INTRODUCTION

The family Acanthochitonidae Pilsbry, 1893 is characterized by 9 pairs of sutural tufts on a well-expanded girdle that overgrows plates. It is found in intertidal and subtidal zones worldwide. Of its eight genera, only two have been previously reported in South Korea: Acanthochitona Gray, 1821 (6 species) and Notoplax H. Adams, 1862. Here we report Leptoplax doederleini (Thiele, 1909) as the first record of the genus Leptoplax in South Korea and describe and compare its morphological features with N. kaasi Hong, Dell’Angelo and Van Belle, 1990. In addition, we provide the partial sequence of the mitochondrial DNA cytochrome c oxidase subunit I gene as a DNA barcode sequence record.

KEYWORDS: Leptoplax, Acanthochitonidae, shell eyes, radula, Korea

MATERIALS AND METHODS

Specimens were collected from the rocky intertidal zone in Jindo and fixed in 95% ethanol. The specimens were identified by their morphological features observed under a stereo-microscope (Leica M205C, Wetzlar, Germany). SEM images were prepared in order to examine the microstructure of the valves, girdle and radula. One specimen was boiled in 7% KOH solution for 10–15 min. After the internal tissues had dissolved, the specimen was rinsed with tap water and the valves, girdle and radula were dissected. The dissected parts were cleaned to remove residual tissue using an ultrasonic cleaner (Shinhan 200H3L; Shinhan-Sonic, Korea), coated with gold-palladium, and photographed using an SEM (Ultra Plus; Zeiss, Germany). The specimens used in this study were deposited in the Marine Mollusk Resource Bank of Korea (MMRBK) in Seoul, Korea (MMRBK Nos. 00006403, 00006404, and 00006407) and the National Institute of Bio-
logical Resources (NIBR) in Incheon, Korea (NIBR No. NIBRIV0000812928).

Genomic DNA was extracted from mantle tissue of four individuals using an E.Z.N.A. Mollusc DNA Kit (OMEGER Bio-tek, Norcross, GA, USA). The partial sequence of the mtDNA coxl gene was amplified by polymerase chain reaction (PCR) using TaKaRa Ex Taq (Takara Bio, Shiga, Japan); the mixture consisted of 37.25 μL distilled water, 5 μL of 10× Ex taq buffer, 4 μL dNTP Mixture (2.5 mM each), 1 μL of each universal primer (LCO1490, HCO2198) (Folmer et al., 1994), 0.25 μL of TaKaRa Ex Taq, and 1.5 μL of genomic DNA. PCR was performed with an initial denaturation at 95°C for 1 min, 40 consecutive cycles of denaturation at 94°C for 30 sec, annealing at 46°C for 30 sec, elongation at 72°C for 30 sec, and a final elongation at 72°C for 10 min. The PCR products were purified using a QIAquick Gel Extraction Kit (Qiagen, Valencia, CA, USA). Sequencing of the PCR products was performed using an ABI PRISM 3730xl DNA analyzer (Applied Biosystems, Foster City, CA, USA).

**SYSTEMATIC ACCOUNTS**

Phylum Mollusca Linnaeus, 1758
Class Polyplacophora Gray, 1821
Order Chitonida Thiele, 1909
Family Acanthochitonidae Pilsbry, 1893
*Genus Leptoplax* Dall, 1882

**Type species.** *Chiton coarctatus* G. B. Sowerby II, 1841


**Diagnosis.** Body small to medium sized, reduced tegumentum, developed apophysis and insertion plates, lateral and pleural areas of intermediate valves not separated, postmural slope of tail valve concave, 9 pairs of low density tufts, radula symmetrical arrangement.

*2*° *Leptoplax doederleini* (Thiele, 1909)
*Notoplax (Notoplax) doederleini*: Van Belle, 1980: 478–480, fig. 4.
Leptoplax doederleini: Saito, 2001: 200, fig. 14; 2006: 217; 
Sirenko and Saito, 2017: 460–463, figs. 9–12, 43D.

**Material examined.** Korea: 3 individuals, Gyeonsangnam-do: Jindo-gun, Gogun-myeon, Geumgye-ri, Gagye seawall, 6 Jul 2016; 1 individual, Jindo-gun, Gogun-myeon, Geumgye-ri, Gagye seawall, 14 Dec 2016.

