

## A New *Astraeine* Turbinid from the Korean Peninsula with Notes on a New Subprovince of the Japonic Molluscan Province

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**ABSTRACT** A new species of giant Star Shell (Turbinidae: *Astreinae*) has been discovered from the Neritic Zone of the Korean Peninsula. The new taxon, *Pomaulax geummae* new species, is described from specimens collected by Haenyeo women shellfish divers on Jeju Island, South Korea. Based on the range of this new species, and the distributions of other endemic taxa, a new subprovince of the Japonic Molluscan Province, the Korean Subprovince, is described.

**KEY WORDS** Turbinidae, *Astreinae*, *Pomaulax*, *P. geummae*, *P. japonica*, Korea, Japonic Molluscan Province, Korean Subprovince

### INTRODUCTION

The Japonic Molluscan Province is a paratropical region that extends from the east and west coasts of central Honshu Island, Japan, to the Ryukyu Archipelago and the Korean Peninsula, to the Yellow Sea and coast of China, and to Taiwan and the deeper water areas of the central South China Sea (Petuch and Berschauer, 2020: 197, figure 6.2). Within this large warm temperate biogeographical area, the molluscan fauna of the Korean Peninsula stands out as being the least studied within the province. Its biogeographical placement within the Japonic Province is discussed in the following the species description in this paper.

Recently, a collector in South Korea brought to our attention a Star Shell of the genus *Pomaulax* that is the largest-known member of its genus and which is undescribed. Comparable in size to the giant *Megastrea undosa* (Wood, 1828) and *M. turbanica* (Dall, 1910) Star Shells of the Californian Molluscan Province, this distinctive turbinid was collected by the renowned women shellfish divers (Haenyeo) of Jeju Island, South

Korea, who collect them as a food resource. Although initially considered to be a variant of the well-known long-spined *Pomaulax japonicus*, enough morphological differences exist to warrant its description as a full species. The new Korean turbinid is described in the systematic section in this paper.

The new species of *Pomaulax* is described in context with the other members of the genus: one from the Western Pacific and two from the Eastern Pacific. The holotype is deposited in the molluscan type collection of the Department of Malacology, Los Angeles County Museum of Natural History, Los Angeles, California and bears an LACM catalog number.

### SYSTEMATICS

Class	Gastropoda
Subclass	Vetigastropoda
Order	Trochida
Superfamily	Trochoidea
Family	Turbinidae
Subfamily	<i>Astraeinae</i>
Genus	<i>Pomaulax</i> Gray, 1850

*Pomaulax geummiæ* Berschauer &  
Petuch, new species  
(Plate 1, Figures A-B; Plate 2, Figures A-B)

**Description.** Shell medium to large for genus, with maximum diameter reaching in excess of 120 mm; thick shelled and solid; spire high, in excess of ninety percent as tall as wide; protoconch yellowish-white and eroded; teleoconch consisting of two to three straight sided whorls sculpted with undulating oblique ribs; body whorl reddish-tan with gold highlights; periphery of early whorls with 12 to 15 flat hollow spines forming a slightly flaring rim at the peripheral edge, increasing in number to 25 to 30 small blunt knobs in later whorls; body whorl sculpted with spiral cords of strong beads which often fuse into undulating cords, with a strong spiral cord of beads just above a rounded peripheral edge; base yellowish-tan, slightly convex, sculpted with 12 to 15 strong spiral beaded cords; umbilicus closed, smooth, white, with a central depression over the umbilical area; aperture rounded and elongate, silvery nacreous interior; operculum smooth, white, elongate, thick and heavy with medium tan to light brown peripheral edge.

**Type Material.** HOLOTYPE - LACM 3325, measuring 106.9 mm in height, 112.8 mm in width. PARATYPES - One specimen in the Berschauer collection measuring 107.3 mm in height and 116.7 mm in width; one specimen in the Petuch collection measuring 113.6 mm in height and 120.1 mm in width; one specimen in the Suhan Kim collection measuring 102.0 mm in height and 127.0 mm in width; five specimens in the collection of Andy Tan, measuring between 90.0 and 120.0 mm in height and 100.0 to 127.0 mm in width.

