

New record of the genus *Mastoniaeforis* (Gastropoda: Triphoridae) from Vietnam

TU Nguyen Tai^{1*}, DUONG Hoang Thi Thuy¹, THANH Nguyen Tam¹, DO Duc Sang²

¹Vietnam – Russian Tropical Center, 63 Nguyen Van Huyen St., Cau Giay, Hanoi, Vietnam.

²Department of Applied Zoology, Faculty of Biology, VNU University of Science, Vietnam National University, 334 Nguyen Trai, Thanh Xuan, Hanoi, Vietnam. E-mail: do.ducsang@hus.edu.vn

*Corresponding author: taitu1990@gmail.com

ABSTRACT. Species of the genus *Mastoniaeforis* are mainly distributed in the Indo-West Pacific with ten species being recorded in the world. To date this genus was not recorded in Vietnam. Specimens of three species, *M. chaperi*, *M. lifuana* and *M. speciosa*, were collected in two field trips from May, 2019 to October, 2020 in Truong Sa archipelago (Spratly Islands), Khanh Hoa Province, Vietnam. The diagnostic characters, distribution, and illustrations of three *Mastoniaeforis* species in Vietnam are provided.

Новые находки рода *Mastoniaeforis* (Gastropoda: Triphoridae) во Вьетнаме

ТУ Нгуен Тай^{1*}, ЗЫОНГ Хоанг Тхи Туй¹, ТХАНЬ Нгуен Там¹, ДО Дук Санг²

¹Vietnam – Russian Tropical Center, 63 Nguyen Van Huyen St., Cau Giay, Hanoi, Vietnam.

²Department of Applied Zoology, Faculty of Biology, VNU University of Science, Vietnam National University, 334 Nguyen Trai, Thanh Xuan, Hanoi, Vietnam. E-mail: do.ducsang@hus.edu.vn

*Автор-корреспондент: taitu1990@gmail.com

РЕЗЮМЕ. Виды рода *Mastoniaeforis* распространены преимущественно в Индо-Вост Пацифике. Известно 10 видов рода. До настоящего времени род не был отмечен во Вьетнаме. Во время двух полевых исследований в мае 2019 и октябре 2020 г. в архипелаге Чуонг Ша (острова Спратли) были собраны экземпляры трех видов – *M. chaperi*, *M. lifuana* и *M. speciosa*. Приводятся данные о распространении видов, диагнозы и изображения раковин.

Introduction

Triphoridae Gray, 1847 is a family of spongivorous gastropods, distributed world-wide, ranging from tropical to arctic seas, and from tidal zone to a depth of about 1000 m. However, triphorid species are mainly distributed from tidal zone to a depth of about 200 m in temperate and tropical seas [Marshall, 1983]. This is a family with various sizes, ranging 2–50 mm, but most of them belong to the small size group of 2–10 mm [Albano *et al.*, 2016]. The shell has a conical shape. There are often 3–4 spiral nodulated cords on each whorl. The shell is sinistral,

except for those of the genus *Metaxia* Monterosato, 1884 [Fernandes, Pimenta, 2011].

More than 792 species, belonging to 52 genera of Triphoridae have so far been identified in the world [Marshall, 1983; MolluscaBase, 2021], of which, 93 species and 21 genera have been identified in the Sea of Japan [Okutani, 2000]; 80 species and 22 genera have been identified in Thailand and the Philippines [Poppe, 2017; Dumrongrojwattana *et al.*, 2016; Dumrongrojwattana, Tanamai, 2020]. In Vietnam 8 species of 5 genera have been recorded: *Inella pyramidalis* (A. Adams et Reeve, 1850), *Iniforis formosula* (Hervier, 1898), *Mastonia rubra* (Hinds, 1843), *Viriola cancellata* (Hinds, 1843), *Viriola connata* (Montrouzier, 1862), *Mesophora cnodax* (Jousseaume, 1884), *Viriola vulpina* (Hinds, 1843) but no species of the genus *Mastoniaeforis* Jousseaume, 1884 have been recorded. No distribution range and photographs of the shells were provided for species in Vietnam [Hylleberg, Kilburn, 2003; Nguyen *et al.*, 2012; Phan *et al.*, 2014; Thai *et al.*, 2018].

