

New and revised marginelliform gastropods (Mollusca Volutoidea) from the South Pacific

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ABSTRACT

Several marginelliform species from the South Pacific collected in Fiji, Western Samoa and Pitcairn Islands are revised on the basis of their shell morphology. The species *Volvaria (Volvarina) pygmaea* Garrett, 1873 described from Fiji is re-assigned to the genus *Gibberula* Swainson, 1840, and a lectotype is designated. The species *Gibberula vomoensis* Wakefield et McCleery, 2004 described from Vomo Island (Western Fiji) is illustrated by a specimen from the same area (Beqa Island, Western Fiji) as a complement to the original description of the species. The species *Crithe cossinea* Cossignani, 1997, described from the Philippines, is reported from Western Fiji and its biogeographical status is discussed herein. Six species are described as new: *Gibberula aureola* n. sp. from Western Samoa and *G. dixonii* n. sp. from Pitcairn, *Cystiscus turbinatus* n. sp. from Pitcairn, *Volvarina storea* n. sp. from Western Samoa, *Granulina vitiensis* n. sp. from Western Fiji, and *G. buplicata* n. sp. from Pitcairn.

KEY WORDS

Cystiscidae; Marginellidae; Granulinidae; *Gibberula*; *Crithe*; *Cystiscus*; *Volvarina*; *Granulina*; shell morphology; endemism.

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INTRODUCTION

The marginelliform gastropods from the South Pacific (shallow reef levels) remain very poorly known. Australia, Tasmania, New Zealand and New Caledonia were subject to various descriptive works from mid-19th century to the early 2000's (Boyer 2003a, Boyer 2003b). Very few descriptive works were published at that time regarding the rest of the South Pacific, especially the archipelagos of Polynesia and of Eastern Melanesia. The scattered literature dealing with marginelliform fauna from this South Pacific insular area is limited for the most part to Pease (1863, 1868), Garrett (1873) and Hed-

ley (1899a, 1899b) in the 19th century, Bavay (1917) and Rehder (1980) in the 20th century. More recently, a series of articles published by Wakefield & McCleery (2002, 2004a, 2004b, 2005, 2006) dealing with the genera *Serrata* Jousseume, 1875, *Granulina* Jousseume, 1888, *Gibberula* Swainson, 1840, *Volvarina* Hinds, 1844 and *Cystiscus* W. Stimpson, 1865, increased considerably the number of marginelliform species of shallow reef levels reported from South Pacific, with 21 new species described from the insular area, including one species described from Vanuatu (but excluding one *Cystiscus* species described from Southern New Caledonia).

Despite this remarkable progress in the process of discovery of the marginelliform fauna of insular South Pacific, the current inventory looks far to be complete. Clues of this situation are given by the high number of species brought to light where the sampling effort is more intense, i.e. in Western Fiji where Wakefield & McCleery (2004a, 2006) documented two new *Granulina* species, two new *Gibberula* species and five new *Cystiscus* species only for the “banded group” (species group “*C. viaderi* Boyer, 2004”). In the same way, the high species richness observed from the upper reef levels of mainland New Caledonia (Boyer 2003a, b) as well as from Loyalty Islands and Vanuatu Archipelago (*pers. obs.*) suggests that a similar diversity must occur in some of the South Pacific archipelagos, at least in the southwestern groups of Fiji, Samoa and Tonga.

The present article is mainly dedicated to the description of some new marginelliform species coming from samplings made during the last twenty years off Western Fiji, Western Samoa and Pitcairn Islands, as a contribution to the inventory of the specific diversity of marginelliform gastropods in South Pacific.

New faunal, taxonomic and iconographic data are provided on some little-known taxa such as *Volvaria (Volvarina) pygmaea* Garrett, 1873, described from Fiji but never reported since then, *Gibberula vomoensis* Wakefield et McCleery, 2004, described from Western Fiji, and *Crithe cossinea* Cossignani, 1997 described from the Philippines.

MATERIAL AND METHODS

Three lots were studied: one lot of empty shells collected off Beqa Island, south of Viti Levu (Western Fiji), at a depth of 20 m (sampling by Bret Raines, July 2011); one lot of live collected specimens collected in Vaisala Lagoon, Savaii Island (Western Samoa), intertidal sands and slabs (sampling by Enrico Schwabe, August 2005); two lots of empty shells collected in Pitcairn, off Bounty Bay at 10–15 m depth and off Saint Paul’s Point at 20–25 m depth (sampling by Bruce Dixon, March 2011–November 2012).

The shell morphology of the morphospecies was compared to that of all the species reported in the literature belonging to the South Pacific marginel-

liform gastropods, from Kavieng (Papua-New Guinea) to New Caledonia on the western side, and from Kiribati to Easter Island on the eastern side.

The macro-photos and plate arrangements were performed with a binocular microscope by Walter Renda (with multi-stacking software).

For the systematics of the family Cystiscidae W. Stimpson, 1865, we follow the proposition of Boyer (2024), who confirms the inclusion of the subfamily Persiculinae G.A. Covert et H.K. Covert, beside the subfamily Cystiscinae W. Stimpson, 1865.

ACRONYMS AND ABBREVIATIONS. ANSP: Academy of Natural Sciences, Drexel University, Philadelphia, USA. MHNG: Muséum d’Histoire Naturelle de Genève, Switzerland. MNHN: Muséum National d’Histoire Naturelle, Paris, France. NHMLAC: Natural History Museum Los Angeles County, USA. NHMUK: Natural History Museum United Kingdom, London, Great Britain. ZSM: Zoologische Staatssammlung München, Germany. CFB: Franck Boyer collection (Meynes, France). CWR: Walter Renda collection (Amantea, Italy). L: shell length; spm: live collected specimen; sh: empty shell; ad: adult; juv: juvenile.

RESULTS

Systematics

Classis GASTROPODA Cuvier, 1795
 Superfamilia VOLUTOIDEA Rafinesque, 1815
 Familia CYSTISCIDAE W. Stimpson, 1865
 Subfamilia PERSICULINAE G.A. Covert et H.K. Covert, 1995
 Genus *Gibberula* Swainson, 1840
 Type species: *Gibberula zonata* Swainson, 1840 = *Volvaria oryza* Lamarck, 1822. By monotypy

Gibberula pygmaea (Garrett, 1873)
 (*Volvaria (Volvarina) pygmaea* Garrett, 1873: 217, pl. 2, fig. 27.