**Type Locality.** Jeju Island, South Korea. Collected at approximately 30 meters depth.

**Range.** Known from various locations as far north as Gochang, Jeeollanam-do, South Korea in the Yellow Sea in the west (known as “the West Sea”), across the far south near Jeju Island (in “the South Sea”), to Dokdo and Ulleungdo Islands, in the Korean Strait / southern Sea of Japan on the eastern side of South Korea (in “the East Sea”) (Figure 2).

**Etymology.** Named in honor of Mun Geum Mi, a traditional woman free diver and shellfish gatherer (“Haenyeo”) of Jeju Island, South Korea, who collected the type specimens.



**Figure 1.** Map showing the ranges and distributions of the two Japonic Province *Pomaulax* species. Yellow dots represent verifiable records of *P. japonicus*. Red dots represent verifiable records of *P. geummiæ* from GBIF records from Kwon, 2022.

**Discussion.** This new species is most similar to the Japanese Archipelago *Pomaulax japonica* (Dunker, 1844), the related taxon to which it has previously been referred. *Pomaulax geummiæ* differs in having a proportionately higher spire, heavier shell, more numerous smaller peripheral knobs (25 to 30 in *P. geummiæ*, compared to 11 to 12 in *P. japonica*), a rounded peripheral edge, and stronger ornamentation on the body whorl and base. The new species is restricted to the Korean Subprovince of the Japonic Province (described below) and is known only along the southern end of the Korean Peninsula in South Korea and on adjacent offshore islands such as

Jeju. The closely-related *P. japonica* is found only along the islands of Honshu and Shikoku on the Japanese mainland and is not reported to range any farther west or south (the known ranges of the two related taxa are shown here on Figure 1; see GBIF Secretariat, 2022). The morphological differences in body shape between these two Japonic species, are shown in a regression analysis of height to width ratios, which are readily apparent on the graph in Figure 3.

As presently understood, the North Pacific Ocean genus *Pomaulax* is represented by four living species (shown here on Plate 3). These include:

*Pomaulax geummae* Berschauer and Petuch, new species (Plate 3, Figure A), here described from South Korea and Jeju Island.

*Pomaulax spiratus* (Dall, 1911) (Plate 3, Figure B); southern tip of Baja California Sur and the southern Gulf of California (records of this species from Costa Rica and Ecuador are erroneous).

*Pomaulax gibberosus* (Dillwyn, 1817) (Plate 3, Figure C); British Columbia, Canada to central Baja California, Mexico.

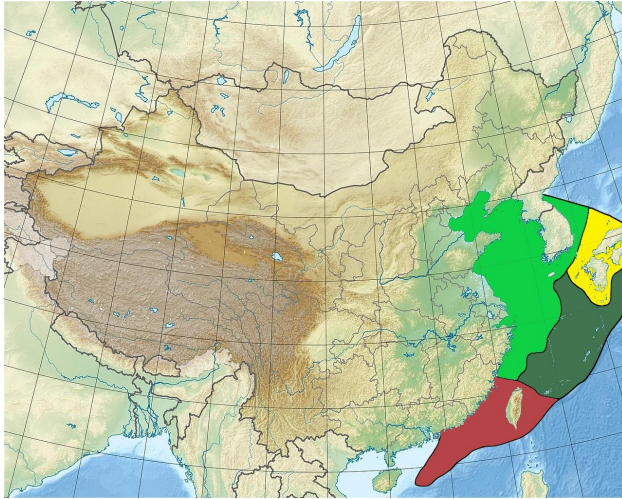
*Pomaulax japonicus* (Dunker, 1844) (Plate 3, Figure D); eastern and western coasts of Honshu Island, Japan and the eastern coast of Shikoku Island, Japan.

Of these four known *Pomaulax* taxa, *P. geummae* is the largest species, reaching a size that dwarfs the other congeners. Along with the Californian *Megastraea* species (*M. undosa* and *M. turbanica*), the new Korean endemic *Pomaulax* is among the largest of the worldwide astreine turbinids. For a review of the more well known *Pomaulax* taxa, see Alf & Kreipl (2011).

