

The genus *Hydroginella* (Caenogastropoda: Marginellidae) at bathyal levels from the Fiji Islands.

Franck BOYER
110, chemin du Marais du Souci,
F-93270 Sevran, France.

Andrew WAKEFIELD
14 Forest Side, Buckhurst Hill
Essex, IG9 5SL, UK.

Tony MCCLEERY
The Moat House, Fort Road, St. Peter Port
Guernsey, C.I.

KEY WORDS. Marginellidae, *Hydroginella*, bathyal levels, Fiji, diversity, dispersion.

ABSTRACT. Seven species of *Hydroginella* are described as new from bathyal levels off the Fiji Islands. The high diversity presented by *Hydroginella* in Fiji at bathyal levels is compared with the low diversity presented in the same range by the other Marginellidae genera. This contrasting situation is interpreted as a consequence of a decreasing diversity of most of the Marginellidae genera eastward from New Caledonia, due to their non-planktotrophic development, and of the special dispersive capacity of *Hydroginella*, attributable to their parasitic behaviour on 'sleeping fishes'.

RESUME. Sept espèces d'*Hydroginella* sont décrites comme nouvelles du bathyal des îles Fidji. L'importante diversité présentée par le genre *Hydroginella* dans le bathyal des Fidji est comparée à la faible diversité prévalant dans cette zone pour les autres genres de Marginellidae. Cette situation contrastée est interprétée comme la conséquence d'une diversité décroissante de la plupart des genres de Marginellidae à l'est de la Nouvelle Calédonie, du fait de leur développement non-planctotrophe, et d'une capacité spéciale de dispersion des *Hydroginella*, attribuée à leur comportement parasitaire sur les "poissons dormeurs".

INTRODUCTION

With the exception of Australia and New Zealand, the marginelliform gastropods from the Southwest Pacific area are mostly unknown, the literature in the main limited to descriptions, in the late 19th and early 20th centuries, of a few species collected as dead shells on the shores of New Caledonia.

No marginelliform species from deep levels had ever been reported to occur east of Australian waters at tropical Southwest Pacific latitudes, until the recent description of several species from bathyal levels in New Caledonia: 7 species from commercial trawling operations (Cossignani, 1997 & 2001) and 15 species from MNHN collections (Boyer, 2001 & 2002). A comprehensive study by the latter author of the collections of the New Caledonian marginelliform gastropods in the Paris Museum, collected during regular campaigns made throughout the last 20 years, is currently underway. The material from bathyal levels is especially well represented in these collections, and includes approximately 100 species of marginelliform gastropods (Boyer, 2002) from the New Caledonia Exclusive Economic Zone (including

the northern Norfolk Ridge, but not the Chesterfield Archipelago).

As a development of the sampling campaigns in New Caledonia, several other campaigns have been performed by MNHN in the Southwest Pacific area during the 1990's, as part of further co-operation with the French research organization IRD (EX-ORSTOM). Campaigns devoted to sampling bathyal depths have been undertaken recently in the Solomon Islands. The sampling undertaken in Fijian waters was the most intensively performed of all of these, with 4 successive campaigns exploring the different parts of this archipelago. The two first Fijian campaigns performed around 200 dredging and trawling operations (Richer de Forges, Bouchet et al., 2000; Richer de Forges, Newell et al., 2000) and they brought up small species lots of Marginellidae from 21 stations (4 from the lower coral reef levels, 16 from upper bathyal and 1 from mid-bathyal) ranging from the western side (Campaign MUSORSTOM 10, 5-19 August 1998, R.V. "Alis") to the eastern side (Campaign BORDAU 1, 22 February – 14 March 1999, R.V. "Alis") of the archipelago (Fig. 37).

MUSORSTOM 10 made 82 stations from 80 to 1058 m (most between 200 and 800 m), along the south, east and north coasts of Viti Levu. BORDAU 1 made 118 stations from 97 to 1216 m (most between 300 and 500 m) around the Lau Islands and the central Lau Ridge. The two next campaigns were devoted by IRD to the southern lagoon of Viti Levu (SUVA 2 and SUVA 4), reaching bathyal levels only accidentally.

Beside 3 indeterminated juvenile shells of *Hydroginella*, a total of 11 different marginellid morphs have been separated from 21 stations made during the MUSORSTOM 10 and the BORDAU 1 campaigns :

- 7 different species of *Hydroginella* (2 lots from lower coral reef levels, the remainder from the upper bathyal),
- 1 large broken shell (11.5 mm in length) attributable to the genus *Volvarina* (BORDAU 1, 1 station north of Vanua Levu, 669-676 m)
- *Granulina* sp 1 (MUSORSTOM 10, 1 station north of Viti Levu, 102-106 m).
- *Granulina* sp 2 (MUSORSTOM 10, 4 stations south of Viti Levu, 149-392 m),
- *Dentimargo* sp 1 (MUSORSTOM 10, 2 stations in the Bligh Water zone, between Viti Levu and Vanua Levu, 251-660 m).