TYPE MATERIAL. Lectotype: FIJI • 1 sh; Viti Isles; L = 1.9 mm, Figs. 2, 3; lot ANSP 29342, present lectotype selected among 3 syntypes (ANSP label in Fig. 1). Paralectotypes: FIJI • 2 sh; Viti Isles; unmeasured; lot ANSP 29342, 2 paralectotypes selected among the 3 syntypes.

TYPE LOCALITY. Fiji.

DESCRIPTION. Original description: Garrett (1873: 217, pl. 2, fig. 27). Complementary description: shell (from the lectotype, Figs. 2, 3) has ogival outline, moderate blunt spire, protoconch quite low, lenticular, moderate width; lower left side of the last whorl slightly concave, receding labial shoulder, labial outline moderately arched with slight rupture of the slope at the upper third part, lip thin, subequal thin denticles inside, aperture moderate, slightly widened in its lower mid-part, four columellar plaits and start of a fifth one as low pleat on the edge of the parietal wall, first plait strong, long, straight and oblique, second plait about parallel and slightly shorter, third and fourth plaits strongly decreasing in size and less pronounced in the aperture; weak siphonal notch; the shell is uniformly beige, probably resulting from its worn condition.

DISTRIBUTION. Known only from the type locality.

REMARKS. Resulting from the ICZN rules (Art. 74.1-7), the present lectotype designation is based on three considerations: any other possible “type lot” of *Volvaria (Volvarina) pygmaea* Garrett was not found in American institutions, the three specimens from ANSP collection are certified to be authentic syntypes (Fig. 1), and the stabilisation of the species concept requires the designation of a bearing-name specimen, together with due illustration (Figs. 2, 3), in order to clarify the distinctive features of the species, not well represented by a crude original description and a type figure that sacrificed a lot to artistic license.

Gibberula pygmaea (Garrett, 1873) has never been rediscovered after his description. This situa-

tion does not invalidate the type locality, as very few samplings and studies were devoted until now to the small marginelliform fauna of the insular South Pacific. Furthermore, the localities given by Garrett are generally considered to be reliable. So, we consider that *G. pygmaea* remains a species to rediscover in the Fiji Islands, and to document more thoroughly.

Gibberula vomoensis Wakefield et McCleery, 2004
Gibberula vomoensis Wakefield et McCleery, 2004:
 76–77, figg 25–28

TYPE MATERIAL. Holotype: FIJI • 1 sh; Vomo Island, Western Fiji; 60 m depth; on mud, L = 1.64 mm (Wakefield & McCleery, 2004: figg. 25–28); MNHN-IM-2000-3444. Paratypes: FIJI • 1 spm; same data as holotype; L = 1.50 mm; paratype 1 MNHN-IM-2000-3445 • 2 spm; same data as holotype; L = 1.54 mm and 1.63 mm; paratypes 2 and 3 Wakefield collection • 2 spm; same data as holotype; L = 1.54 and 1.62 mm; paratypes 4 and 5 McCleery collection.

OTHER EXAMINED MATERIAL. FIJI • 20 sh; from four other stations also located off Western Fiji; 42–60 m depth; McCleery collection • 1 sh; Beqa Island, south of Viti Levu; 20 m depth; Figs. 4, 5; CFB.

TYPE LOCALITY. Vomo Island, Western Fiji, 60 m depth.

DESCRIPTION. Original description: Wakefield & McCleery (2004: 76–77). Complementary description (Figs. 4, 5): shell with subpyriform swollen outline, very short and low conical spire with blunt top, protoconch low, lenticular and wide; lower left side of the last whorl slightly concave, strong bulged labial shoulder, pronounced vertical groove on the parietal wall under the labial attachment, labial outline moderately arched with slight rupture of the slope at the upper fourth part, lower part of the labrum quite oblique, lip moderately thickened, quite straight and oblique internal lip, subequal thin denticles inside; three columellar plaits, the lower one long, thin and oblique, very weak, second plait slightly shorter, stronger and pronounced, the third plait very short, making like a pronounced tooth in the aperture, with concave lower part, a small notch separates the third plait from outline of the parietal wall, narrow stepped callus bordering the aperture from the upper labrum attachment down to the base

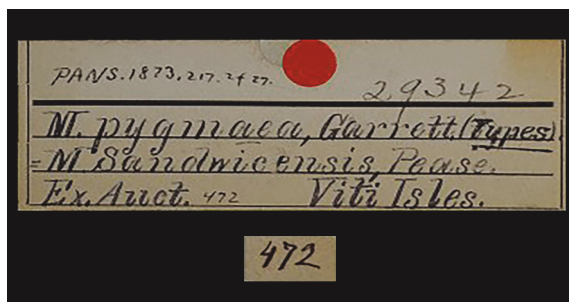


Figure 1. Museum label of the 3 syntypes of *Volvaria (Volvarina) pygmaea* Garrett, 1873; ANSP collection.

of the third plait; siphonal notch moderate, base of the labrum quite ogival and much lower than the columellar keel; vitreous grey-white ground, no apparent colour decoration.

DISTRIBUTION. Originally documented from Western Fiji, at depths from 42 to 60 m. Now reported also from 20 m depth (Beqa Island, south of Viti Levu: Figs. 4, 5).

REMARKS. The original figures of *Gibberula vomoensis* Wakefield & McCleery, 2004 (figg. 25–28: holotype MNHN) are of poor quality, with blurred images of shells with the aperture not oriented perpendicularly to the axis of the camera. We present the photos of a shell from Beqa Island (-20 m) giving a clearer image of the shell morphology in a more fitting orientation, as a contribution to the correct definition of the species.

We must emphasize that *G. vomoensis* is the only described species found among the three morphospecies collected off Beqa Island, whereas the eight other marginelliform species described from Western Fiji by Wakefield & McCleery (2004a, 2006) were not found in this sampling.

