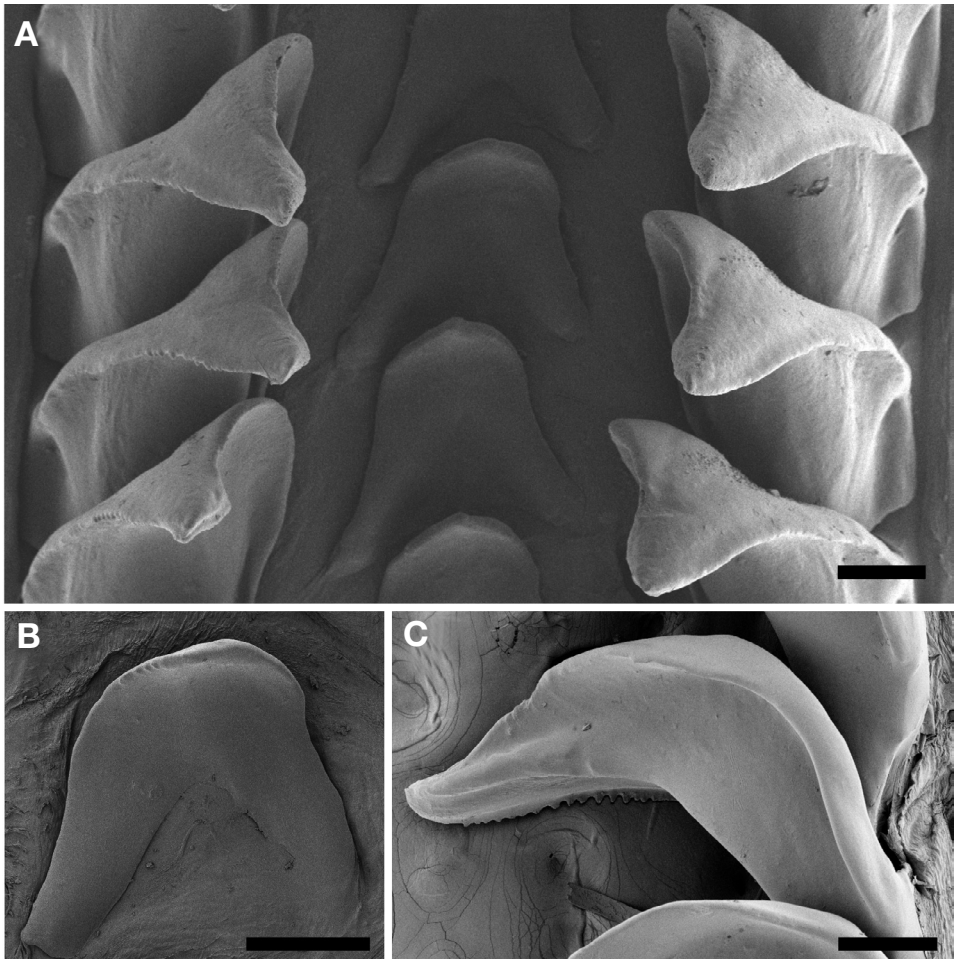

Fig. 3. Scanning electron microscope images of the radula microstructure of *Coriocella jayi* Wellens, 1996. A, Part of the radula; B, Rachidian tooth; C, Lateral tooth. Scale bars: A–C = 200 μm.

Small black eyes located in the middle of tentacles directing outward (Fig. 1B). Foot oval-shaped, dark brown in color occupying about half body length (Fig. 1C).

Shell thin (Fig. 2), fragile, whitish, and covered with a very thin periostracum (width 34 mm, height 26 mm); surface smooth, with clearly visible growth lines; body whorl

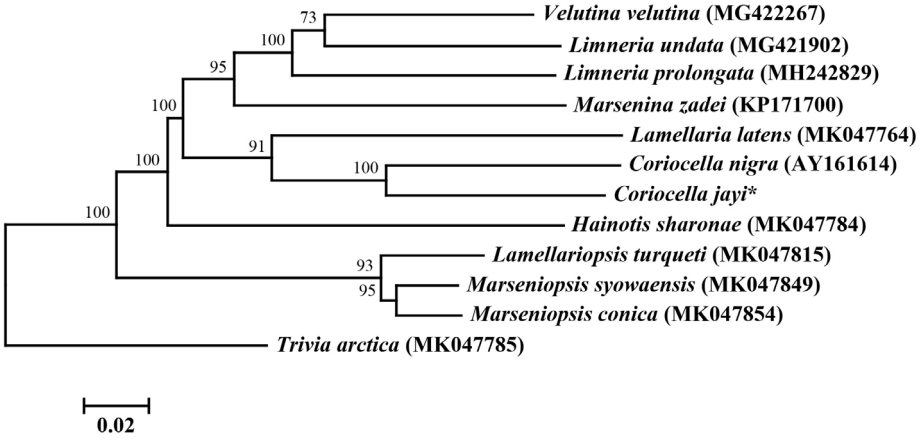

Fig. 4. The phylogenetic tree reconstructed from mtDNA *cox1* sequences of the Velutinidae species using neighbor-joining method. Bootstrap values over 70% are indicated on each node. An asterisk denotes the *cox1* sequence newly determined in this study.

very large, well inflated, and occupying most of shell; suture impressed; upper whorl small and roundly inflated. Aperture large, columella smooth, outer lip thin with fringed outer margin.

Radula reduced taenioglossate, with a radula formula of 0-1-1-1-0 (Fig. 3A). Rachidian tooth thin, elongated quadrate in shape, with a single median cusp, bearing five small denticles on left side of central cusp (Fig. 3B). Lateral teeth prominently developed; cusp long and sharp, pointed tip, with small irregular denticles (Fig. 3C).

Habitat. Subtidal zone (10−20 m depth).

Type locality. Le Platier de Grand Fond, St. Gilles Les Bains, Reunion.

Distribution. Madagascar, Reunion, and Korea.

Remarks. Although this species has been reported to occur in eastern islands (Reunion and Mauritius) of Madagascar in Africa to date, morphological characters of the specimens described in this study generally agree with the original description of *Coriocella jayi* Wellens, 1996 in their body form, internal shell, and radula morphology. This genus includes eight valid species according to MolluscaBase (2022): *Coriocella jayi* Wellens, 1996, *C. fella* Er. Marcus and Ev. Marcus, 1970, *C. herberti* Drivas and Jay, 1990, *C. hibyae* Wellens, 1991, *C. nigra* Blainville, 1824, *C. safagae* Wellens, 1999, *C. semperi* (Bergh, 1875), and *C. tongana* (Quoy and Gaimard, 1832). Among these, *C. jayi* is distinguished from other congeneric species by having six cylinder-shaped tubercular lobes in their dorsal part of mantle body and mantle color (Wellens, 1996). Despite the morphological similarities, further investigation will be needed to confirm whether these two geographically remote populations (African and Korean populations) can be justified as the same species with a disconnected distribution range, or represent morphologically similar but two distinct species.

Molecular identification. In order to confirm species identification, the mtDNA *cox1* sequence of the Korean sample (GenBank accession number: OQ706769) was determined for phylogenetic analysis with other Velutinidae species. The resulting phylogenetic tree (Fig. 4) shows that *C. jayi* is grouped with its congeneric member *C. nigra*, a tropical Indo-Pacific species. Their sister relationship is strongly supported by 100% bootstrap value, but sequence divergence (*p*-distance) between these two species is relatively high (14.24%).

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CONFLICTS OF INTEREST

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

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