Relative to the large number of stations sampled by both campaigns, the recolt of the Fijian bathyal marginellids is, from a quantitative point of view, poor. This becomes even more obvious when compared to the very high diversity and abundance of marginellids yielded from New Caledonian waters at similar depths. However, this Fijian material is of special interest for at least two reasons. Firstly it allows a direct comparison of the composition of the marginellid fauna between Fiji and New Caledonia at bathyal levels, since both archipelagos are situated in relative proximity to each other and they both lie at a similar latitude. Secondly it demonstrates the diversification within a set of species attributed to *Hydroginella*, and their near monopolistic status at bathyal levels in Fiji, as far as marginellids are concerned. This constitutes a very original, previously undocumented situation, very different from the one prevailing for the New Caledonian fauna at these depths.

The present paper is devoted to a taxonomic study of the seven species from the MNHN collection attributable to the genus *Hydroginella*, considered as

fully representative of the bathyal marginellid fauna of the Fiji Archipelago.

The genus *Hydroginella* was the subject of a first revision by Coover & Coover (1995: 82-83) and of further comments by Boyer (2001: 161-163). The diagnosis of the genus by Coover & Coover has at its core the presence of 3 or 3.5 columellar plications which are crowded at the anterior part of the columella, a light shell with a very narrow aperture, a type 2 animal (sensu Coover, 1987) and a type 9 radula (sensu Coover & Coover, 1995). It must be borne in mind, however, that the type 2 animal is common to all the family Marginellidae and currently we only have information on the radula of 5 species of *Hydroginella*, which exhibit a wide variety of narrow, sub-quadrate plates. Due to the similar radular shape found in all of these species, all species attributable to *Hydroginella* are suspected by Coover & Coover (1995: 83) to parasitize 'sleeping fishes' at night in coral reef environment, as first reported by Bouchet (1989) in the case of *H. caledonica* (Jousseaume, 1877), and later confirmed by observations from Johnson et al. (1995).

Abbreviations

MNHN = Muséum national d'Histoire naturelle, Paris.

IRD = Institut de Recherche pour le Développement, Paris.

stn = station, ad = adult, jv = juvenile, sh = shell.

SYSTEMATICS

Family **Marginellidae** Fleming, 1828

Genus ***Hydroginella*** Laseron, 1957

Type species : *H. dispersa* Laseron, 1957, by original designation.

Hydroginella musorstomi sp. nov.

Figs 1-6

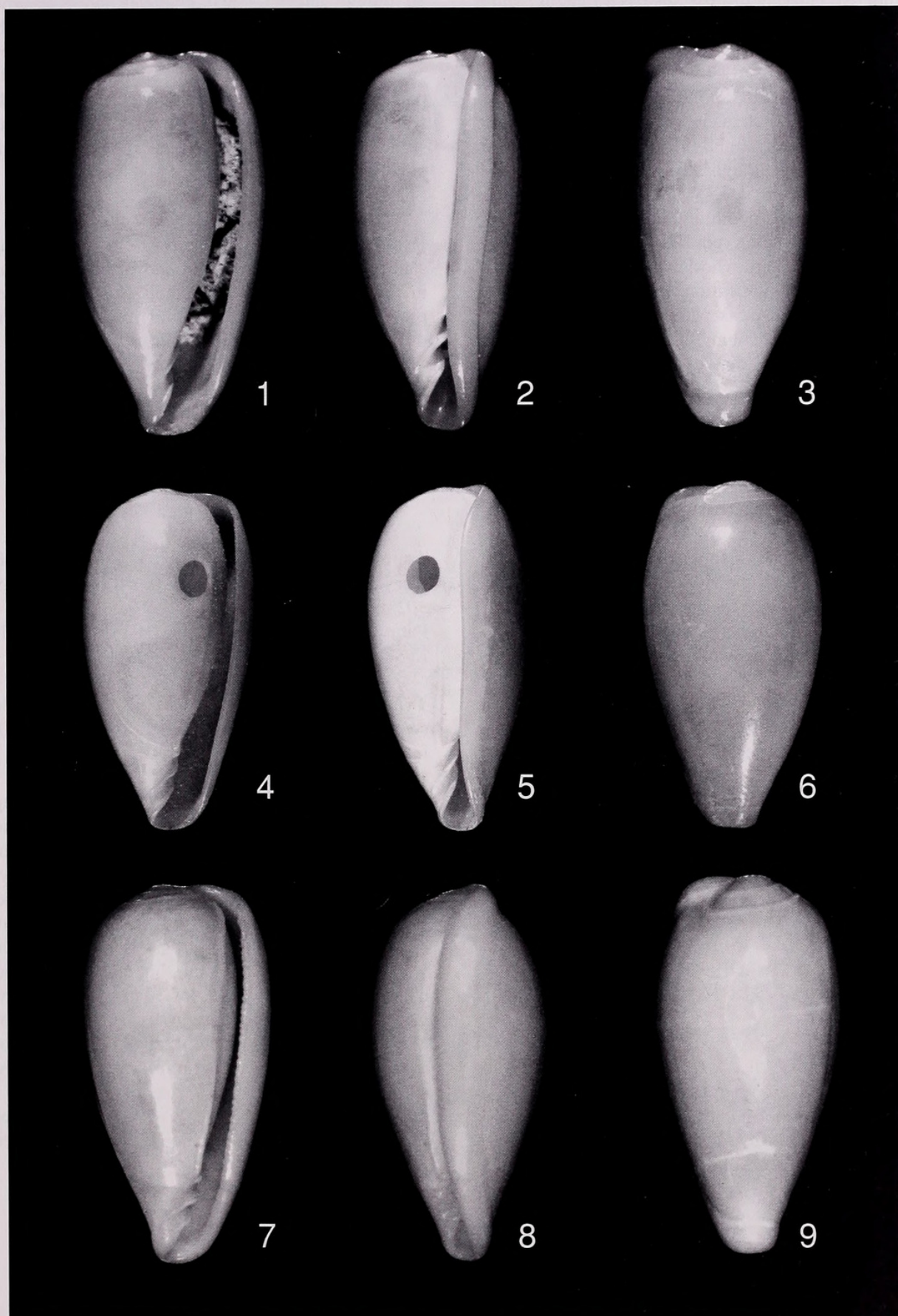
Type material. Holotype (8.0 x 4.2 mm), MNHN, (Figs 1-3): MUSORSTOM 10, stn CP 1348, 353-390 m.