***Gibberula aureola* n. sp.**

<https://www.zoobank.org/DC8F68E2-FA86-436A-96F0-2D3481037528>

TYPE MATERIAL. Holotype: WESTERN SAMOA • 1 spm; Vaisala Lagoon, Savaii Island; intertidal sands, legit Enrico Schwabe, L = 3.3 mm, Figs. 6, 7; holotype MHNG-MOLL-0159584. Paratypes: WESTERN SAMOA • 1 spm; same data as holotype; L = 3.3 mm. Figs. 8, 9; paratype 1 CFB • 1 spm; same data as holotype; L = 3.3 mm; paratype 2 ZSM • 1 spm, same data as holotype; L = 3.25 mm; paratype 3 ZSM • 1 spm; same data as holotype; L = 3.2 mm; paratype 4 CWR • 1 spm; same data as holotype; L = 3.35 mm; paratype 5 NHM-LAC.

TYPE LOCALITY. Vaisala Lagoon, Savaii Island, Western Samoa, intertidal.

DESCRIPTION OF THE HOLOTYPE. Oval outline, low rounded top, spire very short, low and blunt; labrum moderately arched, flexuous at its mid-part, slightly angular just before the attachment to the body whorl, lip moderately thickened, many small equal denticles on the inner border, making long

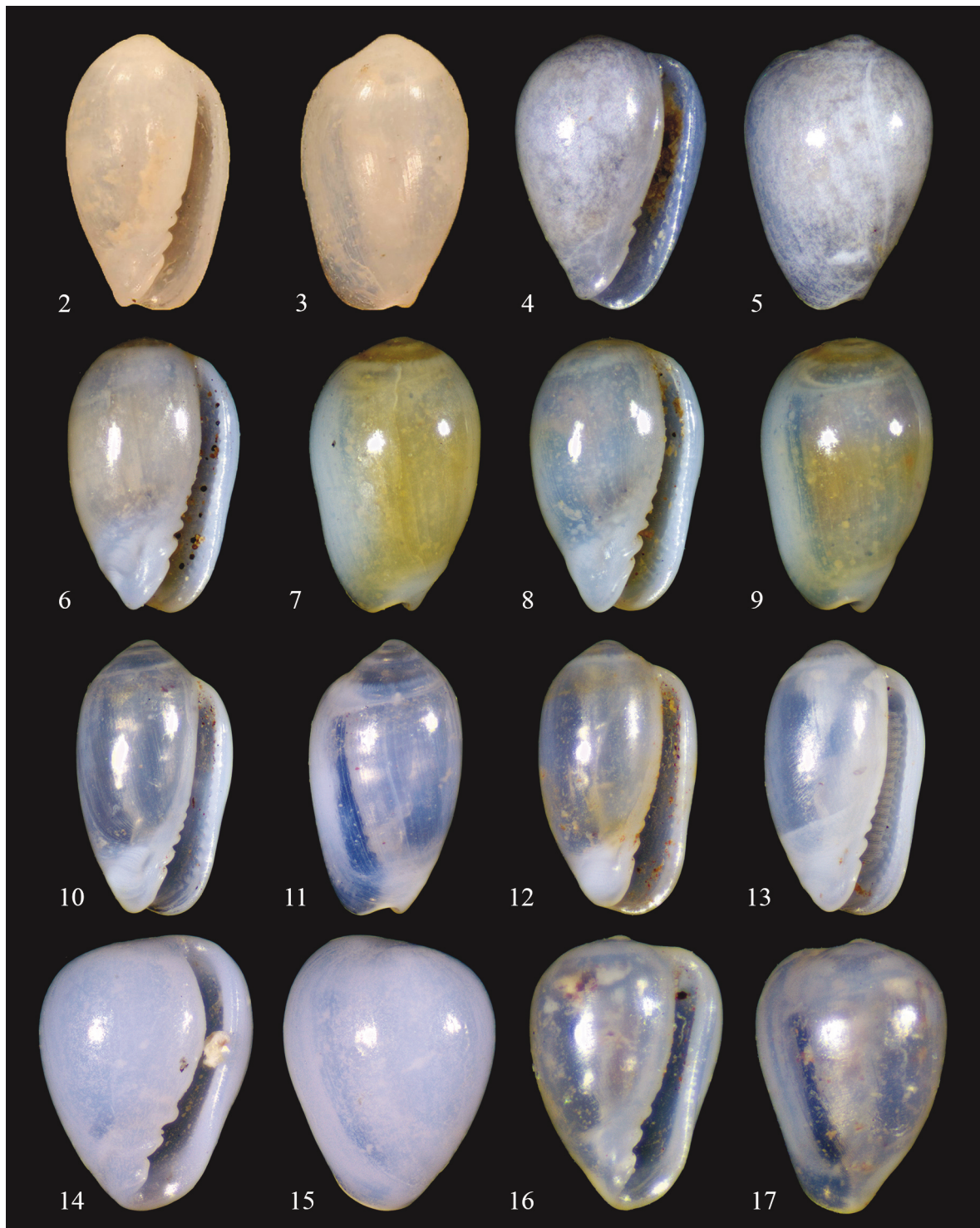
transversal lirations on the inner wall in the lower part; five columellar plaits, the first plait thin, quite long and convex, weak in the aperture, the second plait shorter and stronger, more pronounced in the aperture, the three upper plaits decreasing progressively in size; a strong callus encompassing the three lower plaits, bordered on the left by a wide longitudinal depression; siphonal canal deeply notched. Whitish ground, opaque around the columellar plaits, the base of the shell, the sutures and on the labrum, vitreous in the other places, golden shade on the dorsum, honey-brown diffused bands on the spire (Figs. 6, 7).

VARIABILITY. From the paratypes: the species seems to be fairly consistent in size, in general shape and even in most of the details. The only noticeable differences noted in the type lot are about the first columellar plait (straight or flexuous rather than convex) and in the golden colour shade sometimes less extended on the dorsum. However, we emphasize that only six specimens belonging to the same narrow population were examined, which cannot represent the full variability in this species (Figs. 8, 9).

DISTRIBUTION. Only known for now from Western Samoa.

