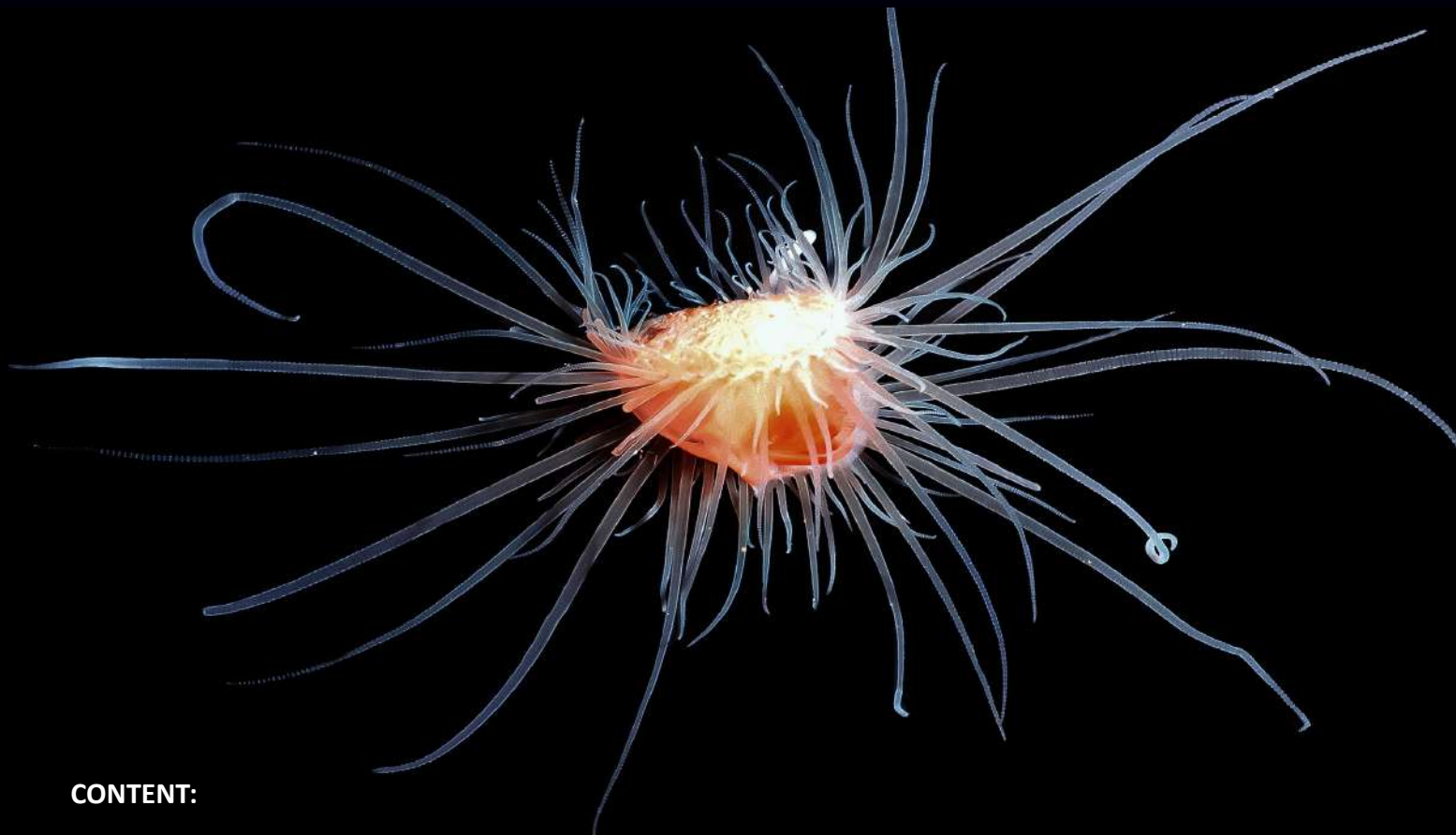


# XENOPHORA

## TAXONOMY

Supplément à Xenophora, Bulletin de l'Association Française de Conchyliologie



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Limidae

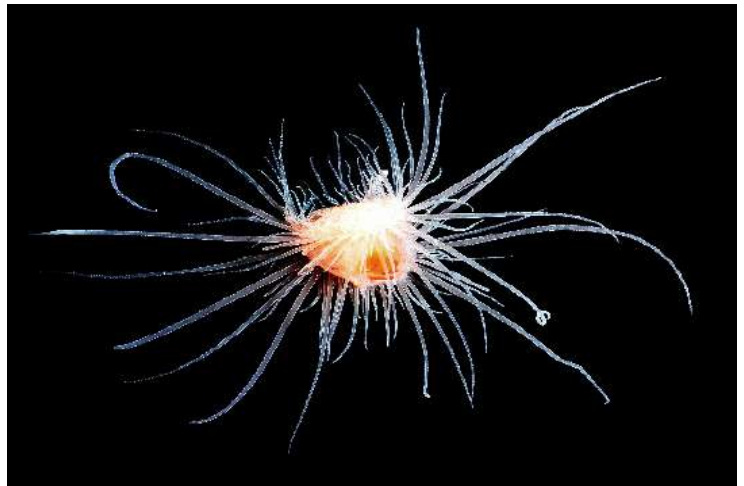
*Limaria fragilis*

(Gmelin, 1791)

MNHN La planète revisitée

Koumac 2018 KR636 LC268 IMGPO751

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**DESCRIPTION OF A DARIOCONUS SPECIES (GASTROPODA: CONIDAE):**  
***DARIOCONUS NOSYBARRENENSIS* SP. NOV., FROM BARREN ISLANDS, WESTERN MADAGASCAR**

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## ABSTRACT

We describe *Darioconus nosybarrenensis* sp. nov. from Barren Islands (= Nosy Barren), Western Madagascar. The new species is compared with *Darioconus corbieri* (Blöcher, 1994) and with *Darioconus rosiae* Monnier, Batifoix & Limpalaër, 2018, both from the South West coasts of Madagascar.

## RESUME

Nous décrivons ici *Darioconus nosybarrenensis* sp. nov. des Iles Barren (= Nosy Barren) de l'ouest de Madagascar. La nouvelle espèce est comparée à *Darioconus corbieri* (Blöcher, 1994) et *Darioconus rosiae* Monnier, Batifoix & Limpalaër, 2018, deux espèces du Sud.Ouest. de Madagascar.

## INTRODUCTION

The *Darioconus pennaceus* complex is composed of many populations scattered all around the Tropical Indian Ocean but also in the Tropical Western Pacific and a remote group of populations in the Hawaiian Archipelago.

The observed protoconch are strictly paucispiral suggesting a direct development of the hatchlings and rather restricted geographic repartition of the different populations.

DNA is only known from a limited number of the various populations of the complex and does not allow to draw firm conclusions about the validity of various species.

Monnier *et al.* (2018) recognized 20 species in this complex. Four of them were left in open nomenclature. From these two were named recently: *Darioconus bratcherae* Petuch & Berschauer, 2019 from the Red Sea and *Darioconus brandonensis* Lorenz, 2019 from the Cargados Carajos Shoals (better known as Saint Brandon). Another species that was lumped in *Darioconus episcopus* (Hwass in Bruguière, 1792) by Monnier *et al.* (2018) endemic from Rodrigues Island as *Darioconus kolaceki* Cossignani, 2023.

New material from Madagascar obtained from Jean-Paul Duboc and Sabine Pineau reveals an unknown and undescribed population that we name herein as a new species.

## MATERIAL AND METHODS

Taxonomy follows Monnier *et al.* (2018). We describe shell morphology using the terminology established in R.K.K. (1995) and modified in Monnier *et al.* (2018). Adult shells were measured with digital calipers, most of the time the measurements were rounded to 0.01 millimeter.