Paratype (9.3 x 5.0 mm), MNHN, (Figs 4-6): BORDAU 1, stn DW 1432, 477-493 m.

Type locality. MUSORSTOM 10, stn CP 1348, southeast of Viti Levu, 17°30.3'S 178° 39.6'E, 353-390 m.

Figures 1-9

1-3. *Hydroginella musorstomi* sp. nov., holotype MNHN, 8.0 x 4.2mm, stn CP 1348. 4-6. *Hydroginella musorstomi* sp. nov., paratype MNHN, 9.3 x 5.0mm, stn DW 1432. 7-9. *Hydroginella rugosa* sp. nov., holotype MNHN, 7.7 x 4.0mm, stn DW 1382.



Description. Shell ovate, slightly inflated, strongly shouldered, tapering towards the base. Length : width ratio c. 53%. Paucispiral protoconch, hyalinous, slightly produced. Spire hardly elevated, antepenultimate whorl slightly depressed, teat-like apex, suture smooth. Shoulder at aperture angular and elevated. Aperture as long as body whorl, narrow posteriorly, flaring slightly anteriorly, inner border showing a vertical straight lateral profile in its central part. Labrum convex, 15 very small labial denticles on posterior half, smooth anterior half. Internal lirae absent. Strongly recurved labial margin, extending posteriorly onto spire whorls, anteriorly around base of shell to join first plication. Parietal border convex, full length smooth weak parietal callus ridge. 3 thin and very oblique columellar plications, first two strongest, third diminutive. Siphonal and posterior notches absent. Shell uniform pale cream colour with darker cream labial margin.

Remarks. The species is only known from 2 shells; one adult trawled south east of Viti Levu on the west side of the archipelago, and one subadult dredged off Vanua Balavu (Lau Islands) on the east side of the archipelago, both at upper bathyal levels. The species is likely therefore to range across the entire archipelago in the upper bathyal, but it has not been confirmed as being present in the central Lau Ridge.

Etymology. Named after the oceanographic campaign MUSORSTOM 10 during which the holotype of the species was collected.

***Hydroginella rugosa* sp. nov.**

Figs 7-9

Type material. Holotype (7.7 x 4.0 mm), MNHN (Figs 7-9): MUSORSTOM 10, stn DW 1382, 441-443 m.

Type locality. MUSORSTOM 10, stn DW 1382, south of Viti Levu, 18°19.2'S 177°51.7'E, 441-443 m.

Description. Shell ovate, slightly inflated, subpyriform, tapering strongly towards base, length : width ratio c. 52%. Paucispiral protoconch, spire elevated, domed, suture beaded. Aperture as long as body whorl, very narrow, widening very slightly anteriorly. Labrum gently convex externally, in lateral profile curved ventrally, at shoulder angular

and slightly elevated, straight internally with about 50 minute uneven labial denticles along its entire length. Internal lirae absent. Strongly recurved labial margin, extending posteriorly onto spire whorls, anteriorly around base of shell to basal two plications. Strong, rugose parietal callus ridge, weaker centrally. 3 columellar plications, basal two strongest, faintly oblique and concave, the third plication almost perpendicular to the aperture. Shell uniform cream-grey colour.

Remarks. This species is known only from a single shell dredged in the western part of the archipelago, in the upper bathyal. The shell exhibits a general profile close to that one of *H. musorstomi* but it differs in many important details.