ETYMOLOGY. From the Latin “*aureola*” = small delicate object in gold: in reference to the golden colour shade of the shell.

REMARKS. *Gibberula aureola* n. sp. belongs to a complex of Indo-West Pacific species remaining poorly documented. We can compare our new species to three forms documented for now: *Gibberula asellina* Jousseaume, 1875 described from the Mascarene Islands and revised by Boyer (2014: 9–11) on the ground of live populations from shallow waters, and differing from *G. aureola* principally by its larger size (L = 4.2–5.0 mm) and three distinct spiral orange bands running on its last whorl (versus large golden sheet on the dorsum); *G. ronchinorum* Bozzetti, 2017, collected at great depths (-220 m) in fresh condition off Aliguay Island, Southern Philippines (Bozzetti, 2017), and differing from *G. aureola* principally by its more dilated upper aperture, its straight labrum (versus sinuous), and its general light orange colour shade (versus golden shade restricted to the dorsum in *G. aureola*); *Gibberula* sp. collected from Kavieng, Papua New Guinea (no shell length;



Figures 2, 3. *Volvaria (V.) pygmaea*, lectotype ANSP 29342, L = 1.9 mm, Viti Isl. Figures 4, 5: *Gibberula vomoensis*, L = 1.7 mm, Beqa Island, Viti Levu (Western Fiji), 20 m depth, CFB. Figures 6, 7. *G. aureola* n. sp., holotype MHNG-MOLL-0159584, L = 3.3 mm, Vaisala Lagoon, Savaii Island (Western Samoa), intertidal sands. Figures 8, 9. *G. aureola*, paratype 1 CFB, L = 3.3 mm, same data as holotype. Figures 10, 11. *G. dixoni* n. sp., holotype MHNG-MOLL-0159585, L = 2.5 mm, Bounty Bay, Pitcairn, 10–15 m depth. Figures 12, 13. *G. dixoni*, paratypes 1–2 CFB, L = 2.2 and 2.4 mm, same data as holotype. Figures 14, 15. *Critho cossinea*, L = 1.4 mm, Beqa Island, Viti Levu (Western Fiji), 20 m depth. Figures 16, 17. *Cystiscus turbinatus* n. sp., holotype MHNG-MOLL-0159583, L = 1.4 mm, Saint Paul's Point, Pitcairn, 20–25 m depth.

no depth) by the MNHN Expedition KAVIENG-2014 and illustrated in Fedosov et al. (2019: 7, fig. 3) under the Register number MNHN-IM-2013-50497; this undescribed species differs from *G. aureola* by the presence of seven columellar plaits, the plaits 4, 5 and 6 being subequal, and a wide spiral orange band running on the mid-part of the last whorl (versus large golden sheet on the dorsum).

***Gibberula dixonii* n. sp.**

<https://www.zoobank.org/06B11F1A-618A-41E4-882F-9D5B5F03E50A>

TYPE MATERIAL. Holotype: PITCAIRN • 1 spm; Bounty Bay, Pitcairn Islands; 10–15 m depth; legit Bruce Dixon, L = 2.5 mm, Figs. 10, 11; holotype MHNG-MOLL-0159585. Paratypes: PITCAIRN • 7 spm and sh; same data as holotype; L = 2.2 to 2.5 mm, Figs. 12, 13; paratypes 1 to 7 CFB • 7 spm and sh; same data as holotype; L = 2.2 to 2.5 mm; paratypes 8 to 14 NHMLAC • 7 spm and sh; same data as holotype; L = 2.2 to 2.5 mm; paratypes 15 to 21 CWR.

OTHER EXAMINED MATERIAL. PITCAIRN • 1 ad sh + 1 juv sh; Saint's Paul Point, Pitcairn Islands; 20–25 m depth; CFB.

TYPE LOCALITY. Bounty Bay, Pitcairn, 10–15 m depth.

DESCRIPTION OF THE HOLOTYPE. Shell vitreous whitish, slender oval outline, ogival spire with mamillated whorls, low and wide lenticular protoconch; labrum quite thin, slightly thickened at its upper third point, sinuous below, weakly shouldered, inner lip straight with 16 subequal small denticles, high aperture, quite narrow; the two lower columellar plaits quite long, sinuous and moderately thickened, the three next plaits decreasing progressively in size, a small varix in the follow, like the trigger of a sixth plait; moderately notched siphonal canal (Figs. 10, 11).

VARIABILITY. From the paratypes, the species looks to be fairly consistent: the only noticeable variations constated lie in some lower spires, and frequently in the two lower columellar plaits being less sinuous and more vertical than in the holotype (Figs. 12, 13).

DISTRIBUTION. Only known for now from Pitcairn Islands.

ETYMOLOGY. From visiting doctor Bruce Dixon, who collected the species in Pitcairn.

REMARKS. Due to the remote location of Pitcairn and of the scarcity of descriptions of marginelliform micro-gastropods from South Pacific, *Gibberula dixonii* n. sp. can be only compared with *G. pascuana* (Rehder, 1980), described from Easter Island in the synonym genus *Granula* Jousseume, 1875 (Rehder, 1980: 85, pl. 9, fig. 20). Beside some evident similarities in the general shell pattern and in some details (proportions of the spire, shape of the labrum), *Gibberula pascuana* differs from *G. dixonii* by a thicker shell and a stouter outline, the presence of only eight labial denticles (versus 16 denticles in *G. dixonii*) and only three regular columellar plaits plus one facultative tiny one (versus five plaits and a tiny upper varix). Even the similarities observed in the two species do not allow to infer a close relationship, as this general shell pattern is very common in the tiny vitreous *Gibberula* species (cf. *G. philippii* group in Boyer, 2003a).

Subfamilia CYSTISCINAE W. Stimpson, 1865
Genus *Crithe* Gould, 1860

Type species: *Crithe atomaria* Gould, 1860. By monotypy.

***Crithe cossinea* Cossignani, 1997**

TYPE MATERIAL. Holotype: CENTRAL PHILIPPINES • 1 ad spm; Mactan Island, Central Philippines; 90–100 m depth; L = 2.35 mm; holotype Museo Malacologico Piceno, Cupra Marittima, Italy. Paratype: CENTRAL PHILIPPINES • 1 ad spm; same data as holotype; L = 2.1 mm; paratype in Tiziano and Vittorio Cossignani collection.