Genus *Mastoniaeforis* is characterized by a tall conical shell with long posterior siphonal canal. Up to now, ten species of the genus have been described, mainly distributed in the Indo-West Pacific [Okutani, 2000; MolluscaBase, 2021]. During the field trips from May, 2019 to October, 2020 in the Truong Sa archipelago (Spratly Islands), Khanh Hoa Province, Vietnam, we collected samples of the species of the genus *Mastoniaeforis*, the first record from Vietnam.

Material and methods

Specimens were collected on coral reefs following the method described by Sirenko [2012], with diving equipment. In total, 44 specimens of the genus

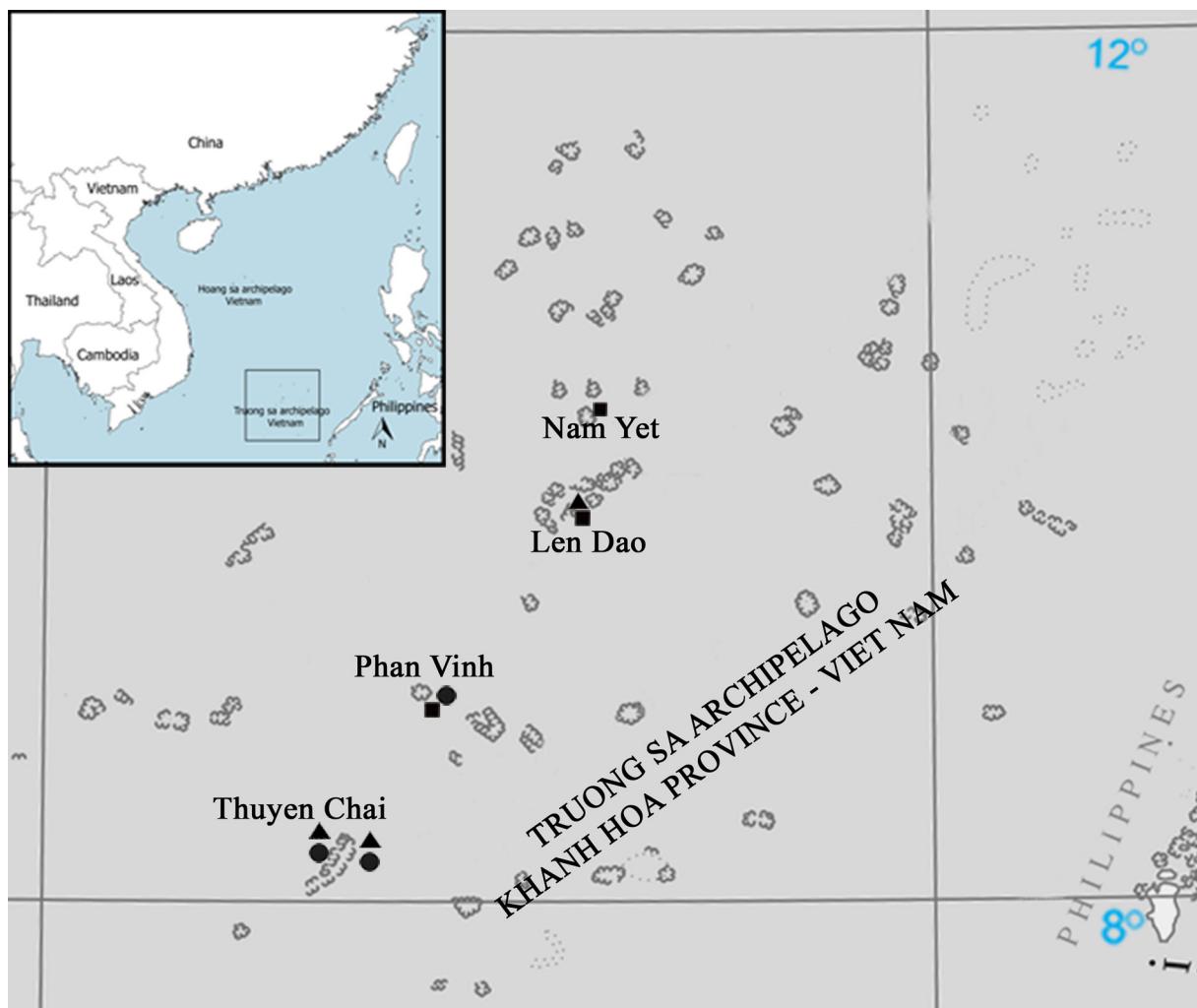


FIG. 1. Distribution map of *Mastoniaeforis* species in the Truong Sa archipelago, Vietnam. Black squares = *Mastoniaeforis chaperi*, black circles = *Mastoniaeforis lifuana*, black triangles = *Mastoniaeforis speciosa*.

