Granulina fernandesi (Gastropoda: Volutacea), a new species from Cape Verde Islands, and some considerations on the genus *Granulina*

Granulina fernandesi (Gastropoda: Volutacea), una especie nueva de las Islas de Cabo Verde, y algunas consideraciones sobre el género *Granulina*

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ABSTRACT

A new species of *Granulina* is described from Cape Verde archipelago, West Africa. The new species, *G. fernandesi*, is compared with some congeneric ones living in shallow waters of the Atlantic ocean. The necessity of deeper investigations into the genus *Granulina* is pointed out. The patterns of micro and macrosculpture of the shell are reported as one of the distinctive characters of the genus *Granulina*.

RÉSUMÉ

Une nouvelle espèce de *Granulina* est décrite de l'Archipel du Cap Vert, Afrique de l'Ouest. La nouvelle espèce, *G. fernandesi*, est comparée avec quelques espèces congénériques vivant par petits fonds dans l'Atlantique. La nécessité d'investigations plus poussées dans le genre *Granulina* est affirmée. Les modèles de micro et de macrosculptures de la coquille sont signalés comme l'un des caractères distinctifs du genre *Granulina*.

RESUMEN

Se describe una nueva especie de *Granulina* del archipiélago de Cabo Verde, África occidental. La nueva especie, *G. fernandesi*, se compara con otras del mismo género que habitan aguas someras del Atlántico. Se concluye que son necesarias investigaciones más profundas sobre el género *Granulina*. Se señala que los patrones de la micro y macroescultura de la concha son uno de los caracteres diferenciales del género *Granulina*.

KEY WORDS: *Granulina fernandesi*, Cystiscidae, *Granulina*, *Cypraeolina, Marginellopsis, Pugnus*, Cape Verde, West Africa.
MOTS CLÉS: *Granulina fernandesi*, Cystiscidae, *Granulina*, *Cypraeolina, Marginellopsis, Pugnus*, Cap Vert, Afrique occidentale.
PALABRAS CLAVE: *Granulina fernandesi*, Cystiscidae, *Granulina*, *Cypraeolina, Marginellopsis, Pugnus*, Cabo Verde, África Occidental.

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INTRODUCTION

The marginellid fauna from Cape Verde Islands is waiting for a complete revision, specially on the group *Volvarina-Prunum* which is particularly well-represented along the archipelago through a lot of species showing close affinities with several taxa from the Caribbean area and from North Western Indian Ocean. A study of the species belonging to the genus *Volvarina* and other related species are in course (MORENO AND BURNAY, 1999 and pers. com.).

A single species belonging to the genus *Granulina* Jousseaume, 1888 has been reported from the archipelago as *G. ocarina* Fernandes, 1987 (Figs. 9-12), an endemic species widely represented in all the islands, from low tide level (authors collections, live specimens and empty shells) down to 120 m and more (CANCAP dredgings in NNM-Leiden; empty shells).

GOFAS (1992) revised the genus *Granulina* from the Mediterranean and Eastern Atlantic. However, in this paper were principally considered data from Mediterranean and Ibero-Moroccan Gulf, with particular references to Straight of Gibraltar and to Central Mediterranean area (Corsica to Tunisia). Few more localities were quoted: shallow water of Madeira, Canary Islands [both for *G. guancha* (d'Orbigny, 1840)], Northern Mauritania (for *G. mauretanica* Gofas, 1992) and some deep water dredgings from Senegal to Ivory Coast [for *G. africana* Gofas, 1992 and *G.* cf. *occulta* (Monterosato, 1869)]. Thus, many areas and habitats remain to be checked in Northwest Africa for a general review of the genus *Granulina*.

Several shallow and deep water samplings made by both authors during the last years from Southern Morocco to Ghana brought to light a lot of unstudied populations belonging to the genus *Granulina*, as well as many field informations on them. The authors have published some papers on the material collected in these samplings, (PIN AND BOYER, 1995 and ROLÁN AND FERNANDES, 1997) and they hold several works under study with the purpose to undertake a general revision of this genus along Northwest African continental shelf.