OTHER EXAMINED MATERIAL. PHILIPPINES • numerous spm; Mactan and Balicasag (Central Philippines) and from Aliguay (Southern Philippines); 30–200 m depth; L = 1.5–2.5 mm; CFB. FIJI • 5 sh; Beqa Island, south of Viti Levu, Western Fiji; 20 m depth; L = 1.4–1.9 mm, Figs. 14, 15; CFB • 2 sh; same data as previous; CWR.

TYPE LOCALITY. Mactan Island, Central Philippines, 90–100 m depth.

DESCRIPTION. Original description: see in Cossignani (1997: 17). Complementary description:

Shell thick, vitreous, white, heart-shaped outline, merged protoconch; high and narrow aperture, widely opened towards the summit side, thick arched labrum, highly shouldered, slightly sinuous and quite oblique in its lower half-part; three thick columellar plaits, the two lower ones slightly depressed in their apertural side (from Figs. 14, 15).

VARIABILITY. The shell is quite variable for its outline, from tear-shaped to heart-shaped or rounded subpyriform. In addition to the three strong lower columellar plaits, three or four upper plaits or thick lirations are often visible on the columellar wall, inside the aperture.

Animal (pers. comm. and grey literature): the animal is fully orange, sometimes yellow-orange, with tiny black eyes. The outer mantle is often spread and it has the same colour as the rest of the animal. The inner mantle has the same colour, when visible through the thick white shell.

DISTRIBUTION. *Crithe cossinea* is known from all the Philippines Archipelago, but it is also recorded from Indonesia and Singapore. The species was also reported from the Turkish coasts in Eastern Mediterranean (Aslan & Ovalis, 2017: 174–175, fig. 2. K; and other reports in grey literature).

REMARKS. Despite a slightly smaller average size (1.4–1.9 mm off Beqa Island, versus 1.5–2.5 mm in the Philippines), the shells collected off Beqa Island (Western Fiji) are perfectly matching the shell variability of *Crithe cossinea*. John and Lynette Flynn photographed recently two specimens in locus off Wadigi Islet, west of Malolo Island, Western Fiji, with shells apparently compatible with that of *C. cossinea*, and with perfectly similar animal chromatism (pers. comm.). *Crithe cossinea* might prove to be conspecific with the type species of the genus, *C. atomaria* Gould, 1860, described from “China Seas”. Such a revision is at work by the authors.

We note that such shell morphology and animal chromatism were also found in northern Papua New Guinea (a juvenile specimen collected by MNHN Expedition Kavieng-2014, lot MNHN-IM-2013-47626, station KS03, 8–10 m depth). However, similar features are not reported from other places of Eastern Melanesia, for instance from New Caledonia. In this area, two species were attributed to the genus *Crithe*, as *C. caledonica* Boyer, 2003 and *C. gofasi* Boyer, 2003: their shell morphology is

comparable with that of *C. cossinea* (overall concerning *C. caledonica*), but their animal chromatism is quite different (*C. caledonica*: yellow head with reddish borders, red eyes, white foot mottled of dirty whitish patches, whitish inner mantle; *C. gofasi*: same head as *C. caledonica*, light yellowish foot with thin axial light reddish-orange line on the metapodium, light yellowish inner mantle with tiny reddish stains). The generic placement of these two Caledonian species will deserve to be re-evaluated, due to their red eyes contrasting with the black eyes found in *C. cossinea*. Furthermore, all the *Cystiscus* species proved to have red eyes (Boyer 2003a, 2004), whereas black eyes are typically found in the allied genus *Crithe* (*C. cossinea*) and in *Plesiocystiscus* G. A. Covert et H. K. Covert, 1995 species (quite similar to *Cystiscus* for the shell shapes, but deeply differing for the external anatomy of the animal and for the radular pattern).

From these elements, we think that the population from Western Fiji attributed to *C. cossinea* might result also from an anthropic introduction, through the seawater tanks of trade ships or through discharges of pleasure boats (anchor sediments, washing of diving equipment, etc). This question remains to be fully investigated.

Genus *Cystiscus* W. Stimpson, 1865

TYPE SPECIES. *Cystiscus capensis* W. Stimpson, 1865 (non-*Marginella capensis* Krauss, 1848) = *Marginella cystiscus* Redfield, 1870 (nomen novum). By monotypy.

Cystiscus turbinatus n. sp.

<https://www.zoobank.org/7D7B85EC-D7F9-4C39-B24C-331C27222155>

TYPE MATERIAL. Holotype: PITCAIRN • 1 spm; Saint Paul’s Point, Pitcairn Islands; 20–25 m depth; legit Bruce Dixon, L = 1.4 mm, Figs. 16, 17; holotype MHNG-MOLL-0159583.

TYPE LOCALITY. Saint Paul’s Point, Pitcairn, 20–25 m depth.

DESCRIPTION OF THE HOLOTYPE. Shell vitreous grey-white, subtransparent, subtriangular outline, spire about flat, tiny lenticular protoconch making a teat-like apex; high aperture, labrum highly shouldered, quite oblique behind the shoulder, thickened in its upper two third parts, flexuous at its lower

third point, ventral cutting edge, inner lip smooth, aperture narrow in its upper half-part, moderately widened in its lower half part; three thin, oblique and weak columellar plaits, decreasing in size from the lower one to the upper one (Figs. 16, 17).

DISTRIBUTION. Only known from Pitcairn Islands.

ETYMOLOGY. From the Latin “*turbinatus*” = with a triangular shape, referring to the outline of the shell.