РИС. 1. Карта распространения видов *Mastoniaeforis* в архипелаге Чуонг Ша, Вьетнам. Черные квадраты = *Mastoniaeforis chaperi*, черные кружки = *Mastoniaeforis lifuana*, черные треугольники = *Mastoniaeforis speciosa*.

Mastoniaeforis were collected. The shells were photographed by scanning electron microscope (SEM) and Olympus SZ61TR stereoscope with Olympus SC180 camera.

The identifications were based on Adams and Reeve [1850], Jousseaume [1884], Hervier [1898], Laseron [1958], Marshall [1983], Okutani [2000], Jay [2007], Poppe [2008], Dumrongrojwattana *et al.*, [2016], Dumrongrojwattana, Tanamai [2020]. In addition, the specimens were also compared with photos of type material deposited in the Muséum National d'Histoire Naturelle, France. The terminology used in descriptions of the shell morphology follows Marshall [1983].

The material is deposited in the following institutions: ZMHU – Zoological Collection of Biological Museum, VNU University of Science, Vietnam National University (Hanoi, Vietnam); MVRTC – Department of Aquatic Ecology, Vietnam-Russian Tropical Center (Hanoi, Vietnam).

Abbreviations: MNHN: Muséum National d'Histoire Naturelle (Paris, France); SH: Shell height; SW: Shell width.

Taxonomy

Class Gastropoda Cuvier, 1795
Subclass Caenogastropoda Cox, 1960
Superfamily Triphoroidea Gray, 1847
Family Triphoridae Gray, 1847

Genus *Mastoniaeforis* Jousseaume, 1884

Jousseaume, 1884: 236.

Contraforis Laseron, 1958: 638.

Epiforis Laseron, 1958: 582.

Type species: *Mastoniaeforis chaperi* Jousseaume, 1884 (by original designation).

Remarks. Genus *Mastoniaeforis* is superficially similar to *Iniforis* Jousseaume, 1884. However, *Mastoniaeforis* differs from *Iniforis* in having long

Table 1. Comparision of shell characters of *Mastoniaeforis* species in Vietnam.Табл. 1. Сравнение признаков раковины вьетнамских видов *Mastoniaeforis*.

Species	Siphon	Protoconch whorls	Lip	Shell colour
<i>chaperi</i>	Posterior and anterior siphonal canals long, white	First whorl with one median spiral thread and axial ribs, whorls 2-5 with two median spiral threads	Thick and intermittent, with riblets on last whorl near peristome	White, last whorl and median whorls of shell with light brown bands
<i>lifuana</i>	Base and top of posterior and anterior siphonal canals with brown streaks	Two median spiral threads on whorls, first whorl with embossed arrow-shaped patterns	Thin and continuous; with 3 spiral cords and ribs with nodular intersections on last whorl near peristome	Light brown, upper teleoconch whorls white
<i>speciosa</i>	Top of the anterior siphonal canal with yellowish brown streak	Two median spiral threads on whorls, first whorl with weak reticulate sculpture	Thin and intermittent; with riblets on the last whorl near peristome	With white spiral cords alternating with yellowish brown ones, upper teleoconch whorls white

posterior siphonal canal (*vs* short posterior siphonal canal); protoconch with two median spiral threads on whorls (*vs* protoconch with one median spiral thread on whorls).

Mastoniaeforis chaperi Jousseaume, 1884
(Figs 1, 2, Table 1)

Mastoniaeforis chaperi Jousseaume, 1884: 243, pl. 4, fig. 4-5; Marshall, 1983: 103, fig. 20E-F; Jay, 2007: 42, fig. 31-33, 43, 58; Tröndlé, Boutet, 2009: 24.

Type locality. La Réunion, France.

Type material. Syntype MHN-IM-2000-478 (Fig. 2 A-B).

Other material. East Sea (South China Sea), Truong Sa archipelago, Khanh Hoa Province, Vietnam: Len Dao Island, on dead corals, under stones, 09°46.62'N, 114°22.58'E, depth 10 m, coll. T.T. Nguyen, 19/5/2019, MVRTC/03; Phan Vinh Island, on dead corals and under stones, 08°57.40'N, 113°41.52'E, depth 18-21 m, coll. T.T. Nguyen, 23/5/2019, MVRTC/03; Nam Yet Island, on dead corals and under stones, 10°11.06'N, 114°22.09'E, depth: 16 m, coll. T.T. Nguyen, 11/10/2020, MVRTC/03, ZMHU/01.