## BIOGEOGRAPHICAL FRAMEWORK

In our worldwide marine biogeographical treatment, *Tropical Marine Mollusks: An Illustrated Biogeographical Guide* (2020), we recognized three biogeographical subprovinces of the Japonic Province; the **Shikokuan Subprovince** (the southern half of Honshu Island, and Shikoku and Kyushu Islands of mainland Japan); the **Ryukyuan Subprovince** (the Ryukyu Archipelago and East China Sea islands); and the **South China Subprovince** (Taiwan, the Taiwan Straits, and deep water areas of the South China Sea). Although sharing most of the classic widespread Japonic index species (Petuch and Berschauer, 2020: 196-199), these three areas also have their own assemblages of regional endemic species, all at a level of endemism that exceeds 25% of the total molluscan fauna.

Until recently, little was known about the malacofauna of the Yellow Sea and Korean coasts, primarily due to regional political problems and lack of field workers in the area. Sporadic collecting by commercial shell collectors and dealers has recently brought to light several new or rarely-seen species and subspecies, all of which are now known to be endemic to the Korean Peninsula and adjacent Yellow Sea. Some of these include the muricid *Ceratostoma burnetti coreanica* (A. Adams, 1854), the babyloniids *Babylonia habei* Altena and Gittenberger, 1981 and *Babylonia perforata perforata* (Sowerby II, 1870), the buccinid *Neptunea dilatata* (Yen, 1936), and the new astreine turbinid *P. geummae* described above. These taxa, and others from the Korean Peninsula and Yellow Sea region, demonstrate that the malacofauna of this area constitutes a previously-unnamed subdivision of the Japonic Province. The composition of the typical Japonic molluscan fauna is defined and described in Petuch and Berschauer, 2020.



**Figure 2.** Map of the Japonic Province showing the coastlines of North Korea, South Korea, China, and the Yellow Sea: the Shikokuan Subprovince (yellow), the Ryukyuan Subprovince (dark green), the South China Subprovince (red), and the Korean Subprovince (light green).

In our 2020 book, we lacked sufficient biodiversity data to be able to assign a biogeographical name to the Korean and Yellow Sea areas. Consequently, we left this area of the Japonic Province unnamed, stating that the undifferentiated area on our biogeographical map “demarcates environments with cooler water temperatures that support impoverished Japonic-type faunas; these may eventually prove to be a new subprovince” (Petuch and Berschauer, 2020: 197, figure 6.2). The discovery of this new Korean turbinid lends support to the differentiation of the area shown here on the map in Figure 2 (in light green) as a new fourth subprovince within the Japonic Province. We here name this new biogeographical subdivision the **Korean Subprovince**, which includes the Korean Peninsula, the entire Yellow Sea, and the central coast of China. For a thorough review of the intertidal fauna of Korean Subprovince see Ryu *et al.* 2012, Noseworthy *et al.* 2007, and Noseworthy & Kwang-Sik 2010.