Moreover, some years ago the second author obtained several specimens and shells from Cape Verde archipelago. These specimens consist in a tiny *Granulina* which presents very particular characters compared with the species of this genus known from the Atlantic ocean. Considered by us as new species, it is described and named hereunder.

We will named "specimen" the material collected alive and "shell" those which were collected as empty shells.

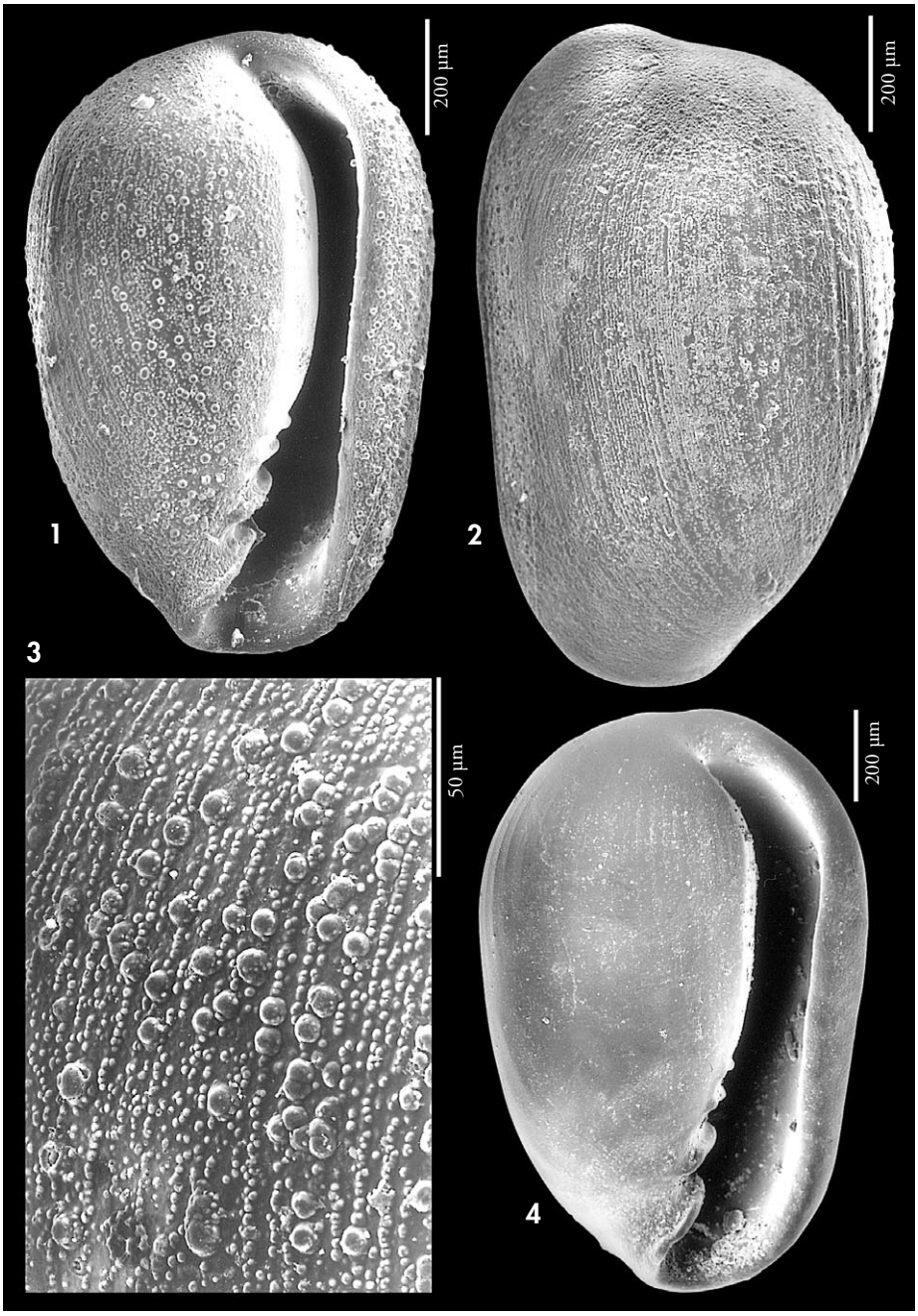
Abbreviations:

AMNH American Museum of Natural History, New York
BMNH The Natural History Museum, London
MNCN Museo Nacional de Ciencias Naturales, Madrid
MNHN Muséum National d'Histoire Naturelle, Paris
NNM National Natuurhistorisch Museum, Leiden
CER collection of E. Rolán, Vigo
CFB collection of F. Boyer, Sevran

RESULTS

Genus *Granulina* Jousseaume, 1888

Type species by monotypy: *Marginella pygmaea* Issel, 1869, *non* Sowerby, 1846 (= *Marginella isseli* G. and H. Nevill, 1875). Red Sea. Illustrated in Fig. 13.