Diagnosis. Shell conical, short, wide, rather thick, with, tall spire; shell white, protoconch yellowish brown. Last whorl and median part of shell with light brown bands. Total teleoconch whorls 8-9½, protoconch of 5-5¾ whorls. First protoconch whorl with one median spiral thread and axial ribs, whorls 2-5 with two median spiral threads. Outer lip thick and intermittent, with riblets on last whorl near peristome. Posterior and anterior siphonal canals long, white.

Dimensions (in mm). SH 3.15-4.28, SW 1.05-1.49 (n = 10).

Distribution. In Vietnam, known from Nam

Yet, Len Dao, and Phan Vinh Islands of Truong Sa Archipelago. Elsewhere: Queensland (Australia), Réunion, French Polynesia [Marshall, 1983; Jay, 2007; Tröndlé, Boutet, 2009].

Remarks. *M. chaperi* differs from *M. jousseaumei* in its short and wide conical shell (*vs* fusiform shell). Our specimens recorded differ from the syntype in having light brown bands on the last whorl and in median part of shell instead of uniform white median part, and in having yellow band on the last whorl.

Mastoniaeforis lifuana (Hervier, 1898)
(Figs 1, 3, Table 1)

Triforis mirifica var. *lifuana* Hervier, 1898: 249, 250, pl. 15, fig. 2-2a.

Mastoniaeforis lifuana – Okutani, 2000: 311, pl. 154, fig. 53; Poppe, 2008: 109, pl. 308, fig. 9; Dumrongrojwattana et al., 2016: 286, fig. 3I.

Type locality. Lifou, New Caledonia

Type material. Syntype MHN-IM-2000-1508 (Fig. 3A-B).

Other material. East Sea (South China Sea), Truong Sa archipelago, Khanh Hoa Province, Vietnam: Phan Vinh Island, on dead corals, on old shells, under stones, 08°57.40'N, 113°41.52'E, depth 18-21 m, coll. T.T. Nguyen, 23/5/2019, MVRTC/03; Thuyen Chai Island, on dead corals, on old shells, under stones, 08°16.59'N, 113°21.18'E, depth 12 m, coll. T.T. Nguyen, 29/5/2019, MVRTC/02; 08°16.91'N, 113°21.86'E, depth 9 m, coll. T.T. Nguyen, 30/10/2020, MVRTC/04, ZMHU/01.

Diagnosis. Shell long, narrow conical, with tall spire. Shell light brown, upper teleoconch whorls white; protoconch yellowish brown. Base and top of posterior and anterior siphonal canals with brown streaks. Total teleoconch whorls up to 10½, pro-