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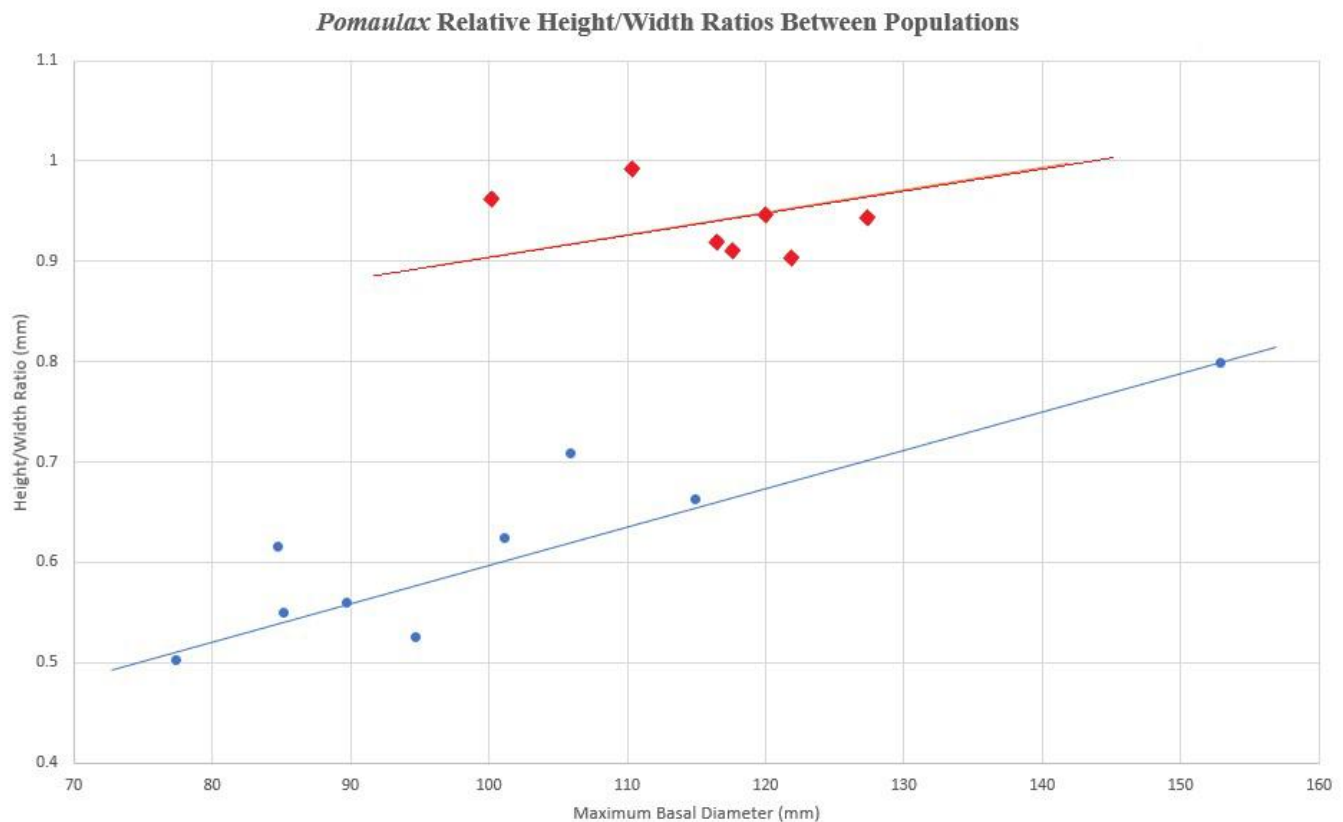
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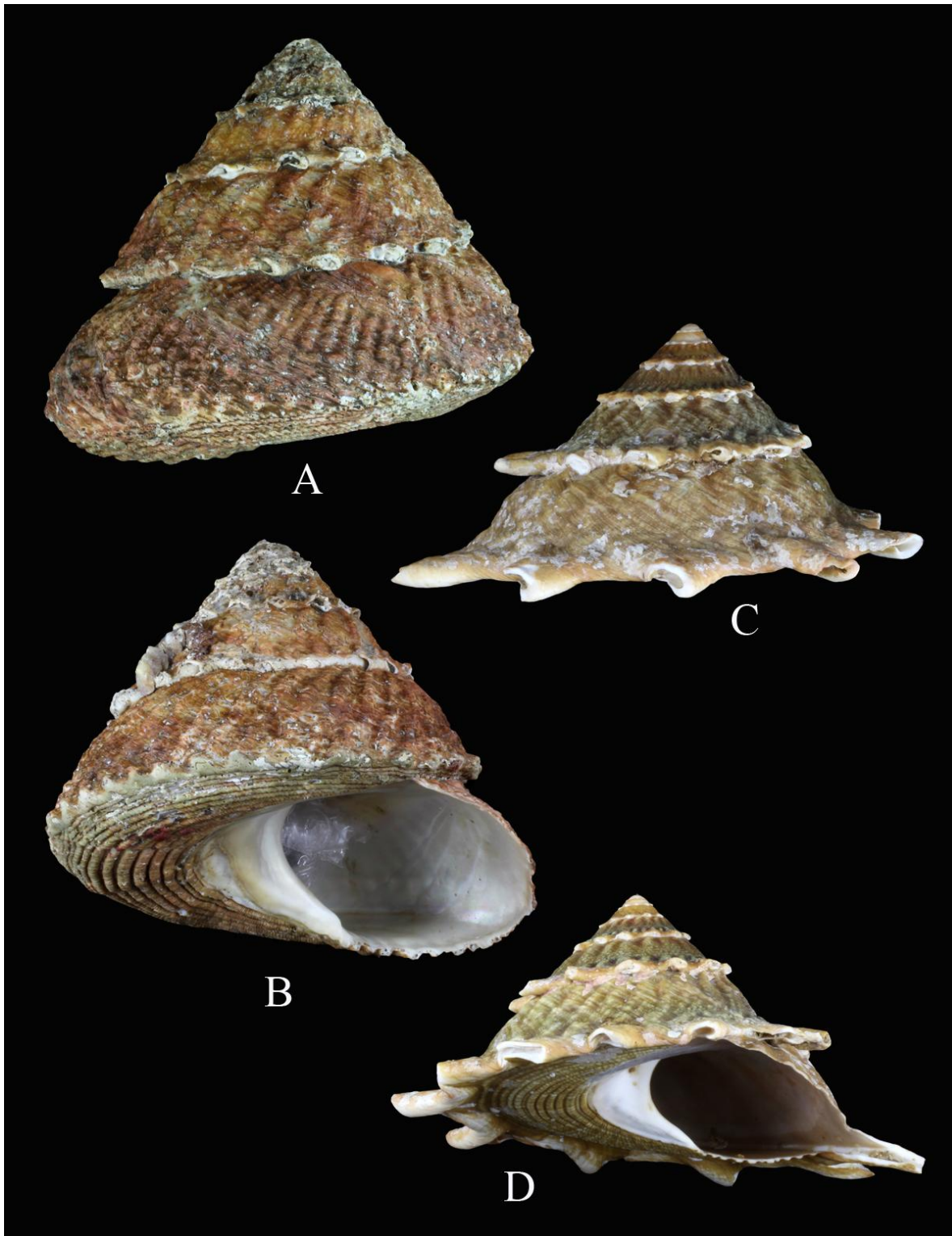