Figures 1-4: *Granulina fernandesi* sp. nov. 1: holotype (MNCN), Teodora Bay, Boa Vista; 2: paratype 4, Rabo de Junco Bay, Sal Island (CER); 3: detail of the sculpture from paratype 4; 4: eroded empty shell, from sediments, Rabo de Junco, Sal (CER).
Figuras 1-4: Granulina fernandesi *sp. nov. 1: holotipo (MNCN), Bahía Teodora, Boa Vista; 2: paratipo 4, Rabo de Junco Bay, isla de Sal (CER); 3: detalle de la escultura del paratipo 4; 4: concha erosionada, recolectada vacía en sedimentos, Rabo de Junco, Sal (CER).*

Granulina fernandesi sp. nov. (Figs. 1-6)

Type material: Holotype: Adult specimen coated with a metallic film for SEM photography (Fig. 1) (L = 1.13 mm, W = 0.74 mm). Deposited in MNCN (nº 15.05/31011). Paratype 1: Adult shell, coated with a metallic film for SEM photography (L = 1.25 mm, W = 0.80 mm); deposited in MNHN. Paratype 2: Young adult shell (L = 1.10 mm, W = 0.63 mm); deposited in AMNH. Paratype 3: Adult shell (L = 1.20 mm, W = 0.72 mm); deposited in CFB. All the above mentioned specimens from the type locality, sediment, at 4-6 m. Paratype 4: Adult shell (Fig. 2), coated with a metallic film for SEM photography; obtained in Rabo de Junco Bay, Sal Island, sediment at 4-6 m (L = 1.14 mm, W = 0.72 mm); deposited in CER. Paratypes 5 and 6: Juvenile shells, obtained in Regona Bay, Sal Island, sand sediment, at 10 m; [L = 1.20 mm (broken shell), L = 0.90 mm (intact shell)]; deposited in CER. Paratypes 7, 8 and 9: Adult shells, from Sal-Rei, Boa Vista, sandy sediment at 6 m, two of them with rest of soft parts; (L = 1. 4 mm, W = 0.84 mm; L = 1. 4 mm, W = 0.9 mm; L = 1.3 mm, W = 0.82, respectively); deposited in CER. Paratype 10: Adult shells, from Sal Rei, Boa Vista, sandy sediment at 6 m, two of them with remains of soft parts; deposited in NNM.
Other material examined (all in CER): 1 adult specimen (Figs. 5, 6) collected in Regona Bay, Sal Islands, in sand at 10 m (L = 1.12 mm, W = 0.67 mm); 3 shells from Rabo de Junco, Sal Islands; one of them represented in Figure 4 (L = 1.30 mm); 2 adult shells collected in Mordeira Bay, Sal Island, one in bad condition; 14 shells from Pau Seco, Maio Island, 30 m; 6 shells from Porto da Cruz, Sal Rei, Boa Vista, 3 m; 1 shell from Ilheus Rombos, 10 m; 1 shell from Praia, Santiago Island, 5 m.
Type locality: Teodora Bay, Boa Vista, Cape Verde Islands.
Etymology: The new species is named after Francisco Fernandes "Xico", keen collector and student from Luanda, Angola, died on January 1996, who devoted to West African malacology and brought a special interest to Cape Verdian marginellids.