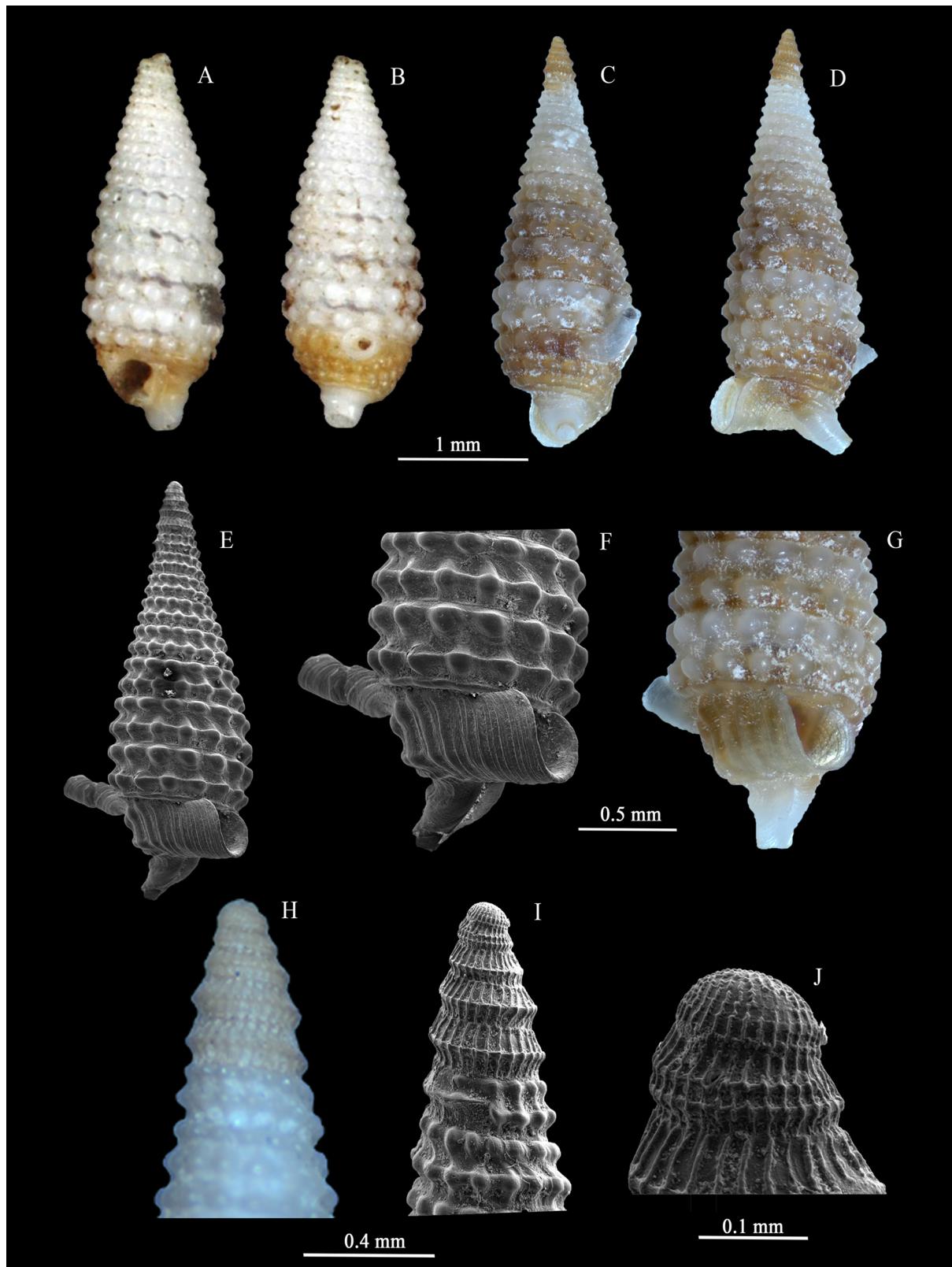


FIG. 2. *Mastoniaeforis chaperi* Jousseaume, 1884. A–B. Syntype MNHN-IM-2000-478 (downloaded from the website of the MNHN), A – front view; B – Back view. C–J. VRCM/09, ZMHU/01, from Truong Sa archipelago, Vietnam, C – back view, D–E – side view, F–G – peristome view, H–J – protoconch. Scale bars: A–E: 1 mm; F, G: 0.5 mm; H–I: 0.4 mm; J: 0.1 mm.

РИС. 2. *Mastoniaeforis chaperi* Jousseaume, 1884. А–В. Синтип MNHN-IM-2000-478 (с вебсайта MNHN), А – вентральный вид; В – дорсальный вид. С–Ж. VRCM/09, ZMHU/01, архипелаг Чуонг Ша, Вьетнам, С – дорсальный вид, Д–Е – вид сбоку, Ф–Г – вид перистома, Г–Ж – протоконх. Масштабные линейки: А–Е: 1 мм; Ф, Г: 0.5 мм; Г–И: 0.4 мм; Ж: 0.1 мм.