Etymology. From the Latin for "wrinkled" or "folded", due to the long and narrow parietal callus ridge present in this species.

***Hydroginella bullata* sp. nov.**

Figs 10-15

Type material. Holotype (4.65 x 2.6 mm), MNHN (Figs 10-12): MUSORSTOM 10, stn DW 1365, 295-302 m.

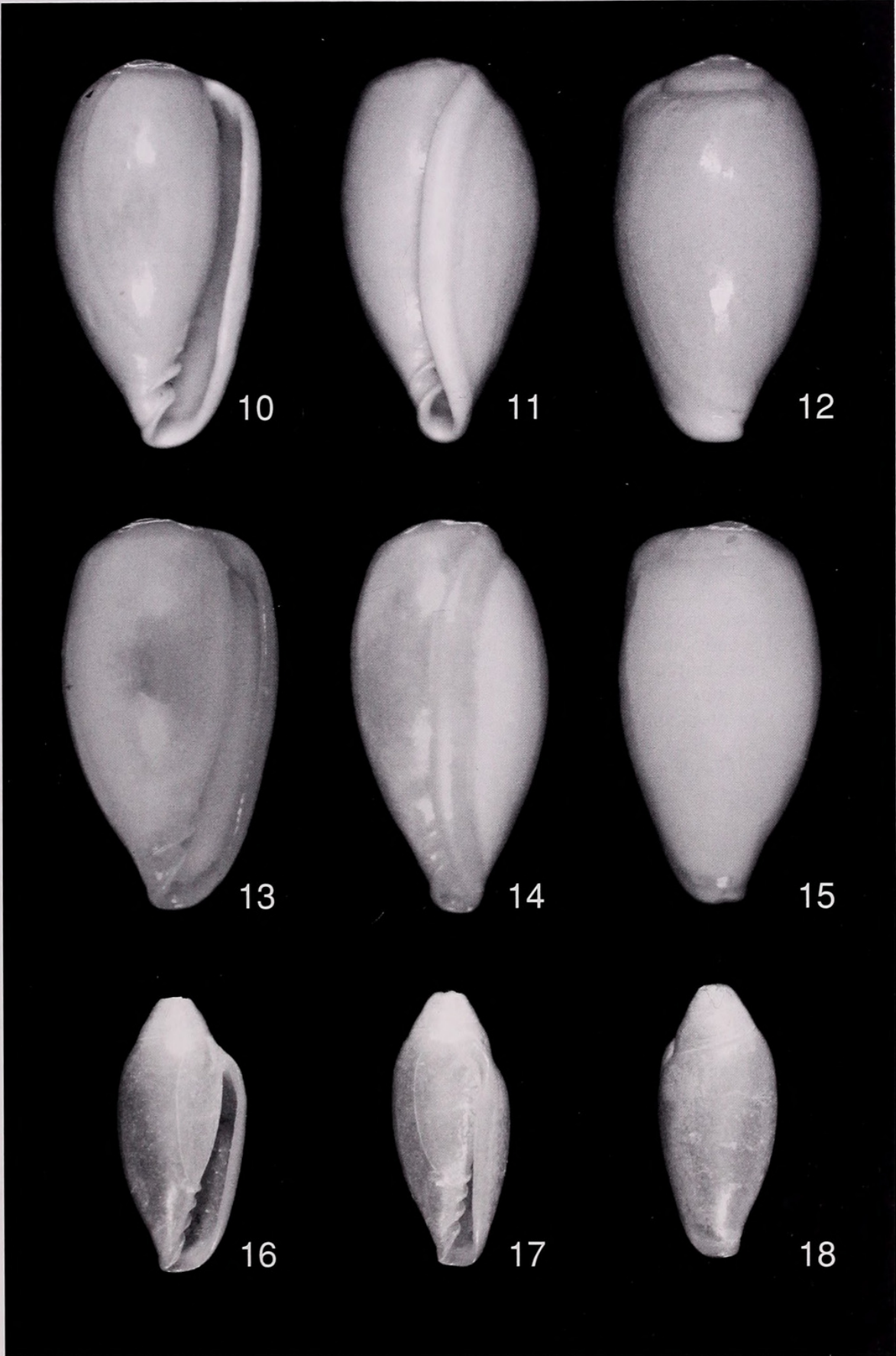
Paratype (4.4 x 2.5 mm), MNHN (Figs 13-15): MUSORSTOM 10, stn CP 1366, 149-168 m.

Type locality. MUSORSTOM 10, stn DW 1365, south of Viti Levu, 18°12.75'S 178°32.4'E, 295-302 m.