REMARKS. *Cystiscus turbinatus* n. sp. is described on the basis of a single shell (holotype) due to its peculiarity that distinguishes it from other *Cystiscus* living in the South Pacific and the remote location from which it comes. Its distinct small size (1.4 mm), the depth of collection of the sample (20–25 m depth) and the very remote place it comes from (Pitcairn Island) that renders obtaining new material difficult, have prompted us to describe this new species. It can be compared with other species described from the South Pacific and belonging to two different groups of tiny subtriangular shelled species. A group of three species with marbled or patchwork patterns on the inner mantle (honey to blackish marks or spots on whitish/yellowish ground) is nested in the Tuamotu Archipelago (Wakefield & McCleery, 2005); another group with black and yellow/orange banded inner mantle is spread out in most of the Southern Pacific, from Moorea, Society Islands, to New Caledonia (Wakefield & McCleery, 2006). This last group was defined as “*C. viaderi* species group” by Boyer (2004) and proves to be very diversified in the South Pacific. Among the eleven “banded species” described from this area by Wakefield & McCleery (2006), several of them present a more slender-cylindrical shell outline, but six other ones have a more triangular outline and they deserve to be compared with *C. turbinatus*.

Among the three “marbled species” from the Tuamotu, *Cystiscus carinifer* Wakefield et McCleery, 2005 presents a low domed spire without pronounced protoconch, a uniformly narrow aperture, three to four columellar plaits, and its size 1.56 mm; *C. mosaica* Wakefield et McCleery, 2005 has a higher labial shoulder, a less pronounced protoconch, three to four plaits, and its size is 1.51 mm; *C. nebulosa* Wakefield et McCleery, 2005 shows a slightly squattier outline, four columellar plaits and one upper liration, all the plaits being depressed on

their apertural side and slightly bifurcated at their distal end, and its size is 1.40 mm.

Among the “banded species” from South Pacific, *Cystiscus maskelynensis* Wakefield et McCleery, 2006 from Vanuatu presents a more oval, narrow and slender outline, a slightly domed top with very low protoconch, 3–4 plaits, the third plait being long and wide, and its size is 1.66 mm; *C. maloloensis* Wakefield et McCleery, 2006 from Viti Levu, Fiji, presents a slightly more slender outline, a merged protoconch, and its size is 1.62 mm; *C. beqae* Wakefield et McCleery, 2006 from Beqa Island, Viti Levu, Fiji, looks to be much variable, from oval pupoid to triangular outline, most often with low mamillated spire, very low protoconch, more regularly thickened labrum with non-sinuous lower part, more widened aperture, and its size is 1.46 mm; *C. pusillus* Wakefield et McCleery, 2006, also from Beqa Island, Viti Levu, Fiji, presents a squattier outline, a thicker shell, a low mamillated spire, 5–6 plaits, and its size is 1.18 mm; *C. deeae* Wakefield et McCleery, 2006 from the Tonga has a less angular outline, 4–6 columellar plaits, and its size is 1.23 mm; *C. vavauensis* Wakefield et McCleery, 2006, also from the Tonga, has a tear-shaped outline, a very low mamillated spire, the two lower columellar plaits strong, third plait very small, four subequal upper lirations, and its size is 1.77 mm.

Overall, the assemblage of “marbled” *Cystiscus* species looks as slightly closer to *C. turbinatus* for their shell morphology, but in the present state it is not possible to infer whether *C. turbinatus* belongs to the “marbled” group documented from the Tuamotu, or better to the “banded group” documented from New Caledonia to Moorea.

Familia MARGINELLIDAE J. Fleming, 1828

Subfamilia PRUNINAE G.A. Covert et H.K.

