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First Record of Abyssal vitreous scallop, *Delectopecten vitreus* (Gmelin, 1791) (Bivalvia: Pectinoidea: Pectinidae) from Korea

Sang-Hwa Lee[1], Cheol Yu[2], Chang Rak Jo[2], Ui-Cheol Shin[3], Young-Sun Song[3], Eun-Ho Kim[3] and Myung-Hwa Shin[2]

[1]Invertebrate Diversity Institute (InDI), Cheongju, 24339, Republic of Korea
[2]National Marine Biodiversity Institute of Korea, Seocheon, 33662, Republic of Korea
[3]Dokdo Fisheries Research Center, National Institute of Fisheries Science

ABSTRACT

Nineteen individuals of abyssal transparent scallop species were collected by standard bottom trawl survey (East Sea) and were identified as *Delectopecten vitreus* (Gmelin, 1791). To date, 23 species, including 14 fossil species, in genus *Delectopecten* R. B. Stewart, 1930, have been reported worldwide; however, there is no report in Korea thus far. In this study, we provide morphological descriptions and photographs of *D. vitreus*, with the mitochondrial DNA cytochrome c oxidase subunit I (mtDNA *cox1*) sequence, as a new record of the Korean waters.

Keywords: New record, *Delectopecten vitreus*, trawl survey, Korea

INTRODUCTION

The family Pectinidae Rafinesque, 1815, commonly known as scallops, are distributed in various environments and climates and are one of the most biologically, ecologically, and morphologically diverse family of Bivalvia. (Serb, 2016; Smedley *et al*., 2019). They are only found in the ocean and are one of the few groups that can swim freely among the bivalves. Scallops are also a widely used food source, but due to their biological values (biological diversity, the number of extant species, shell morphology, etc.), many researchers utilize them as an ideal model for evolution of traits, such as phototransduction, swimming mechanics, shell shape, and behavior (Alejandrino *et al*., 2011; Faggionato and Serb, 2017; Gomez *et al*., 2011; Guderley and Tremblay, 2013; Hayami, 1991; Kingston *et al*., 2015; Millward and Whyte, 1992; Porath-Krause *et al*., 2016; Serb *et al*., 2011, 2013, 2017; Sherratt *et al*., 2016; Stanley, 1970; Tremblay *et al*., 2015; Valentine *et al*., 2006).

Among the genera in the family Pectinidae, Genus *Delectopecten* R. B. Stewart, 1930, has more fossil species than the extant species, and consists of transparent small species. According to the MolluscaBase 2023 data, 23 species, including 14 fossil species, have been recorded in the genus *Delectopecten* R. B. Stewart, 1930; however, there is no report in Korea thus far.

DeepSea surveys were carried out in Gangwon and Gyeongbuk offshore, from April and October 2023, with the research ships (Tamgu 23ho [1,679G/T] and Tamgu 22ho [1,458G/T]) of the National Institute of Fisheries Science (NIFS). A standard bottom trawl haul is 30mins and is towed at an average of 3.2 kts speed. A standard trawl haul starts when the trawl touches the bottom and ends when the winches are connected at haul back. In this research study, nineteen specimens of transparent small scallops were collected. Among them, three specimens were collected

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Corresponding author: Myung-Hwa Shin
Tel: +82 (41) 950-0815, e-mail: speciosus@marbik.re.kr
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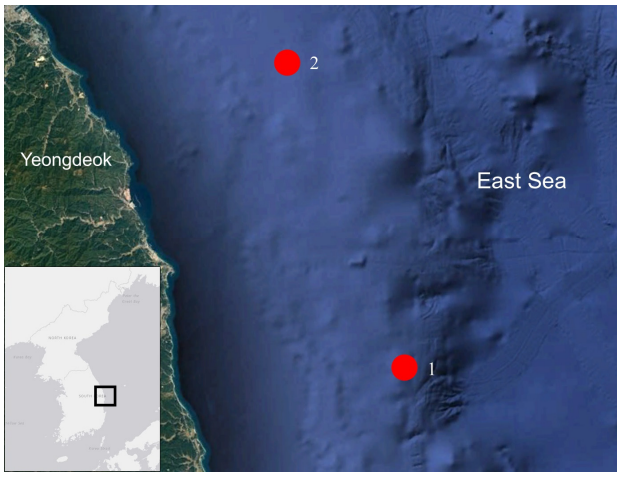

Fig. 1. Map showing the sampling area.

by the bottom trawling with a research ship (Tamgu 23ho) at a depth of 700 m from Gyeongbuk offshore in 7 April 2023 and the other 16 specimens were collected by the bottom trawling with research ship (Tamgu 22ho) at the depth of 500 m from Gangwon offshore on 8 October 2023 (Fig. 1, table 1).