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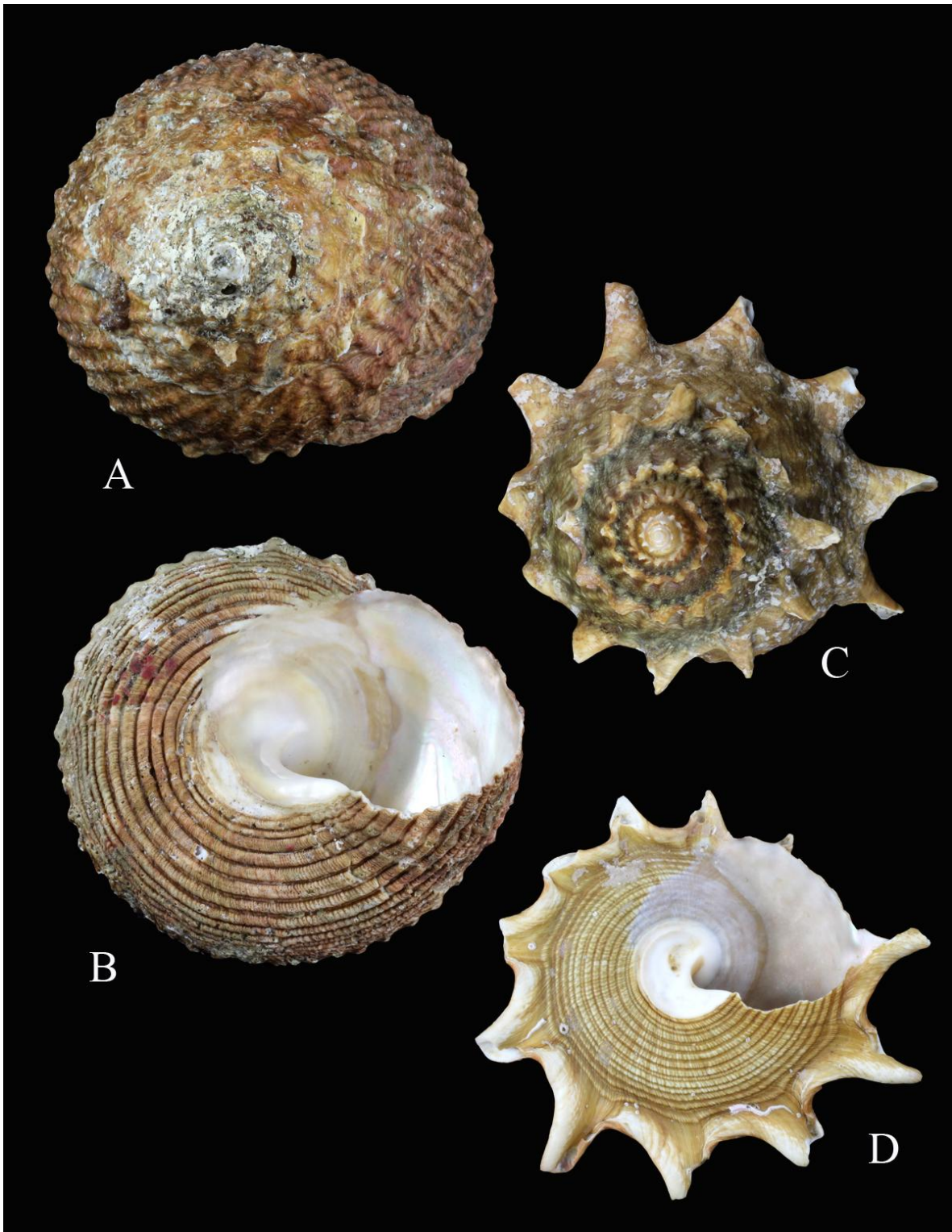
**Figure 3.** Graph showing the relative height to width ratios of studied specimens of the two Japonic *Pomaulax* species. Blue dots and line = height/width ratios of *Pomaulax japonicus*. Red diamonds and line = height/width ratios of *Pomaulax geummae* n. sp. As seen here, there is no overlap in the shell profiles of the two related taxa.