Description: Small, subcylindric, whitish-grey shell (Figs. 1, 2, 4-6). Length: 1.10 to 1.40 mm; width: 0.63 to 0.90 mm. Labrum moderately thickened; lip curved into the aperture, no labial denticles; posterior part of the labrum slightly elevated above the top of the body whorl; no apparent spire neither apex; the first whorls seeming to be overlaped and absorbed by the last whorl. Narrow aperture, slightly opened towards the top, and more widely opened towards the base. The central part of the smooth inner lip is straight and vertical. Moderate anterior break of the outline, at the level of the siphonal canal. Four columellar plaits occuping the anterior third part of the parietal side, decreasing in size from the base.

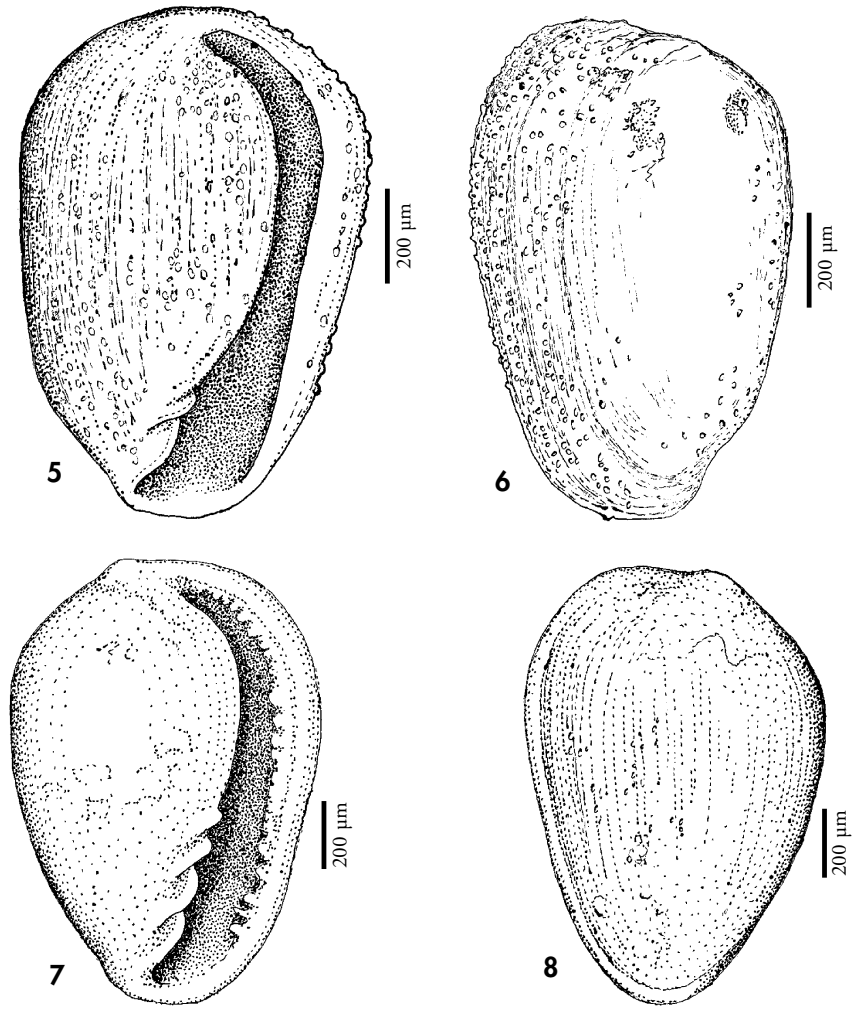
Even in live collected specimens, the general appearance of the surface is not shinning but presents a satin look. Under high magnification (Fig. 3), a fine sculpture is revealed, constituted by axial alignments of microscopic rounded granules, looking like a silky veil on the shell, spangled with larger grainy pustules, irregularly dispersed on the body whorl and on the labrum. This microsculpture pattern covers a ground sculpture of fine axial ribs running along the shell, and possibly constituted by growing lines.

The animal was not fully examined. Its prevailing colours are yellow and violet.

Habitat: Live specimens were collected in sediment of soft bottoms and among algae on rocks, from 3 to 30 m. *G. fernandesi* seems to be restricted to moderate depths. None specimens was found in CANCAP dredgings (NNM-Leiden) by first author. We however note that CANCAP dredgings obtained few results in Cape Verde Islands along this group, and that most of the samplings were carried out in somewhat deep water (circalittoral and bathyal).