## REPOSITORIES

MNHN: Muséum National d'Histoire Naturelle, Paris, France

EM: Eric Monnier reference collection, Paris, France

LL: Loïc Limpalaër reference collection, Haudivillers, France

FP: Fabrice Prugnaud reference collection, Suresnes, France

## ABBREVIATIONS

R.K.K.: Röckel, Korn & Kohn.

| <i>Shell morphometry</i>                                  |
|-----------------------------------------------------------|
| SL: maximum shell length                                  |
| MD: maximum diameter                                      |
| H: height                                                 |
| SH: spire height = SL-AH                                  |
| HMD: height of maximum diameter                           |
| W: shell weight                                           |
| AH: aperture height                                       |
| RD: relative diameter (= MD/AH)                           |
| V: estimated "model" volume (= SL x MD x H)               |
| RSH: relative spire height (= SH/SL = (SL-AH) / SL)       |
| PMD: relative position of the maximum diameter (= HMD/AH) |
| RW: relative shell weight 'length' (= W/SL)               |
| RW': relative shell weight 'volume' (= W/V)               |

## RESULTS

## SYSTEMATIC

**Family CONIDAE Fleming, 1822**

**Genus *Darioconus* Iredale, 1930**

**-1- *Darioconus nosybarrenensis* sp. nov.**



**Figure 1:** *Darioconus nosybarrenensis* sp. nov. Holotype  
MNHN-IM-2000-28668

**Material examined:** Holotype and 12 paratypes of *Darioconus nosybarrenensis* sp. nov. have been studied. The holotype is deposited in the Muséum National d'Histoire Naturelle, Paris, France, under the reference MNHN-IM-2000-28668 (ex-Eric Monnier's collection). The paratypes are stored in private collections. (See Table 1 for details).

| Type        | Institution       | Dimensions – Weight<br>SL x MD x W (mm x mm x g) | Locality                                           |
|-------------|-------------------|--------------------------------------------------|----------------------------------------------------|
| Holotype    | MNHN-IM-2000-2868 | 37.22 x 18.58 x 6.2                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 1  | Coll. EM          | 39.33 x 20.00 x 7.5                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 2  | Coll. EM          | 34.17 x 17.42 x 4.8                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 3  | Coll. EM          | 36.52 x 18.40 x 5.5                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 4  | Coll. EM          | 35.82 x 18.66 x 5.6                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 5  | Coll. EM          | 35.31 x 18.35 x 5.2                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 6  | Coll. EM          | 32.49 x 16.82 x 4.4                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 7  | Coll. EM          | 33.86 x 16.61 x 4.5                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 8  | Coll. LL          | 37.93 x 19.23 x 7.1                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 9  | Coll. FP          | 33.48 x 17.65 x 5.0                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 10 | Coll. FP          | 34.60 x 17.44 x 4.9                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 11 | Coll. FP          | 35.19 x 18.40 x 5.4                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |
| Paratype 12 | Coll. FP          | 31.78 x 16.17 x 4.2                              | Nosy Andrano, Barren Islands, W. Madagascar, 1-4 m |

**Table 1: Types of *Darioconus nosybarrenensis* sp. nov.**

### Synonymy

2005. *Conus pennaceus episcopus* (Hwass, 1792). Duboc & Pineau. Escale aux Iles Barren. Xenophora 110: p. 20-23, 1 pl.

**Type locality:** Barren Islands, West of Madagascar, in the Mozambique Channel.

**Distribution and habitat:** All the studied shells of *T. nosybarrenensis* sp. nov. have been collected in Nosy Andrano, Barren Archipelago, W. Madagascar in a narrowly localized zone at 1-4 m, in detrital coral by Jean-Paul Duboc and Sabine Pineau (sailing boat: "Voilier Azenon") in November 2003.

Nosy Andrano in the Barren Archipelago is located at about 22 km from the west coast of Madagascar. The maximum width of the islet is about 1 km. It is also located at about 170 km from the South East of Juan de Nova Island.