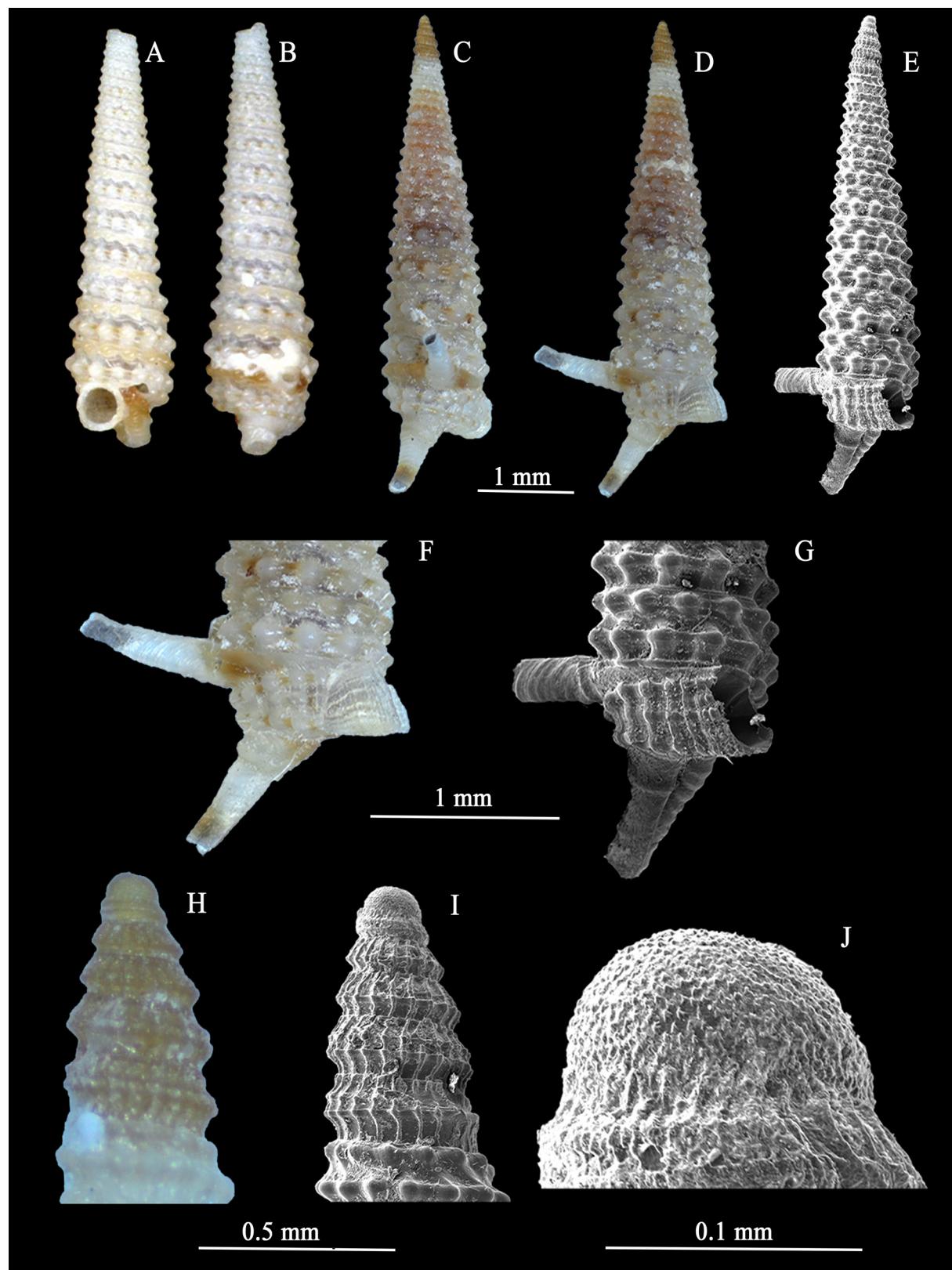


FIG. 3. *Mastoniaeforis lifuana* Hervier, 1898. A–B. Syntype MNHN-IM-2000-478 (downloaded from the website of the MNHN), A – front view, B – back view. C–J. VRCM/09, ZMHU/01, from Truong Sa archipelago, Vietnam, C – back view, D–E – side view, F–G – peristome, H–I – protoconch. Scale bars: A–G: 1 mm; H–I: 0.5 mm; J: 0.1 mm.

РИС. 3. *Mastoniaeforis lifuana* Hervier, 1898. А–Б. Синтип MNHN-IM-2000-478 (с вебсайта MNHN), А – вентральный вид; Б – дорсальный вид. С–Д. VRCM/09, ZMHU/01, архипелаг Чуонг Ша, Вьетнам, С – дорсальный вид, Д–Е – вид сбоку, Ф–Г – перистом, Н–И – протоконх. Масштабные линейки: А–Г: 1 мм; Н–И: 0.5 мм; Д: 0.1 мм.

toconch of 6 whorls. Protoconch whorls with two median spiral threads, first whorl with embossed arrow-shaped patterns. Outer lip thin, continuous, last whorl near peristome with three spiral cords and ribs with nodular intersections.

Dimensions (in mm). SH 4.04–5.70, SW 1.13–1.31 (n = 10).