Covert, 1995

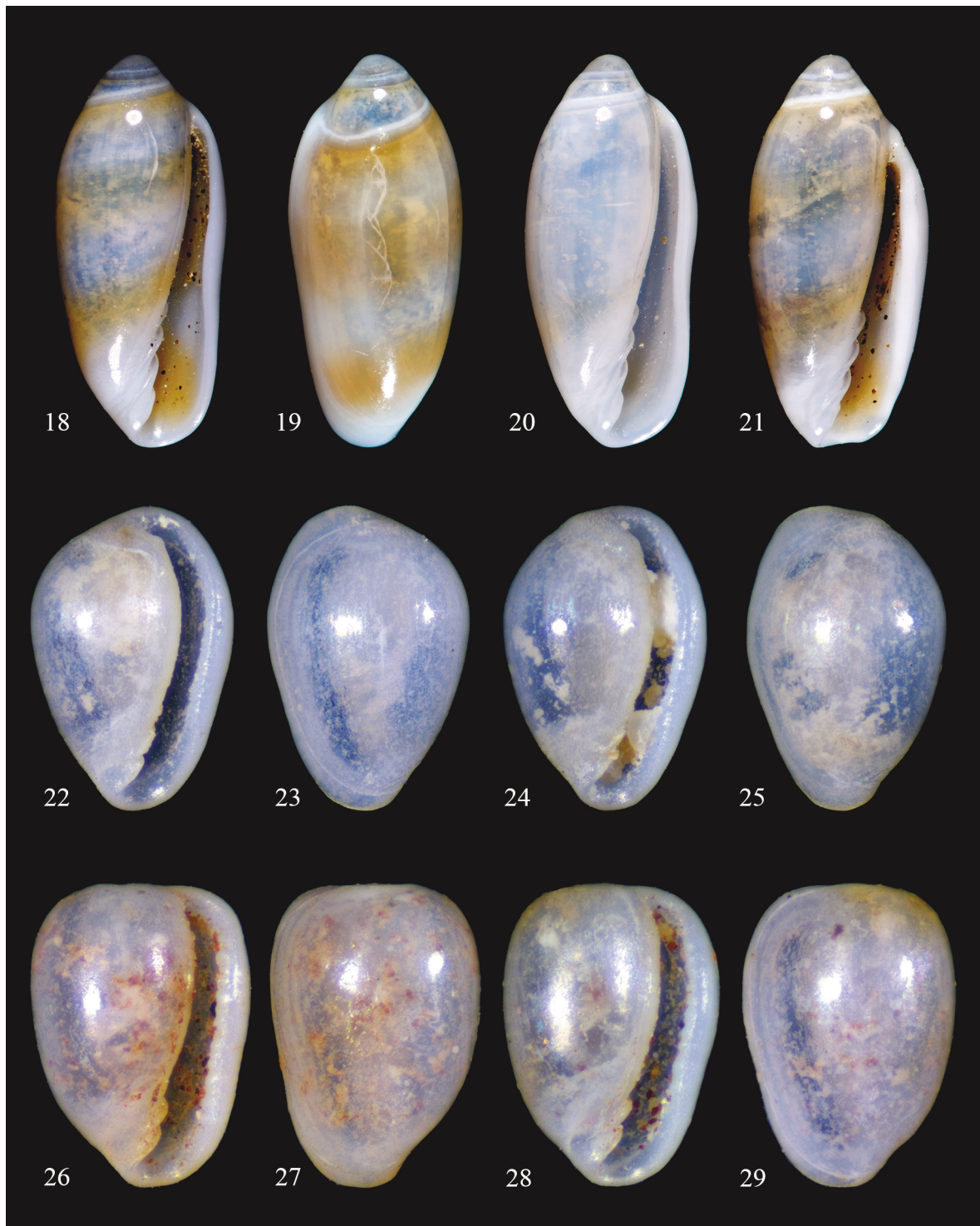
Genus *Volvarina* Hinds, 1844

TYPE SPECIES. *Marginella nitida* Hinds, 1844 = *Volva mitrella* Risso, 1826. By subsequent designation.

Volvarina storea n. sp.

<https://www.zoobank.org/5AAE03EA-45DA-4256-A0F4-F658CB133157>

TYPE MATERIAL. Holotype: WESTERN SAMOA • 1 ad spm; Vaisala Lagoon, Savaii Island;



Figures 18, 19. *Volvarina storea* n. sp., holotype MHNG-MOLL-0159588, L = 7.0 mm, Vaisala Lagoon, Savaii Island (Western Samoa), intertidal slabs. Figure 20. *V. storea*, paratype 1 CFB, L = 7.4 mm, same data as holotype. Figure 21. *V. storea*, paratype 2 ZSM, L = 6.5 mm, same data as holotype. Figures 22, 23. *Granulina vitiensis* n. sp., holotype MHNG-MOLL-0159586, L = 1.3 mm, Beqa Island, Viti Levu (Western Fiji), 20 m depth. Figures 24, 25. *G. vitiensis*, paratype 1 CFB, L = 1.3 mm, same data as holotype. Figures 26, 27. *Granulina biplicata* n. sp., holotype MHNG-MOLL-0159587, L = 1.1 mm, Saint Paul's Point, Pitcairn, 20–25 m depth. Figures 28, 29. *G. biplicata*, paratype 1 CFB, L = 1.1 mm, same data as holotype.

intertidal under slabs, legit Enrico Schwabe, L = 7.0 mm, Figs. 18, 19; holotype MHNG-MOLL-0159588. Paratypes: WESTERN SAMOA • 1 ad spm; same data as holotype; L = 7.4 mm, Fig. 20; paratype 1 CFB • 1 ad spm; same data as holotype; L = 7.4 mm, Fig. 21; paratype 2 ZSM • 1 spm juv; same data as holotype; L = 6.65 mm; paratype 3 ZSM.

TYPE LOCALITY. Vaisala Lagoon, Savaii Island, Western Samoa, intertidal.

DESCRIPTION OF THE HOLOTYPE. Shell fusiform outline, high spire, subconical with blunt apex, two whorls with slightly convex sides, large pronounced protoconch; tapered base making a hooked profile on its left side, rounded siphonal canal, high aperture, narrow in its upper mid-part, widened in its lower mid-part, labrum thin and flexuous, four very oblique columellar plaits, the first one quite short and tenuous, somewhat flattened at its mid-part, second and third plaits much longer and stronger, fourth plait very small, the plaits series presents a quite concave alignment. Three spiral orange colour bands on the last whorl, a narrower light orange spiral band on the previous whorl, general vitreous whitish ground, with opaque milky-white ground at the base of the last whorl and on the labrum, chalk white suture (Figs. 18, 19).

VARIABILITY. From the paratypes: full-white phasis is occurring (Fig. 20). Paratype 2 (Fig. 21) looks quite different, with thicker arched labrum, very convex alignment of the plaits and concave base, but it seems to be a teratologic specimen resulting from a growth accident, suggested by the irregular outline at the top of the labrum.

DISTRIBUTION. Only known from Western Samoa so far.

ETYMOLOGY. From the Latin “*storea*” = braid-shaped, from the look given by the plaits series.

REMARKS. *Volvarina storea* n. sp. is comparable to many species belonging to the group of *V. avena* (Kiener, 1834) distributed in the Caribbean, and to some occurring in the Indo-Pacific, where this group seems to have lesser diversity. In the Pacific, the two species most resembling to *V. storea* are *V. peasei* (Reeve, 1865), described from Kiribati (equatorial Central Pacific), and *V. sylviae* Cossig-

nani et Lorenz, 2021 described from Kavieng, Papua New Guinea.

Volvarina peasei (Reeve, 1865) (emended epithet for *peasii*) is the replacement name of *Marginella cylindrica* Pease, 1863, non Sowerby, 1862, which was described from Kingsmill Islands (now Gilbert Islands, West Side of the Republic of Kiribati). Reeve (1865: pl. 21, figg 108 a–b) revised Pease’s species on the basis of the same original material (NHMUK 1964300, Cuming collection, 7 syntypes). Then Kay (1965: 77–78, pl. 13, figg 5–6) selected and illustrated the syntype (L = 11 mm) previously used by Reeve for his illustration of the species as the lectotype of *M. cylindrica* Pease and of *M. peasei* Reeve. Later, Pease (1868: 280, 23, fig. 19) also renamed his species “*Marginella cylindracea*” (wrong citation for *cylindrica*) as *M. polita* Pease, 1868 from Tarawa (northern Gilbert Islands), implicitly recognizing the homonymy with *M. cylindrica* Sowerby, 1862. However, this renaming was unnecessary and it fell in disuse.

When comparing the figures of the lectotype in Kay (1965: pl. 13, figg 5–6) to our new species, the larger shell of *Volvarina peasei* presents a slender oval outline with tapered tips (versus fusiform outline in *V. storea*), a short spire with a very tiny pointed protoconch, a very narrow aperture in its upper third part, but much widened in its two lower third parts, a pronounced first columellar plait, a fairly recessed and smaller second plait. The spiral bands on the creamy-white colour ground look to be mostly faded.