Description. Shell ovate, inflated, strongly shouldered, tapering towards the base, length : width ratio c. 57%. Paucispiral protoconch, very slightly produced. Spire faintly elevated, stepped dorsally at suture between body whorl and penultimate whorl. Remaining sutures smooth. Aperture almost as long as body whorl, very slightly flaring. Labrum convex, smooth, lirae absent. Labial shoulder angular, non-elevated, lateral profile of the labrum curved ventrally. Thick labial margin, extending posteriorly onto spire of penultimate body whorl, anteriorly around base of shell to first plication. Parietal border convex, callus evident as raised ridge only at posterior and anterior ends. 3 columellar plications, first 2 strong and faintly oblique, third very reduced. Siphonal and posterior notches absent. Shell white, glossy.

Figures 10-18

10-12. *Hydroginella bullata* sp. nov., holotype MNHN, 4.65 x 2.6 mm, stn DW 1365. **13-15.** *Hydroginella bullata* sp. nov., paratype MNHN, 4.4 x 2.5 mm, stn CP1366. **16-18.** *Hydroginella wareni* sp. nov., holotype MNHN, 5.9 x 2.85 mm, stn DW 1472.



Remarks. This species is only known from 2 adult shells, one dredged in upper bathyal, southeast of Viti Levu on the west side of the Fiji Archipelago, the other trawled in the vicinity, in the lower coral reef levels.

Etymology. From the Latin for "inflated".

Hydroginella wareni sp. nov.
Figs 16-18

Type material. Holotype (5.9 x 2.85 mm), MNHN (Figs 16-18): BORDAU 1, stn DW 1472, 262-266 m. 3 paratypes (6.75 x 3.1 mm, 6.5 x 3.4 mm, 5.5 x 2.6 mm), MNHN: same locality as holotype.

Type locality. BORDAU 1, stn DW 1472, off Vatoa Island, Lau Ridge, 17°18'S 179°33'W, 262-266 m.

Description. Shell biconic, subcylindrical, weakly shouldered, length : width ratio c. 50%. Protoconch paucispiral, spire bluntly rounded, slightly inflated, elevated, forming 25% of total shell length. Sutures smooth, aperture forms 2/3 of total shell length, narrow, flaring anteriorly. Labrum straight, faintly shouldered, smooth, denticles and lirae absent, margin weakly recurved and thickened, extending posteriorly to suture of body whorl, anteriorly around base of shell to meet first columellar plication. Parietal border weakly convex. Parietal callus ridge absent. Four columellar plications, first two more or less of equal size and oblique, the posterior two diminutive and less oblique. The first plication has a straight profile. Siphonal and posterior notches absent.

Shell uniform creamy white colour, hyaline.

Remarks. This species is only known from a single lot dredged from the upper bathyal, off an isolated submarine relief situated in the far southeast of the Fiji Archipelago, on the central Lau Ridge.

Etymology. Named for Professor Anders Warén, malacologist at the Stockholm Museum, who took part in the BORDAU 1 campaign.

Hydroginella vitiensis sp. nov.
Figs 19-27

Type material. Holotype (6.4 x 3.2 mm), MNHN (Figs 19-21): MUSORSTOM 10, stn DW 1359, 183-188 m.

Figures 19-27

19-21. *Hydroginella vitiensis* sp. nov., holotype MNHN, 6.4 x 3.2mm, stn DW 1359. **22-24.** *Hydroginella vitiensis* sp. nov., paratype MNHN, 7.1 x 3.7mm, stn DW 1365.

25-27. *Hydroginella vitiensis* sp. nov., 6.7 x 3.1mm, stn DW 1440.

6 paratypes : 5 ad. sh. (L= 7.1 mm, 6.6 mm, 6.2 mm, 6.2 mm) and 1 juv. (L=5.3 mm), MNHN, (Figs 22-24): MUSORSTOM 10, stn DW 1365, 295-302 m.

1 paratype : broken ad. sh. (L=8.8 mm, with removed spire), MNHN: MUSORSTOM 10, stn DW 1333, 200-215 m.

Other material examined. 1 ad. sh. (6.7 x 3.1 mm), MNHN, (Figs 25-27): BORDAU 1, stn DW 1440, off Vanua Balavu, 17°11'S 178°43'E, 190-308 m.

Type locality. MUSORSTOM 10, stn DW 1359, south of Viti Levu, 17°47.7' 178°47.8'E, 183-188 m.

Description. Shell biconic, subpyriform, weakly shouldered, length : width ratio c. 50 %. Paucispiral protoconch, spire nipple-shaped, smooth sided, elevated, comprising 25% of total shell length. Sutures smooth. Aperture accounting for 3/4 total shell length, narrow, flaring slightly anteriorly, Labrum slightly convex externally, receding shouldered, faintly sinuous internally with 30 weak denticles, extremely weak in middle 1/3, inner border showing a vertical straight lateral profile centrally. Margin strongly recurved, thickened, extending posteriorly to suture of body whorl, anteriorly around base of shell to meet first two plications. Parietal border convex, weak parietal callus ridge only evident from level of third plication to midbody. 3 sinusoidal, rather oblique columellar plications, third not quite as strong as first two.