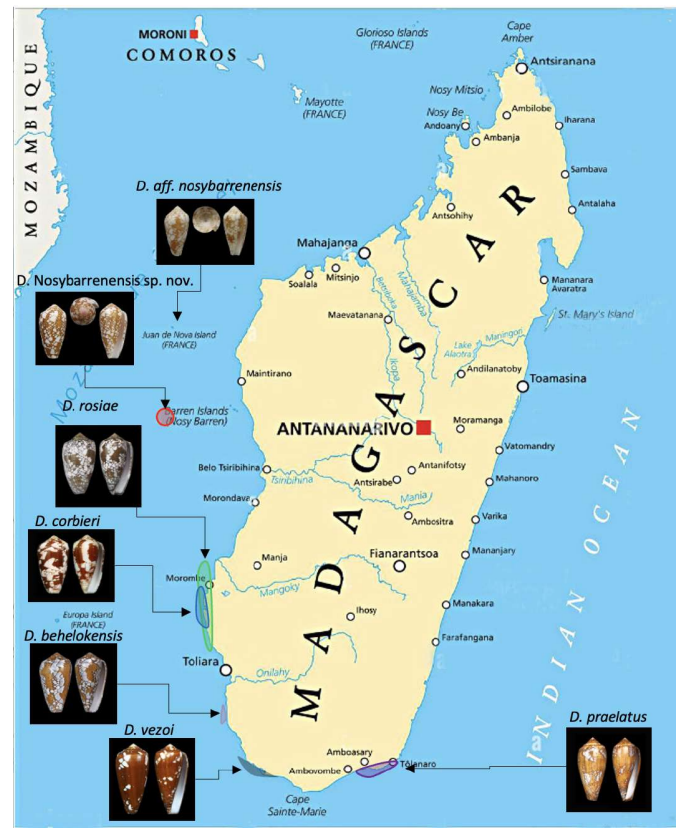


**Figure 2a:** Distribution map of *Darioconus nosybarrenensis* sp. nov., and other *Darioconus* around Madagascar. (see page 12 for detail view).



**Figure 2b:** Distribution map of *Darioconus nosybarrenensis* sp. nov., localisation of Nosy Barren Archipelago islands.



Figures 3a & 3b: Nosy Andrano, Barren Archipelago

**Etymology:** The new species is named *Darioconus nosybarrenensis* from the Malagasy name of the type locality where all the type specimens were collected.

**Morphometric parameters:**

SL = 31 - 40 mm (mean SL = 35.2 mm) (maximum SL = 47 mm in Duboc & Pineau paper); RD = 0.55 - 0.59 (mean RD = 0.57); PMD = 0.81 - 0.87 (mean PMD = 0.84); RSH = 0.08 - 0.14 (mean RSH = 0.11); RW = 1.3 - 1.9 g/cm (mean RW = 1.5 g/cm); RW' = 0.46 - 0.57 g/cm<sup>3</sup> (mean RW' = 0.52 g/cm<sup>3</sup>).

**Description:** Shell moderately small to medium-sized, ventricosely conical somewhat trapezoidal in profile and moderately solid in weight. The protoconch is broken or eroded in all the specimens and cannot be characterized. The shell has about 10 to 11 whorls. The spire is low to rather moderate (mean RSH = 0.11) with a straight to slightly convex outline. The teleoconch sutural ramps are slightly convex in profile and juxtaposed with numerous and very thin spiral striae and radial growth lines and threads (fig. 7). The suture is narrow and shallow with a linear sutural line. The shoulder is subangulate. The outline of the last whorl is convex. The columellar lip is straight in the abapical part and becoming slightly convex in the top of the adapical end. The aperture is slightly wider at base than near shoulder. The lip is translucent white and convex, the

profile of the origin of the lip is receding with a V-shaped anal notch while the siphonal outline is straight. The ground color of the shell is white. The last whorl is overlaid with light orange brown leaving many small to moderately large tentlike ground color markings. The pattern and colors of all the collected specimens are quite constant. Spiral rows of very small irregular dots are disposed on the tiny cords that ornate the last whorl. The apex is pink. The color and pattern of the spire is consistent with those of the last whorl.

**Living animal and radula:**

The soft parts, radula and DNA of the new species are not known.

**COMPARISONS**

*Darioconus nosybarrenensis* sp. nov is compared with two other species from the *Darioconus pennaceus* complex living about 300 km further south in the southwest coast of Madagascar: *Darioconus corbieri* (Blöcher, 1994) and *Darioconus rosiae* Monnier, Batifoix & Limpalaër, 2018.

**1. Differentiating features**

- *Darioconus corbieri* (Blöcher, 1994)



Figure 5. *Darioconus corbieri* (Blöcher, 1994) Holotype SMNS: 54.6 x 29.4 mm.

*Darioconus corbieri* is found from Salary to Tsiandamba in a stretch of coast of about 20 km in the North of the Great Lagoon of Toliara, in the South West of Madagascar.

The new species lives in Barren Islands about 500 km further north. The pattern of *D. corbieri* is rather constant and quite different from that of the new species. In *D. corbieri* it is of a solid reddish pink and the tents are not lined with darker colour. There are no spiral line of tiny white dots.