Geographic distribution: Known from southern and eastern islands of the Cape Verde archipelago. The occurrence of the species in northern islands should be verified.

The species was not found in the many samples which were obtained in recent times from Northwest African coast and other Macaronesian archipelagos, even when a diversificated fauna of *Granulina* was noted.



Figures 5, 6: *Granulina fernandesi* sp. nov., adult specimen, collected alive in Regona Bay, Sal, 10 m (CER); 5: ventral view (two more columellar plaits are present into the aperture); 6: dorsal view. Figures 7, 8: *Granulina vanhareni*. Adult shell, Algeciras, Spain (CFB); 7: ventral view; 8: dorsal view. *Figuras 5, 6:* Granulina fernandesi *sp. nov., ejemplar adulto, recolectado vivo en la Bahía de Regona, Sal, 10 m (CER); 5: vision ventral (dos pliegues columelares más están presentes dentro de la abertura); 6: visión dorsal. Figuras 7, 8:* Granulina vanhareni. *Concha adulta, Algeciras, España (CFB); 7: visión ventral; 8: visión dorsal.*

Discussion: *Granulina fernandesi* sp. nov. is clearly distinct from the sympatric *Granulina ocarina* Fernandes, 1987 (Figs. 9-11). This late species, widerspread in Cape Verde Islands, presents a stouter, larger (length about 2 mm) and more or less heart-shaped shell (instead of subcylindrical as in *G. fernandesi*), bearing strong denticles on the inner lip (sometimes absent in gerontic specimens), a parietal sulcus and it shows a tendancy to a fifth columellar plait. Under high

magnification (Fig. 12), *G. ocarina* shows a fine microsculpture covering the shell, made of an unorganized distribution of pustules of irregular shape, very different from the pattern presented in *G. fernandesi*. These two species do not seem to be close relatives, and they probably belong to two different lineages within the genus *Granulina.*

G. fernandesi apparently does not have close relatives in Atlantic ocean neither in Indo-Pacific area, but two Atlantic tiny sized species (*Cypraeolina vanhareni* van Aartsen, Menkhorst and Gittenberger, 1984 and *Marginellopsis serrei* Bavay, 1911) show however some similarities to *G. fernandesi* in their shell features.