Compared to *Volvarina storea*, the species *V. sylviae* (Cossignani & Lorenz, 2021: 21–22) has a similar size, but a much smaller spire, a longer, more vertical and straighter second columellar plait, the concave curvature of the flexuous labrum is located lower, the anterior part of the shell is less bevelled than in *V. storea*, the banded decoration is about similar in the two species.

Familia GRANULINIDAE G.A. Covert et H.K. Covert, 1995

Subfamilia GRANULININAE G.A. Covert et H.K. Covert, 1995

Genus *Granulina* Jousseau, 1888

TYPE SPECIES. *Marginella isseli* G. Nevill et H. Nevill, 1875, replacement name for *Marginella pygmaea* Issel, 1869, non-G.B. Sowerby II, 1846. By monotypy.

***Granulina vitiensis* n. sp.**

<https://www.zoobank.org/1D343E27-5D33-4D10-8B13-0EA38093036F>

TYPE MATERIAL. Holotype: FIJI • 1 ad spm; Beqa Island, Viti Levu, Western Fiji; 20 m depth; legit Bret Raines, L = 1.3 mm, Figs. 22, 23; holotype MHNG-MOLL-0159586. Paratype: FIJI • 1 ad spm; same data as holotype; L = 1.3 mm, Figs. 24, 25; paratype CFB.

TYPE LOCALITY. Beqa Island, Viti Levu, Western Fiji, 20 m depth.

DESCRIPTION OF THE HOLOTYPE. Shell very small vitreous white shell with egg-shaped outline and sharply rostrate top; high and narrow aperture, the upper part being cut out and turned towards the top, thick stepped callus encompassing the top of the shell and running along the columella down to the left side of the plaits; the anal canal bordered by a strong toothed varix located at the upper part of the columellar border; thin arched labrum, a break in the outline at mid-part of the outer side, inner lip finely denticulated; three columellar plaits, the lower one thin and quite short, quite oblique and moderately arched, the second plait slightly thicker, straight and very oblique, with angular tips, the third plaits very small, small button shaped, quite distant from the second plait (Figs. 22, 23).

VARIABILITY. The shell of the paratype seems to be fairly consistent, mostly differing by a slightly more biconical outline and by a smoother rostrate top (Figs. 24, 25).

DISTRIBUTION. Only known for now from Western Fiji.

ETYMOLOGY. From Viti Levu (Western Fiji), the principal island in the vicinity of the sampling station where the new species was collected.

REMARKS. *Granulina vitiensis* n. sp. differs noticeably from all the *Granulina* species documented from the South Pacific insular area (Crosse, 1867; Boyer, 2003b; Wakefield & McCleery, 2004a; Cossignani & Lorenz, 2021), except from the species reported from Funafuti (Tuvalu) as *Marginella isseli* var. *ellicensis* by Hedley (1899) and accepted as a good *Granulina* species by Boyer (2003b) as *G. ellicensis* (Hedley, 1899).

Granulina ellicensis, described from a small archipelago located far north of Fiji (Hedley, 1899b: 560, fig. 78), looks closely related to our new species *G. vitiensis*, but it differs by a more tear-shaped outline with a more attenuated base, the absence of a thick stepped callus encompassing the top of the shell, the absence of the calloused tooth just below the anal canal, and a thin arched second columellar plait (versus thicker, straight and squared in *G. vitiensis*).

***Granulina biplicata* n. sp.**

<https://www.zoobank.org/AA89BA91-DF67-41BC-A54C-D4AC492BE415>

TYPE MATERIAL. Holotype: PITCAIRN • 1 ad spm; Saint Paul's Point; 20–25 m depth; legit Bruce Dixon, L = 1.1 mm, Figs. 26, 27; holotype MHNG-MOLL-0159587. Paratype: PITCAIRN • 1 ad sh; same data as holotype; L = 1.1 mm, Figs. 28, 29; paratype CFB.

TYPE LOCALITY. Saint Paul's Point, Pitcairn, 20–25 m depth.

DESCRIPTION OF THE HOLOTYPE. Shell tiny vitreous whitish shell, squatty squared outline, flat top, quite pinched left side of the base; moderately narrow aperture, widening progressively from the top to the base, thick subvertical labrum, numerous subequal denticles, two pronounced columellar plaits, thin, nail-shaped and subequal (Figs. 26, 27).

VARIABILITY. The shell of the paratype seems to be fairly consistent, mostly differing by a slightly more oval/tear-drop outline.

DISTRIBUTION. Only known from Pitcairn so far.

ETYMOLOGY. From the two pronounced nail-shaped columellar plaits observed on the shell of the new species.

REMARKS. *Granulina biplicata* n. sp. presents no similarity with other species documented from South Pacific insular area. By its squatty squared outline and its two pronounced nail-shaped columellar plaits, *G. biplicata* resembles *Pugnus parvus* Hedley, 1896, described from Sydney (NSW, Australia). However, *Granulina biplicata* lacks the general spiral macrosculpture found in *Pugnus parvus*, and of the tiny third columellar plait, hardly visible but well defined in *Pugnus*

parvus (confirmed on several shells checked from NSW and from Tasmania: pers. obs.). In these conditions and while waiting further documentation, we prefer to attribute our new species to the genus *Granulina* Jousseume, 1888, which remains largely a catch-all category in the present state of the art (Boyer, 2017).

DISCUSSION

Among the original lots studied in this article, two species prove to be already known to science (one of them being apparently recently introduced) and six species are described as new. If we consider these lots as resulting from random samplings in the South Pacific insular area, our results are reflecting a high rate of new species (75% of the whole set; 85.7% if we take in account only the native species), which means a high-rate of undiscovered taxa in the regional fauna. This testifies that the marginelliforms of the South Pacific (and by extension the marine micro-gastropods) remain very poorly investigated, even in places like the Fiji where natural sciences are intensively studied since the 19th century and where popular submarine exploration is routinely active for the last dozen years. Conversely, appropriated sampling efforts towards the marine micro-gastropods from South Pacific would allow the discovery of a highly diversified fauna, which remained largely unexpected until now.

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