The morphological features of the specimen were examined using a stereomicroscope (Leica MZ12.5, Germany). It was identified as *Delectopecten vitreus* (Gmelin, 1791), the first record from the Korean waters, based on its shell characters. After alcohol fixation, all specimens were deposited at the National Marine Biodiversity Institute of Korea (MABIK), Seocheon, Republic of Korea. The mitochondrial cytochrome c oxidase subunit 1 (*cox1*) sequence was obtained, but genetic information of the same species was not registered in the GenBank database, so it could not be compared.

In this study, we provide morphological descriptions and photographs of *D. vitreus*, with the cytochrome *c* oxidase subunit 1 (*cox1*) sequence, as a new record of the Korean waters.

SYSTEMATIC ACCOUNTS

Class Bivalvia Linnaeus, 1758 이매패강
Order Pectinida Gray, 1854 가리비목
Superfamily Pectinoidea Rafinesque, 1815 가리비상과
Family Pectinidae Rafinesque, 1815 가리비과
Subfamily Camptonectinae Habe, 1977 투명가리비아과
Genus *Delectopecten* R. B. Stewart, 1930 반투명가리비속
***Delectopecten vitreus* (Gmelin, 1791) (Fig. 1) 투명유리가리비(신칭)**

Ostrea vitrea Gmelin, 1791: 3328; Dillwyn, 1817: 263.
Pecten vitreus; Locard, 1888: 135.
Palliolum vitreum; Barnard, 1962: 254; idem, 1963: 5, 14; idem, 1964: 431 (in part); 1974: 761.
Delectopecten vitreus vitreus; Nordsieck, 1969: 47, pl. 7, fig. 31.10.
Chlamys (*Delectopecten*) *vitrea*; Tebble, 1976: 64, text figs. 27A-B.
Delectopecten vitreus; Abbott, 1974: 446; Lucas, 1979: 18, figs; Waller, 1984: 208, figs 3d-e; Wagner, 1991: 13, text fig. 5; Poppe & Goto, 1993: 65, pl. 9, fig. 7; Dijkstra & Kilburn, 2001: 270, figs 3 and 4; Dijkstra & Goud, 2002: 48, figs 42-44; Dijkstra & Gofas, 2004: 59, fig. 18A-I.
Cyclopecten (*Delectopecten*) *vitreus*; Rombouts, 1991: 78, pl. 27, fig. 3; Lussi, 1995: 2, 12, fig. 20.

Type locality: 'Oceano septentrionali' (North Atlantic Ocean) (Gmelin, 1791).
Habitat: Sublittoral to abyssal depths, usually attached to rocks, stones, gorgonians or hydroids on a substratum of mud or muddy sand (Dijkstra, 2001).

Table. 1. The collecting sites and dates of the species, *Delectopecten vitreus* (Gmelin, 1791)

Station	Collecting date	GPS for collecting locations		Depth
		Trawl starting	Trawl finishing	
1	7 April 2023	36.904582 N 129.883828 E	36.879262 N 129.885215 E	712 m
2	8 October 2023	37.381503 N 129.687580 E	37.392763 N 129.658632 E	480 m