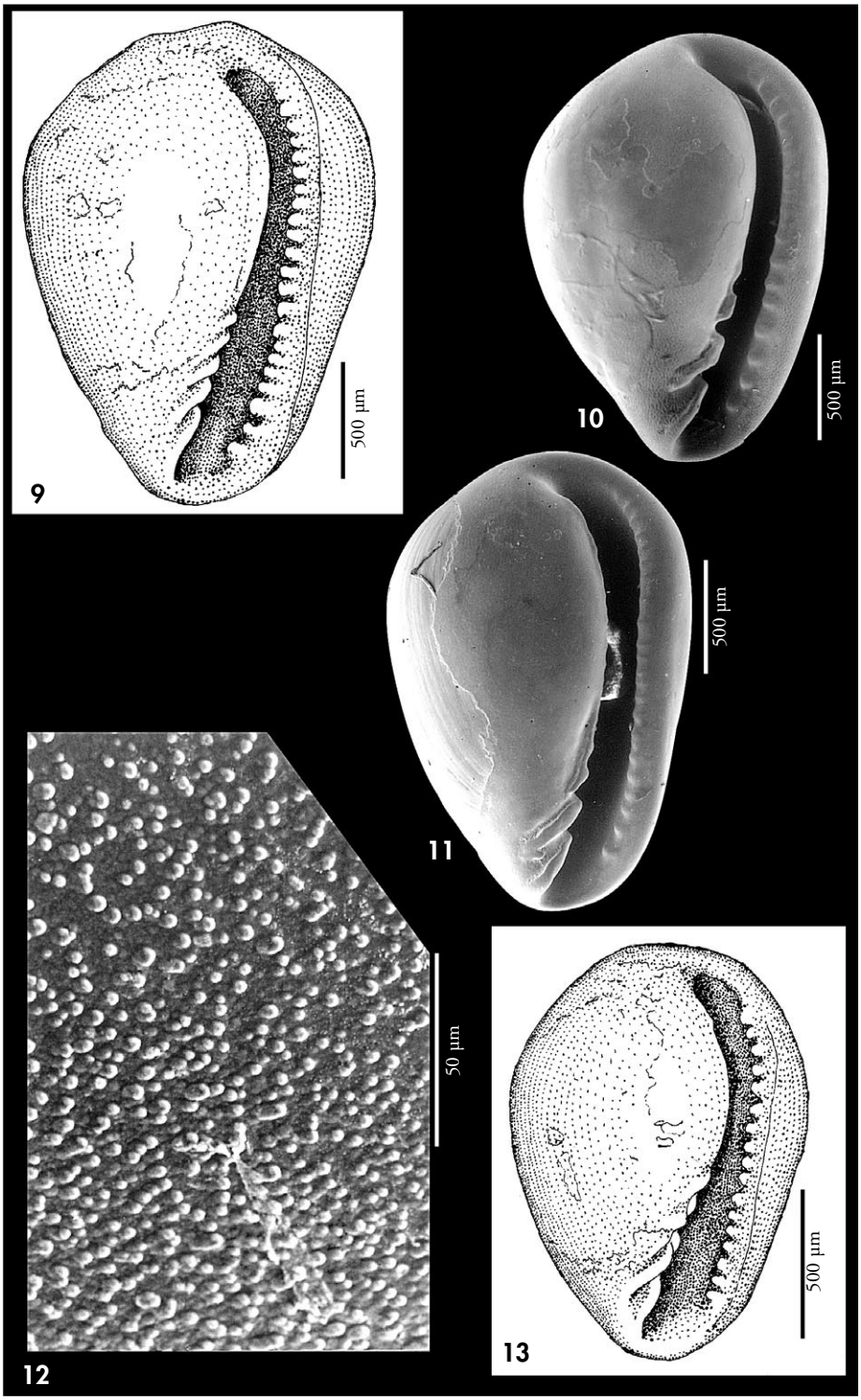
C. vanhareni (Figs. 7-8) was described from Algeciras Bay, Southern Spain, and it is only known from both sides of Straigth of Gibraltar (Aartsen, Menkhorst and Gittenberger, 1984), bears over its shell a fine microsculpture made of axial lines of microscopic pustules superposed to a system of close and faint axial ribs. A ground structure of packed growing lines is more visible between the ribs contributing to give the silky appearance of the surface of the body whorl. This pattern of pustulose microsculpture covering an axially ribbed macrosculpture is similar of that presented in *G. fernandesi*. However, the general outlines and structural building of the shell of *C. vanhareni* are significatively different from that ones of *G. fernandesi*. *C. vanhareni* is also larger, sizing 1.4 to 1.8 mm in length. Its general shape is more similar to that one of *Granulina isseli*, type species of the genus *Granulina* and endemic to the Red Sea and Gulf of Aden.

On the other hand, *Marginellopsis serrei,* type species of the genus *Marginellopsis* Bavay, 1911 (Figs. 14-16), described from the Caribbean Sea and widespread in this area (Bavay, 1911), bears a stronger macrosculpture organized according a pattern of wavy axial (growing?) lines, interwined with thick spiral ribs, sometimes more marked on the top and on the base of the last whorl. Under high magnification, the silky look of the surface reveals a squared to grained structure (Fig. 17), sometimes clouded when winding axial lines are dominant, with one isolated granule on each relief or intersection. The shell presents a subcylindric to square outline, an aperture narrowed in its central part by an inflexion of the labrum, faint labial teeth (but a smooth inner lip in young adult or gerontic specimens), two strong and sharp anterior columellar plaits and two very small and packed posterior ones. The length of the shell is about 1 mm.

M. serrei presents some similarities with *G. fernandesi* for the tendancy to subcylindrical outlines, shape of the aperture, structure of the labrum and organization of the columellar plaits. However, *M. serrei* presents a deeply different pattern of micro and macrosculpture. This late feature could have phyletical meaning as discussed later on. Therefore, we provisionally consider that *M. serrei* and *G. fernandesi* belong to different supraspecific taxa within the genus *Granulina* "sensu lato".