Distribution. In Vietnam, known from Thuyen Chai and Phan Vinh Islands of the Truong Sa Archipelago. Elsewhere: Japan, the Philippines, Thailand, New Caledonia [Okutani, 2000; Poppe, 2008; Dumrongrojwattana *et al.*, 2016; Hervier, 1898].

Remarks. *M. lifuana* differs from *Triphora mirifica* (Deshayes, 1863) in having up to 10½ teleoconch whorls and protoconch of 6 whorls (vs 13 teleoconch whorls, protoconch of 4 whorls); first whorl with embossed arrow-shaped patterns (vs first whorl smooth); in light brown shell, with brown spiral thread between protruded nodules (vs shell creamy white); and smaller shell – SH up to 5.7 mm, SW up to 1.31 mm (vs dimensions: SH 7 mm, SW 1.5 mm). The specimens often were found under rocks, on dead corals.

Mastoniaeforis speciosa
(A. Adams et Reeve, 1850)
(Figs 1, 4, Table 1)

Triphoris speciosus A. Adams, Reeve, 1850: 45, pl. 11, fig. 28-28a.

Mastoniaeforis speciosus: Okutani, 2000: 311, pl. 154, fig. 54.

Type locality. “China Sea”.

Type material. Not found.

Other material. East Sea (South China Sea), Truong Sa archipelago, Khanh Hoa Province, Vietnam: Len Dao Island, on dead corals, on old shells, under stones, 09°46.62'N, 114°22.58'E, depth 10 m, coll. T.T. Nguyen, 19/5/2019, MVRTC/08; Thuyen Chai Island, on dead corals, on old shells, under stones, 08°16.59'N, 113°21.18'E, depth 12 m, coll. T.T. Nguyen, 29/5/2019, MVRTC/05; 08°16.91'N, 113°21.86'E, depth 9 m, coll. T.T. Nguyen, 30/10/2020, MVRTC/08, ZMHU/03.

Diagnosis. Shell narrowly conical, spire tall; shell with white spiral cords alternating with yellowish brown spiral cords, upper teleoconch whorls white, protoconch yellowish brown. Total teleoconch whorls up to 12 ¼ whorls, protoconch of 4 ½ whorls. Protoconch whorls with two median spiral threads, first whorl with weak reticulate sculpture. Top of the anterior siphonal canal with yellowish brown streak. Outer lip thin, intermittent; ripples present on last whorl near peristome.

Dimensions (in mm). SH 3.90–4.50, SW 1.00–1.10 (n = 24).

Distribution. In Vietnam, known from Len Dao and Thuyen Chai Islands of the Truong Sa Archi-

pelago. Elsewhere: Japan, China, [Okutani, 2000; A. Adams, Reeve, 1850].

Remarks. *M. speciosa* is very similar to *Inforis casta* (Hinds, 1843), but differs in having yellowish brown streak on the top of the anterior siphonal canal; long posterior siphonal canal (vs short posterior siphonal canal); protoconch with two median spiral threads on whorls (vs one median spiral thread on whorls). From *I. formosula*, *M. speciosa* differs in having one yellowish brown spiral cord on the last whorl (vs four reddish brown spiral cords on the last whorl).

Discussion

We present herein the first records of the genus *Mastoniaeforis* in the East Sea (South China Sea). Three species belonging to genus *Mastoniaeforis* are newly recorded in the Truong Sa archipelago, bringing the total number of species of the Triphoridae in Vietnam to 11 species and 6 genera.

All species were collected on coral reef. However, the majority of specimens were presented by empty shells. Therefore, further studies are needed to assess the diversity of genus *Mastoniaeforis* in Vietnam.

There is a current in the East Sea flowing from north to south [Pham, 2015]. This may be one of the reasons of relative similarity of the species composition of the genus *Mastoniaeforis* in the Truong Sa archipelago and Sea of Japan region. From the results obtained we may suggest that Hoang Sa archipelago (Paracel Islands) of Vietnam has the species composition of genus *Mastoniaeforis* similar to that of the Truong Sa archipelago.