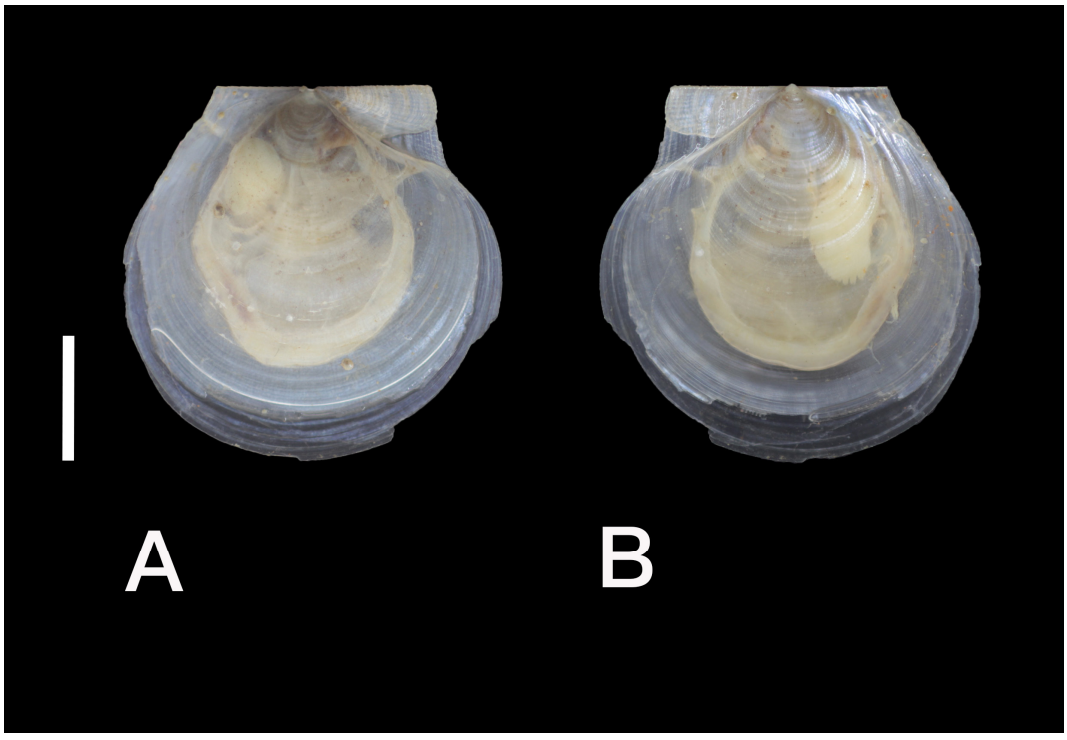

Fig. 2. *Delectopecten vitreus* (Gmelin, 1791). **A**. Left valve exterior; **B**. Right valve exterior. Scale bar: 10 mm.

Distribution: Arctic Ocean (Norway, Iceland, Greenland), NW, East Atlantic, South Africa, Turkey (Demir, 2003), and Korea (East Sea, this study).

Material examined: 3 specimen (MABIK MO00184507), Gyesangbuk-do offshore (East Sea), Korea, 36°31'39.2"N 129°31'52.1"E, 700m, 7 April 2023, and 16 specimen (MABIK MO00184900), Gangwon-do offshore (East Sea), Korea, 37°14'08.4"N 129°23'42.6"E, 500m, 8 October 2023, M-H Shin.

Measurement: Same shell height and width, 30 mm.

Description: Shell fragile, transparent, up to 25 mm high, almost circular in shape, right valve slightly more convex than left valve, anterior auricles slightly larger than posterior ones. Both valves smooth, or, covered with antimarginal microsculpture and growth lines with vesicular tubercles, except on anterior auricle of right valve, which has 5-6 lamellose radial riblets. Hinge line straight. Byssal fasciole rather broad, byssal notch well-developed. Active ctenolium well-developed with 3-6 teeth on suture. Color dull translucent white or hyaline.

Remarks: It is very high similarity in shape among the genus *Delectoecten*. In particular, in the case of *D. vitreus*, there are variations in convexity and in sculpture depending on the collection site (Dijkstra *et al*, 2009), so genetic data are considered necessary to clearly distinguish them. In this study, We performed molecular experiments to obtained the gene information of mtDNA *cox1* partial sequence for DNA barcoding of *D. vitreus* (Appendix 1.), but only the 12s, 18S, and 28S partial gene sequences of *D. vitreus* were registered in Genbank database, so molecular identification could not be performed. However, we provide the DNA barcoding sequence for further studies by other researchers related to *D. vitreus* in the future.

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