M. serrei clearly belongs to a homogeneous group well-represented in the Indo-Pacific area and composed by several species with very close similarities, both for their shell structure and for

(Right page) Figures 9-12: *Granulina ocarina*. 9: adult specimen, in algae on boulders, Calheta Fonda, Sal (CFB); 10: shell collected alive, from Boa Vista Island; 11: empty shell, collected from Boa Vista Island; 12: detail of the sculpture from the specimen of Figure 10. Figure 13: *Granulina isseli*, adult specimen, in seaweeds, 1-2 m, Safaga, Egypt, Red Sea (CFB).
(Página derecha) Figuras 9-12: Granulina ocarina. *9: ejemplar adulto, en matas de algas, Calheta Fonda, Sal (CFB); 10: ejemplar recolectado vivo, en la isla de Boa Vista; 11: concha vacía, recolectada en la isla de Boa Vista; 12: detalle de la escultura del ejemplar de la Figura 10. Figure 13:* Granulina isseli*, ejemplar adulto, en praderas de fanerógamas marinas, 1-2 m, Safaga, Egipto, Mar Rojo (CFB).*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the micro and macrosculpture. These species are: *Pugnus parvus* Hedley, 1896 (type-species of the genus *Pugnus* Hedley, 1896), from South-East Australia; *Pugnus maesae* Roth, 1972, from Cocos-Keeling Islands; and *Granula atomella* Bavay, 1917, from Mascarene Islands.

In the present state, the genera *Marginellopsis* Bavay, 1911 must be considered as junior synonym of *Pugnus* Hedley, 1896.

We note that, in the revision undertaked by GOFAS (1992), the author considered *Granulina* as a whole, that means a morphologically homogeneous, phyletically united and undifferentiated group, and he did not propose taxonomic subdivisions at supraspecific level.

The presence of micro and macrosculpture on the shells of marginelliform species gathered within the genus *Granulina* sensu lato is generally not quoted by modern authors and not used by them as a morphologically and/or phyletically significant feature. In fact, most of the recently described species of *Granulina* have illustrated only by simplified drawings of the shells and not SEM photograph of the microsculpture (FERNANDES, 1987, GOFAS AND FERNANDES, 1988, GOFAS, 1992, PIN AND BOYER, 1995, ROLÁN AND FERNANDES, 1997).

This feature is however unique and constant in each species, and well-represented in the whole genus, even in the type species *G. isseli,* which presents itself a faint "leopard-patterned" microsculpture on a smooth ground.

Several distinctive groups seem to be distinguishable on the basis of the patterns of micro and macrosculpture. This systematic character is hereby proposed for taxonomic and phylogenetic analysis within the genus *Granulina*, beside other characters currently used.

Further researchs will tentatively explain (if explainable) the biological origin and adaptative meaning of such micro and macrosculpture, which are not present in other marginellid genera, even in those associated to *Granulina* by COOVERT AND COOVERT (1995) to erect the family Cystiscidae.

In the present state, we feel appropriated to place the newly described species within the genus *Granulina* sensu lato, considered (GOFAS, 1992) as a monophyletic and undifferentiated group. This provisional placement follows the approach adopted by the last reviewers (GOFAS, 1992, COOVERT AND COOVERT, 1995). However, it could be reconsidered in the course of a more general revision work on the genus *Granulina*.

In his revision of fossil and recent *Granulina* from Mediterranean, LA PERNA (1999) explains why "the move to Cystiscidae (by COOVERT AND COOVERT, 1995) seems not well supported" and he better finds reasons for maintaining the allocation of *Granulina* in Marginellidae. We follow La Perna on both points, but we think that the complete study of the systematics of *Granulina* remains to do.

A better knowledge of the wide diversity within the genus *Granulina* and a deeper study of its distinctive features could lead to propose a reorganization of this group and a possible revision of its taxonomic placement within the marginelliform gastropods.