**Description.** Body elongate oval shaped, small in size (length 12–14 mm, width 6–8 mm). Head valve, 2nd valve, and 4th valve pinkish red; the other valves yellowish white and maculated with olive green or pink; jugal area of intermediate valves greenish white except for 2nd valve. Girdle pink with pale pink bands. Gills arrangement abanal and mebrobranchial (Fig. 1B).

Head valve semicircular, anterior margin roundish, posterior margin widely V-shaped, irregularly sized circular granules on surface (Fig. 2A). Articulamentum white, insertion plate symmetric and wide with 5 slits; shallow channels and wrinkles.

Intermediate valves trapezoid, jugal area wedge shaped and smooth, pleural and lateral areas not distinguished; with oval granules on surface (Fig. 2B, C). Articulamentum white, central callus rather thick, apophysis thin and slightly protruded; separated without jugal laminae, 1 slit on each side of insertion plate; deep channels and strong wrinkles near channels, ventral tegmental callus thin and slightly wide.

Tail valve oval, central mucro (Fig. 2D). Antemucronal area with smooth central surface and with oval granules on both sides. Postmucronal area similar to head valve, postmucronal slope concave. Articulamentum white, apophysis rather protruding without jugal laminae and anterolateral side concave, insertion plate asymmetric and with differently sized teeth with 9 slits.

Granules usually in quincuncial arrangement (Fig. 3A); sometimes in irregular arrangement and attached closely side by side (Fig. 3B; white arrowheads). Usually 2–3 shell eyes on each granule, sometimes only one shell eye. Located on the surface except for granules with dense shell eyes.

Girdle rather wide. Perinotum with 9 pairs of not noticeable sutral tufts; seven pairs of sutural tufts between each valve and two pairs of sutural tufts at the ends of both the head and tail valves, densely covered with very small spines,
Leptoplax doederleini from South Korea

rarely large spines (Fig. 4A). Small spines sharply pointed, sometimes with narrow longitudinal grooves on the tip. Large spines long and smooth. Hyponotum densely covered with flattened spines directed outward (Fig. 4B).

Radula symmetric rows (Fig. 5). Central tooth oblong, basal part narrow. Centro-lateral tooth rather thin, antero-dorsal corner hardly protruding. Head of major lateral tooth tricuspid, three cusps of similar length, middle cusp slightly longer than the others, long groove along lateral side of shaft. Small lateral tooth rather thick. Major uncinus tooth S-curved; spoon-like in shape on the upper side. Marginal tooth flattened, slightly dented on the central part.

Habitat. Intertidal zones of rocky shores.

Distribution. Hong Kong, Japan, Korea, and Vietnam.

Remarks. Leptoplax and Notoplax are morphologically similar to each other: both have a reduced tegmentum, well-developed articulamentum, slit formula of 5/1/3-10, wide and thick girdle with dense spicules, and inconspicuous sutural tufts. But these two genera are distinguished by several morphological characters: diagonal lines, postmucronal slope of the tail valve, and radula arrangement. In N. kaasi, the head valve has five diagonal ridges with enlarged granules compared to the granules that are not on the ridges; the pleural and lateral areas of the intermediate valves are distinguished by a diagonal line; the postmucronal slope is convex and precipitous; and the radula are arranged obliquely (Hong et al., 1990). On the other hand, L. doederleini lacks diagonal lines, and so the pleural and lateral areas are not distinguished (Fig. 2B, C); the postmucronal slope of the tail valve is concave (Fig. 2D); and the radula is arranged symmetrically (Fig. 5).

A 658-bp partial cox1 sequence was obtained from 4 individuals, each differing by 3–9 bp. The sequences were deposited in GenBank (accession Nos. MH445296, MH445297, MH445298 and MH445299).

ACKNOWLEDGMENTS

This research was supported by the Marine Biotechnology Program of the Korea Institute of Marine Science and Technology Promotion (KIMST) funded by the Ministry of Oceans and Fisheries (MOF) (No. 20170431) and by the National Institute of Biological Resources (NIBR) funded by the Ministry of Environment (MOE) of the Republic of Korea.

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Received November 15, 2018
Accepted December 28, 2018