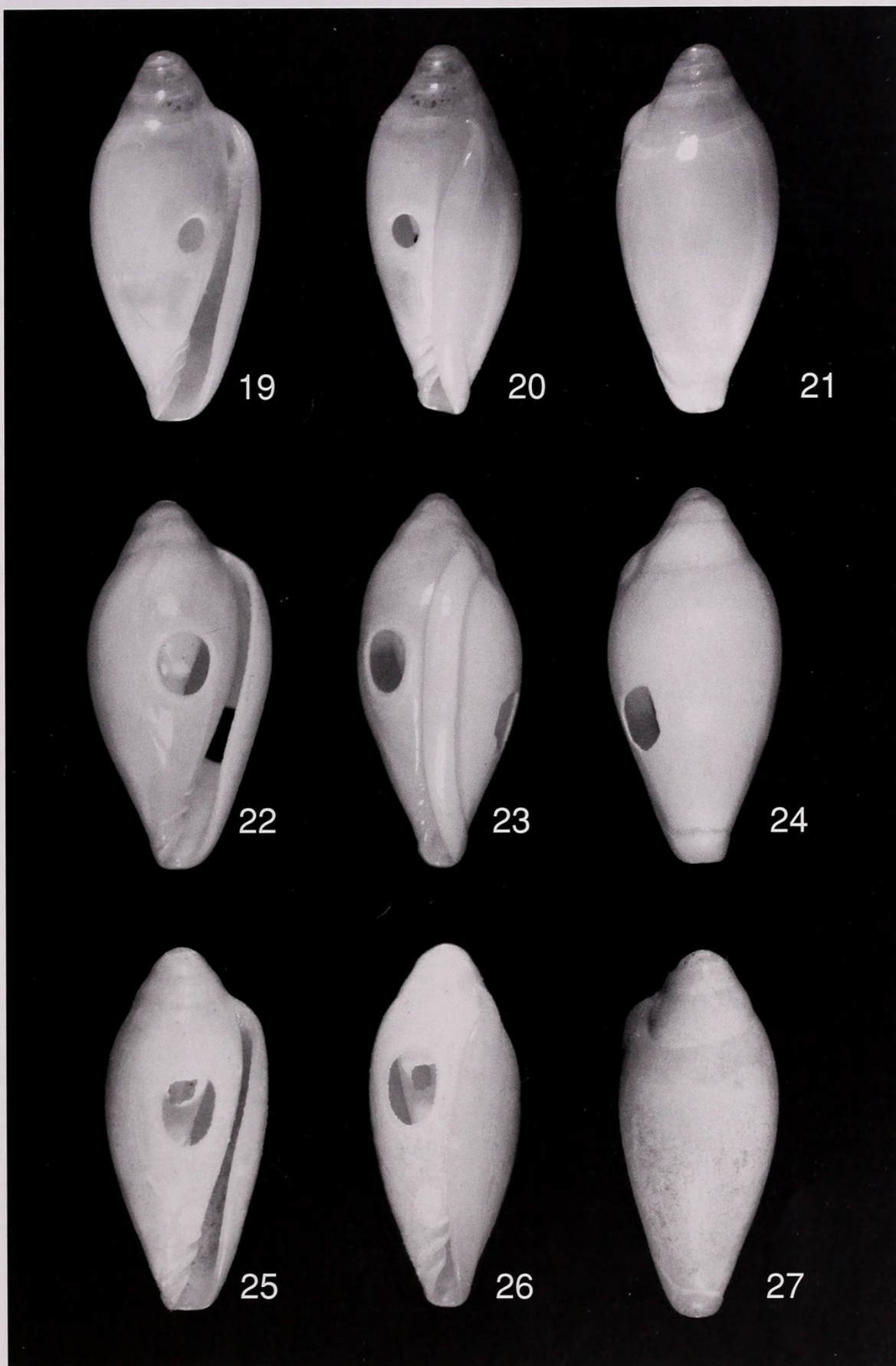
Shell pale cream colour, glossy.

Remarks. This species is known from 4 lots. Three lots were dredged respectively south, east and north off Viti Levu on the west side of the Fiji Archipelago, in the lower coral reef levels and upper bathyal; a fourth lot (Figs 25-27) comes from the eastern part of the archipelago (Vanua Balavu, Lau Islands, upper bathyal). This species shows as much variable by its size as well as by its general outline.

Etymology. Named after the main island of the Fiji Archipelago.

Hydroginella angustata sp. nov.
Figs 28-33

Type material. Holotype (9.2 x 4.0 mm), MNHN (Figs 28-30): BORDAU 1, stn DW 1497, 335-350 m. 3 paratypes (L= 9.8 mm, 8.45 mm, 8.40 mm), MNHN (Figs 31-33): BORDAU 1, stn DW 1469, 314-377 m.



Type locality. BORDAU 1, stn DW 1497, off Moce Island, Yagasa group, Lau Ridge, 18°44'S 178°25'W, 335-350 m.