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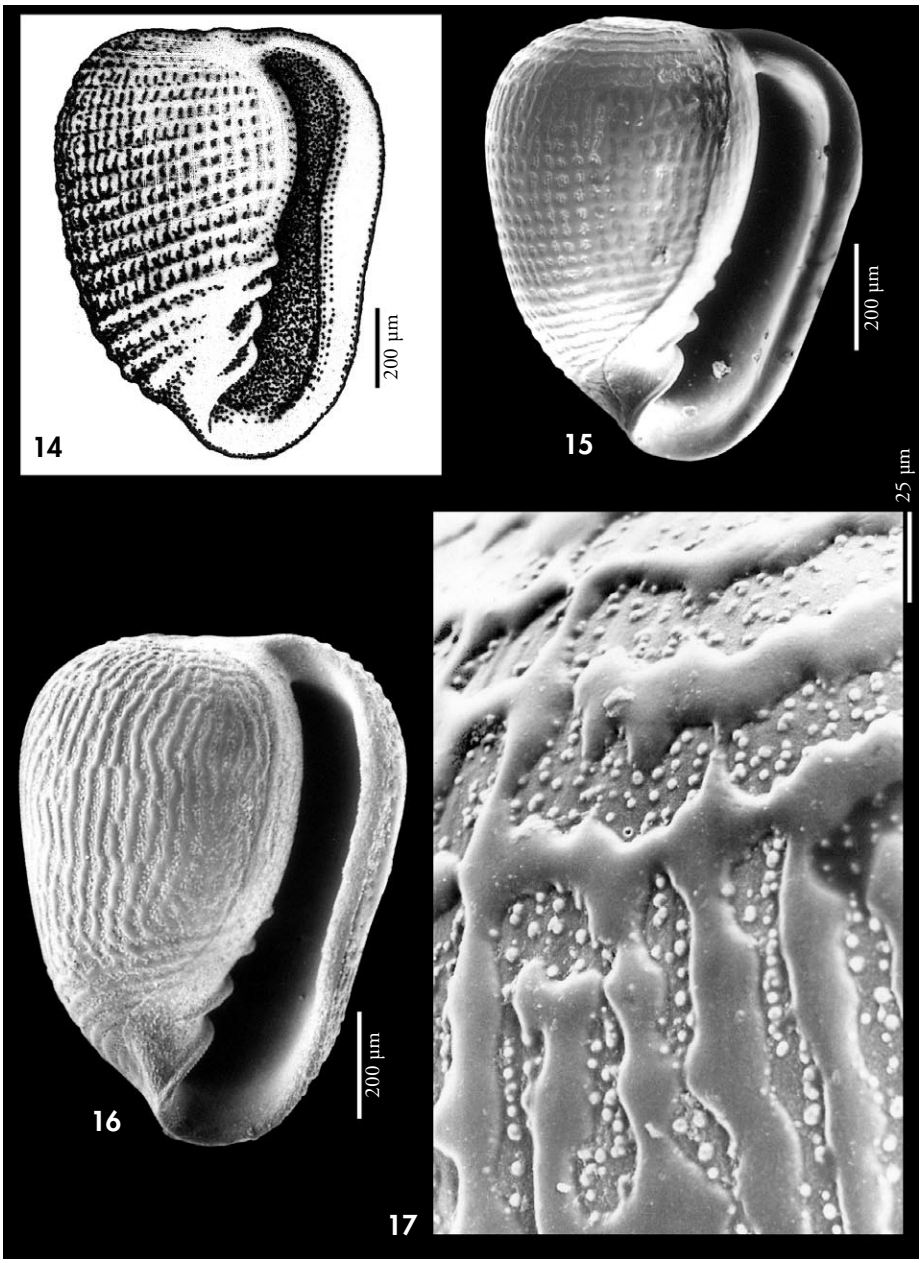

Figures 14-17: *Marginellopsis serrei*. 14: adult shell, one of the 4 cotypes in BMNH (reg. nº 1911.10.18.1-4), Cuba. The cotypes are mounted on a paper; that one here pictured is the second from the left; 15-16: shells from Abaco, Bahamas (C. Redfern collection); 17: detail of the sculpture (from the shell of the Figure 16).

Figuras 14-17: Marginellopsis serrei. *14: concha adulta, uno de los 4 cotipos en el BMNH (reg. Nº 1911.10.18.1-4), Cuba. Los cotipos están montados sobre un papel, el aquí representado es el segundo de la izquierda; 15-16: conchas de Abaco, Bahamas (colección de C. Redfern); 17: detalle de la escultura (de la concha de la Figura 16).*

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