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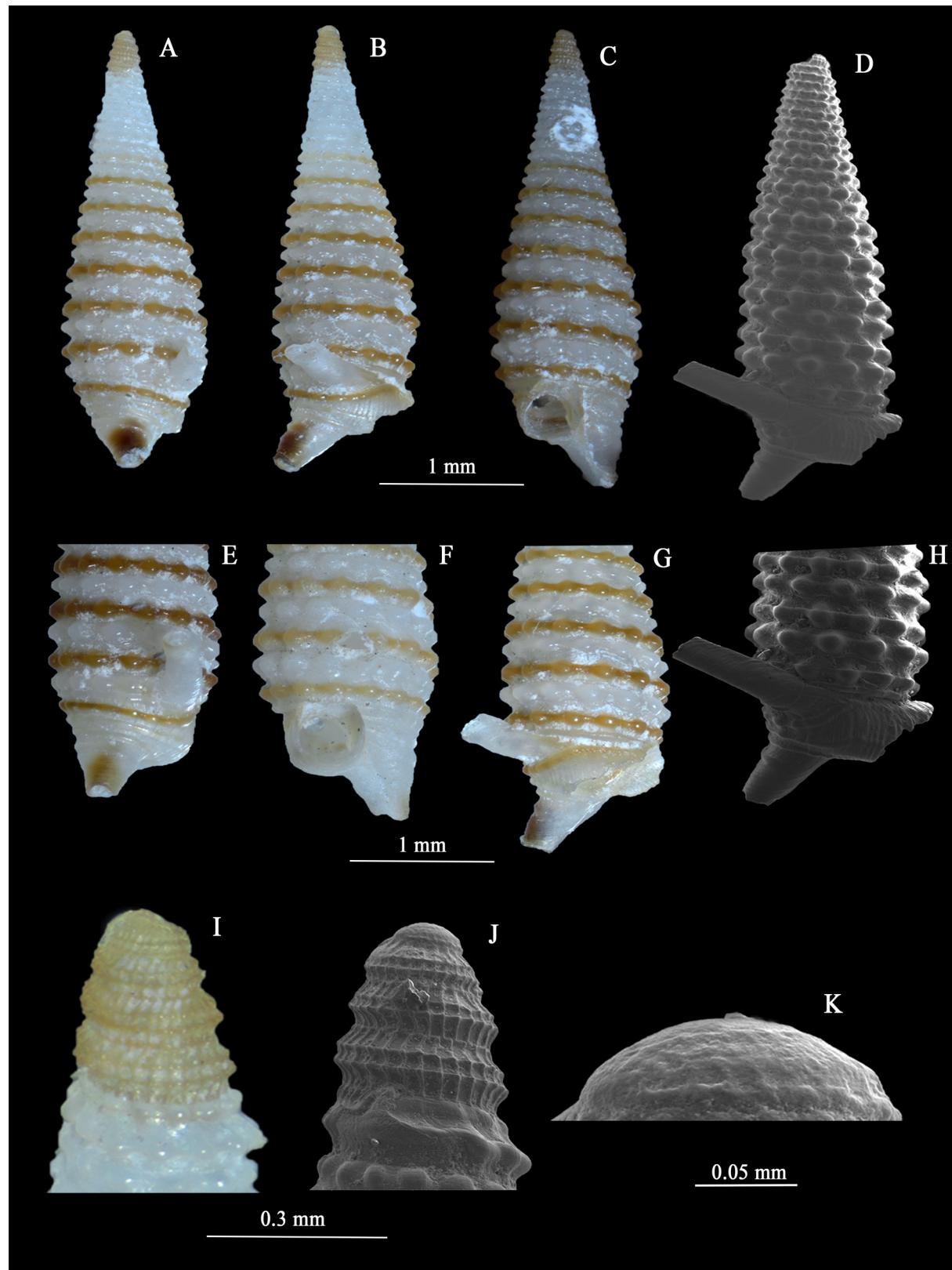


FIG. 4. *Mastoniaeforis speciosa* A. Adams et Reeve, 1850. A–K. VRCM/21, ZMHU/03, from Truong Sa archipelago, Vietnam, A, E – back view, B, D – side view, C – front view, I–K – protoconch, F – aperture, G–H – peristome. Scale bars: A–H: 1 mm; I–J: 0.3 mm; K: 0.05 mm.

РИС. 4. *Mastoniaeforis speciosa* A. Adams et Reeve, 1850. А–К. VRCM/21, ZMHU/03, архипелаг Чуонг Ша, Вьетнам, А, Е – дорсальный вид, В, Д – вид сбоку, С – вентральный вид, И–К – протоконх, F – устье, Г–Х – перистом. Масштабные линейки: А–Н: 1 мм; И–Д: 0.3 мм; К: 0.05 мм.

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