Moreover, a subadult specimen of *D. corbieri* similar in size to the average of the new species is figured in plate 3. The pattern is not similar with the new species described here.

Both species differ strikingly by their shell length. The average size of *D. nosybarrenensis* sp. nov. is of 35.9 mm against 57.2 mm in *D. corbieri*. The latter is wider than the new species: RD of 0.61 against 0.57. The new species is relatively heavier with RW' of 0.52 against 0.49.

- *Darioconus rosiae* Monnier, Batifoix & Limpalaër, 2018



**Figure 6.** *Darioconus rosiae* Monnier, Batifoix & Limpalaër, 2018 Holotype MNHN 58.3 x 28.4 mm

*Darioconus rosiae* is found from Beangolo to Tsiandamba in the North of the Great Lagoon of Toliara, in the S.W. of Madagascar.

The new species lives in Barren Islands about 500 km further north.

The pattern of *D. rosiae* is very variable unlike the new species. A subadult specimen of *D. rosiae* similar in size to the average of the new species is figured in plate 2. The pattern is quite different with the new species described herein.

The average shell length is also different: 35.2 mm in the new species against 59.5 mm in *D. rosiae*. The latter is wider than the new species with RD of 0.60 against 0.57.

The new species is relatively heavier with RW' of 0.52 against 0.47.

| Species                            | Values       | SL (mm) | RD          | PMD         | RSH         | RW (g/cm)   | RW' (g/cm³) |
|------------------------------------|--------------|---------|-------------|-------------|-------------|-------------|-------------|
| <i>D. nosybarrenensis</i> sp. nov. | Our values   | 31 - 40 | 0.55 - 0.59 | 0.81 - 0.87 | 0.08 - 0.14 | 1.31 - 1.91 | 0.46 - 0.57 |
|                                    | Medium value | 35.2    | 0.57        | 0.84        | 0.11        | 1.53        | 0.52        |
| <i>Darioconus corbieri</i>         | Our values   | 48 - 65 | 0.58 - 0.64 | 0.79 - 0.86 | 0.08 - 0.13 | 2.90 - 6.71 | 0.41 - 0.57 |
|                                    | Medium value | 57.2    | 0.61        | 0.83        | 0.10        | 4.77        | 0.49        |
| <i>Darioconus rosiae</i>           | Our values   | 51 - 71 | 0.57 - 0.62 | 0.83 - 0.87 | 0.12 - 0.16 | 3.27 - 5.74 | 0.41 - 0.60 |
|                                    | Medium value | 59.5    | 0.60        | 0.85        | 0.14        | 4.27        | 0.47        |

**Table 2.** Morphometric parameters for *Darioconus nosybarrenensis* sp. nov. & two compared species



**Figure 7.** Detailed view of the teleoconch sutural ramp of *D. nosybarrenensis* sp. nov., Paratype 12.

## Graphical morphometric comparisons

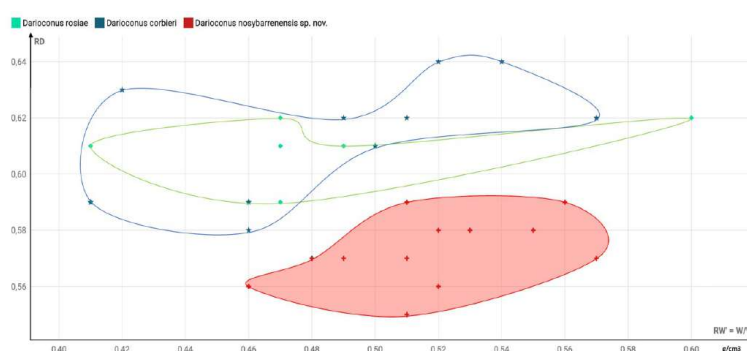


**Figure 8.** Graph of  $RD = f(RW')$  for *Darioconus nosybarrenensis* sp. nov., *Darioconus rosiae* and *Darioconus corbieri*. The new species is figured in red colour. (see page 13 for detailed view)

Figure 8 shows the plotting area of each of the 3 species represented on the graph:  $RD = f(RW')$ .