**Plate 1. *Pomaulax* species from the Japonic Province.**

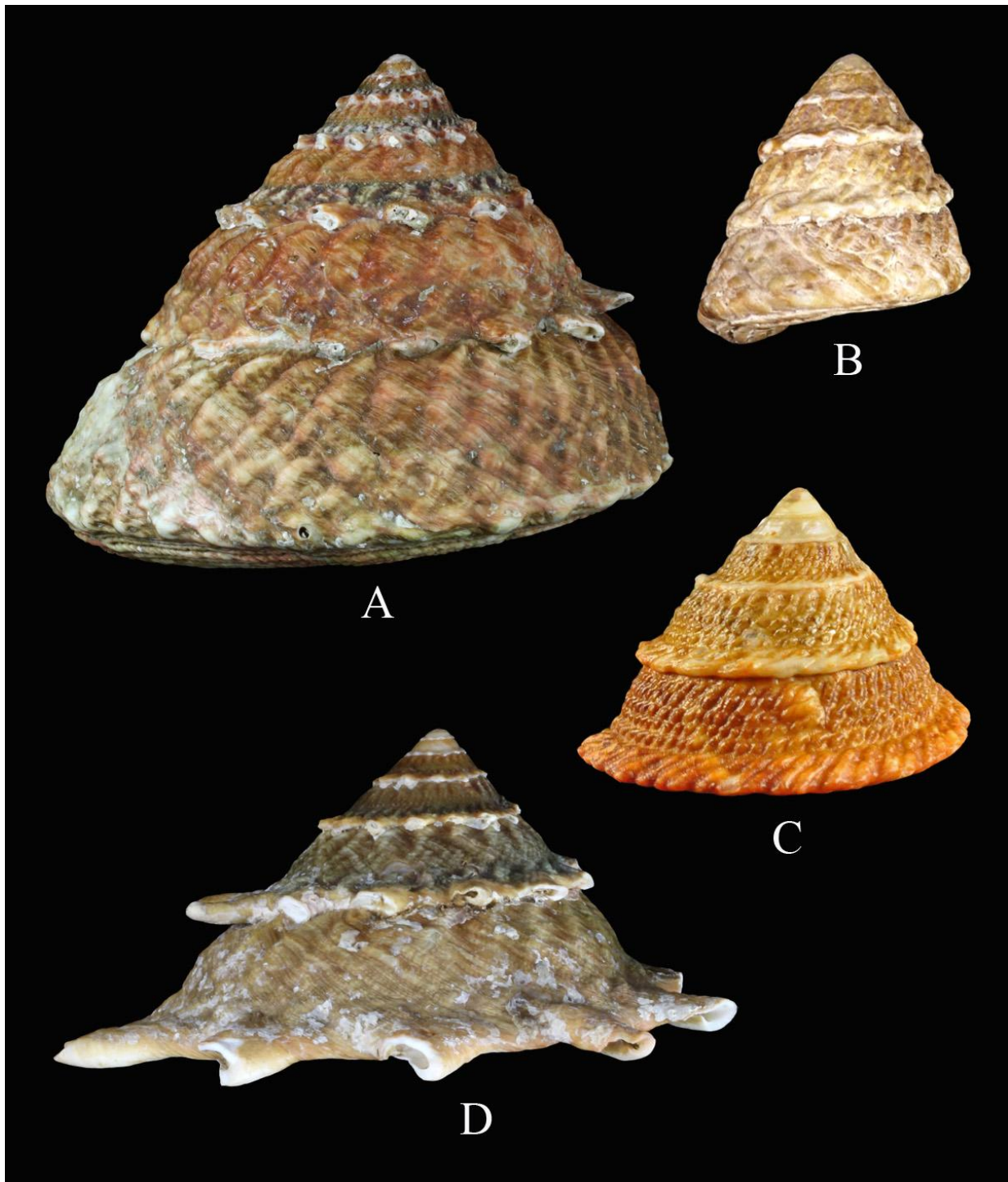
**A, B=** *Pomaulax geummiae* Berschauer and Petuch, new species. Holotype, height 106.9 mm, width 112.8 mm, LACM 3325. Collected in 30 m depth off Jeju Island, South Korea, by the Haenyeo, Mun Geum Mi; **C, D=** *Pomaulax japonicus* (Dunker, 1844. height 46.8 mm, width 85.3 mm collected in deep water off Point Daio, Honshu, Japan.



**Plate 2. *Pomaulax* species from the Japonic Province.**

**A, B=** *Pomaulax geummiiae* Berschauer and Petuch, new species. Holotype, height 106.9 mm, width 112.8 mm, LACM 3325. Collected in 30 m depth off Jeju Island, South Korea, by the Haenyeo, Mun Geum Mi; **C, D=** *Pomaulax japonicus* (Dunker, 1844. height 46.8 mm, width 85.3 mm collected in deep water off Point Daio, Honshu, Japan.





**Plate 3. *Pomaulax* species from the Eastern and Western Pacific.**

**A**= *Pomaulax geummae* Petuch and Berschauer, new species; height 107.3 mm, width 116.7 mm, off Jeju Island, South Korea; **B**= *Pomaulax spiratus* (Dall, 1911); Holotype USNM 222318, approximate height 31.0 mm, width 29.6 mm, type locality unknown but based upon recently collected specimens presumed to be near Cabo San Lucas, Baja California Sur, Mexico; **C**= *Pomaulax gibberosus* (Dillwyn, 1817); height 40.3 mm, width 45.1 mm, collected at 65 feet off Point Loma, San Diego, California (Paul Tuskes Collection); **D**= *Pomaulax japonicus* (Dunker, 1844); height 46.8 mm, width 85.3 mm, Point Daio, Honshu, Japan.