Description. Shell very narrow, elongate, subcylindrical, not shouldered, tapering towards base, length : width ratio c. 43.5%. Paucispiral protoconch, hyaline, produced, bluntly rounded. Spire moderately elevated, slightly blunted, smooth sided, forming 25% of total shell length. Sutures smooth. Aperture 4/5 of total length of shell, very long, narrow, parallel sided. Labrum long, receding shouldered, straight except for slightly inflexed basal third, about 40 minute denticles, internal lirae absent. Strongly recurved, thickened margin extending posteriorly to suture on body whorl, anteriorly around base of shell to join first two plications. 3 oblique columellar plications, crowded anteriorly. First two very strong, third diminutive. Siphonal and posterior notches absent.

Shell uniform pale cream, opaque white marginal callus and plications.

Remarks. The species is known from 2 lots, both from upper bathyal, one dredged off Vatoa Island, an isolated place on the central Lau Ridge, the other one from Moce Island, in the north of the Yagasa group, situated at a more northerly latitude on the central Lau Ridge. The species can be considered to range along the whole central Lau Ridge in the upper bathyal.

Etymology. From the Latin word for 'narrowed', 'straight', due to the outline of the shell.

Hydroginella unica sp. nov.

Figs 34-36

Type material. Holotype (6.9 x 2.9 mm), MNHN (Figs 34-36): BORDAU 1, stn DW 1472, 262-266 m.

Type locality. BORDAU 1, stn DW 1472, off Vatoa Island, Lau Ridge, 19°40'S 178°10'W, 262-266 m.

Description. Shell elongate, fusiform, subcylindrical, weakly shouldered, the entire last whorl gently tapering towards the base, length:width ratio 42%. Paucispiral protoconch, produced, domed. Spire elevated, very blunt, forming 25% of total shell length. Sutures slightly stepped. Aperture 4/5 of total shell length, long, narrow posteriorly, flaring anteriorly. Labrum long, internally straight, denticles and lirae absent, moderately thickened external margin, posteriorly extending almost to suture of

body whorl, anteriorly extending around base of shell to join first two columellar plications. Parietal border weakly convex, parietal callus ridge absent. Three columellar plications, crowded anteriorly, first two strongest, long and sinuous, third diminutive. Siphonal and posterior notches absent. Shell uniform pale cream.

Remarks. The species is only known from one shell dredged in the upper bathyal off an isolated relief situated far to the southeast of the Fiji archipelago, on the central Lau Ridge.

Etymology. From the Latin form of 'one' or 'unique', coming from the fact that the species is represented by one single shell.

DISCUSSION

All seven species described above are represented from scarce material found in very few stations. Only two species, *H. musorstomi* sp. nov. and *H. vitiensis* sp. nov. are present both on the western and eastern sides of the archipelago, whereas the other five species are known from a single location or from one single upper bathyal formation (the exception from this point of view being *H. angustata* sp. nov., which is found from two places along the central Lau Ridge and has a discontinuous distribution fragmented by intermediate mid-bathyal depths).

The paucity of the specimens found relative to the high numbers of sampling operations made may be interpreted either as rarity of population settlements and / or the number of individuals in each species, or as a result of the animals occupying special habitats which are not capable of being sampled by dredging or trawling techniques. Whatever the reason, the records available are insufficient to state about the distribution of *Hydroginella* species in Fiji, and especially to be interpreted as giving an account of a tendency towards micro-endemisms.

The original predominance of *Hydroginella* at bathyal levels in Fiji, where other marginellid genera are so poorly represented, poses a complex biogeographic issue. This pattern of marginellid diversity must be compared to the one prevailing at bathyal levels from New Caledonia, where the genus *Dentimargo* is much diversified and where the genera *Protoginella* and *Haloginella* are represented by several species, whereas *Hydroginella* presents comparatively a very limited occurrence (Boyer, 2001 & 2002).

Figures 28-36

28-30. *Hydroginella angustata* sp. nov., holotype MNHN, 9.2 x 4.0mm, stn DW 1497. **31-33.** *Hydroginella angustata* sp. nov., paratype MNHN, 9.8 x 4.5mm, stn DW 1469. **34-36.** *Hydroginella unica* sp. nov., holotype MNHN, 6.9 x 2.9mm, stn DW 1472.



The decreasing of the diversity eastward from the New Caledonian old formation (estimated more than 60 millions years) within a family characterized by a non-planktotrophic larval development (paucispiral protoconchs) is not particularly surprising, due to the distances between the Southwest Pacific Archipelagos, the hydroclimatic regional conditions and the relative younger geologic formations east from the New Caledonian ridges. The real issue lies in the high diversity of *Hydroginella* in bathyal levels of Fiji, despite the fact that these *Hydroginella* species all show paucispiral protoconchs, from which an intracapsular larval development can be inferred.

A tentative explanation of this situation may consist in the 'high dispersive capacity' of a marginellid group served by its ecto-parasitic behaviour on 'sleeping fishes'. Such a kind of transport may enable the geographic as well as the bathymetric spread of the group, independently of its rate of speciation. Naturally, a more complete documentary evidence must be brought to support this theory, comparing the situations between several places from Indo Pacific where bathyal levels have been subjects to intensive sampling. Such a study is currently under way by the first author.

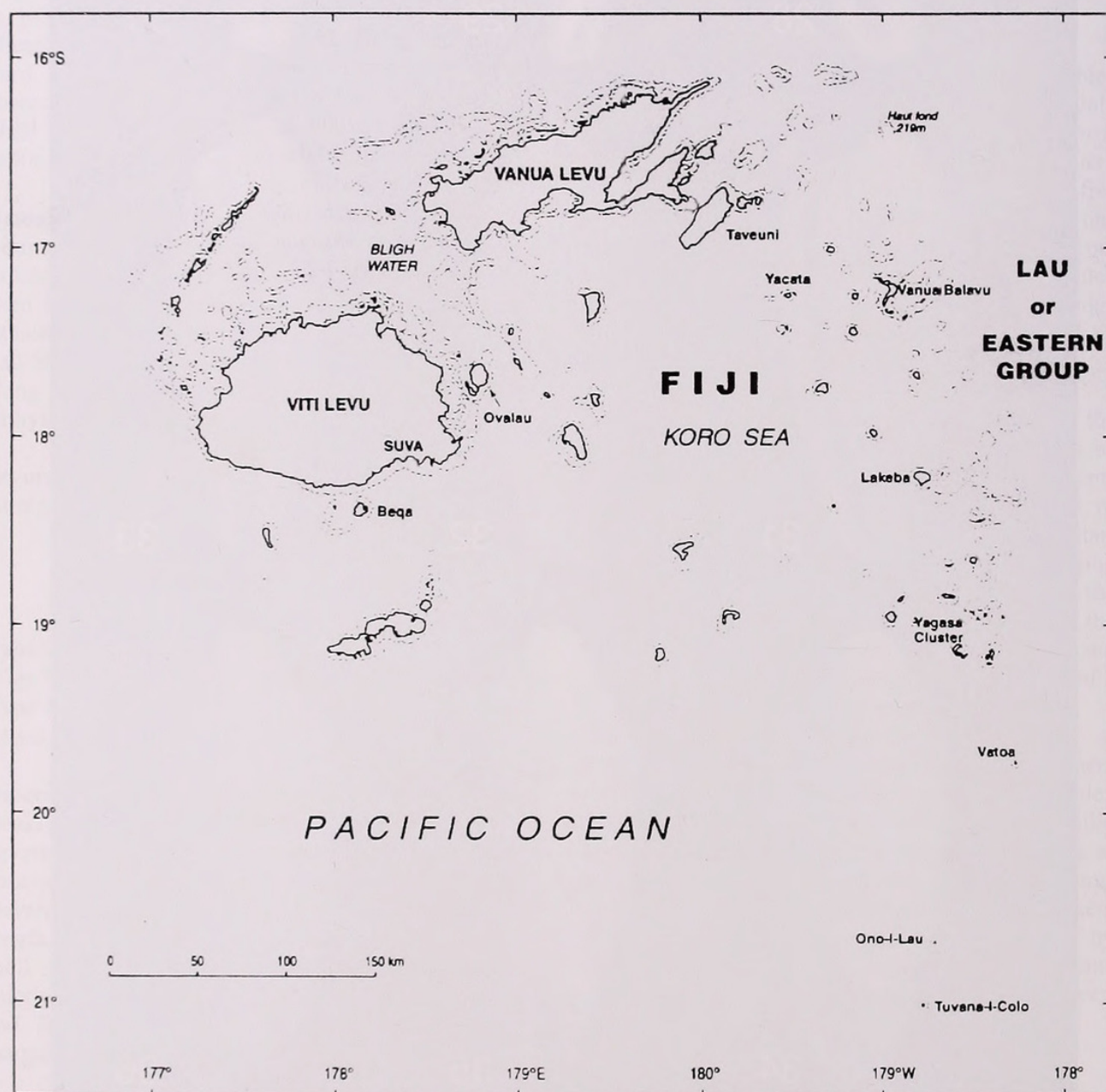


Figure 37
Map of the Fiji Archipelago

ACKNOWLEDGEMENTS

We are indebted to Pr. Philippe Bouchet (Muséum national d'Histoire naturelle, Paris) for access to the MNHN Southwest Pacific collections, and for his advice and encouragement.

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Boyer, Franck, Wakefield, Andrew, and Mccleery, Tony. 2003. "The genus *Hydroginella* (Caenogastropoda:Marginellidae) at bathyal levels from the Fiji Islands." *Novapex : trimestriel de la Société belge de malacologie* 4, 67–77.

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