It clearly shows that *D. nosybarrenensis* sp. nov. occupies a distinct position on the graph: The new species does not share common morphological points with the other specimens of the compared species. The density of the new species: RW' in  $g/cm^3$  is higher than the compared species for an equivalent relative diameter.

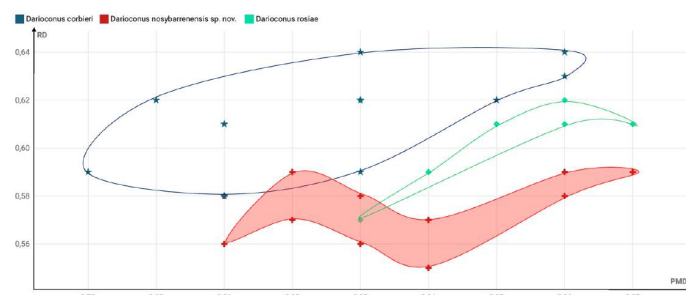


**Figure 9.** Graph of  $RD = f(PMD)$  for *Darioconus nosybarrenensis* sp. nov., *Darioconus rosiae* and *Darioconus corbieri*. The new species is figured in red colour. (see page 13 for detailed view)

Figure 9 shows the plotting area of each of the 3 species represented on the graph:  $RD = f(PMD)$ .

It appears that *D. nosybarrenensis* sp. nov. mostly occupies a distinct area in this graph: The new species has very few common morphological points with *D. rosiae* and *D. corbieri*.

The new species can be finally compared with a specimen (called in our tables *D. aff. nosybarrenensis*) collected in Juan de Nova Island. This small and isolated Island is located at about 130 km from the West coast of Madagascar and at about 300 km East from Mozambique coast.

The pattern of the shell from Juan de Nova is quite similar to that of the new species. The size of this shell is similar to that of the new species: SL = 38.64 mm (SL of the new species: 31 to 40 mm), the relative diameter  $RD = 0.53$  is smaller than that of the new species (0.55 to 0.59) which means that the Juan de nova shell is slender than the new species. The relative position of the maximum diameter and the relative spire height are similar to those of the new species:  $PMD =$

0.84 and RSH = 0.11 (average PMD = 0.84 and average RSH = 0.11 for the new species). Finally, the relative shell weight of the specimen from Juan de Nova (0.46 g/cm<sup>3</sup> is smaller than that of the new species (average RW' = 0.52 g/cm<sup>3</sup>). With a single specimen at hand, it is not possible to conclude reliably on its specific identity. It therefore remains in open nomenclature pending the availability of more material.



**Figure 10:** *Darioconus* aff. *nosybarrenensis* 38.64 X 18.39 mm, Juan de Nova Is., Coll. EM

#### REMARKS

Some specimens of this small new *Darioconus* species have growth lines. Moreover, the shells are quite heavy, and the lips are thickened suggesting that they are adult individuals and excluding that they may be young from already known species. It is interesting to note that along the coasts of Madagascar different species belonging to the *Darioconus pennaceus* complex are living: *D. praelatus* (Hwass in Bruguière, 1792) at the Southeast of the Island, *D. vezoi* (Korn, Niederhöfer & Blöcher, 2007) at the extreme South, *D. behelokensis* (Lauer, 1989) in the south of Toliara in the south west, then *D. corbieri* (Blöcher, 1994) & *D. rosiae* Monnier, Batifoix & Limpalaër, 2018 in the north of Toliara but still on the south west of the island. *D. nosybarrenensis* new species is located at the central west part of Madagascar. The Juan de Nova shell and other scarce finds point to the presence of other populations in the complex that are still poorly documented.

The presence of a population of the *Darioconus pennaceus* complex in the Barren Islands has only been documented in the literature in the paper by Duboc and Pineau. They illustrate 3 specimens that belong to the type series and give some information about their habitat. The maximum size they give is of 47 mm.

However Manfred Blöcher, in his description of *D. corbieri*, (fig. 2) figured 3 small shells measuring from 35.7 mm to 44.5 mm for which he states: "A fifth distinct population (...) also from the remote area north of Tuléar (...) also shows relatively little variability (...). But all shells are small compared with the other Madagascar *pennaceus* (...). However, the shells are solid and heavy. Growth lines are present, indicating adult individuals which have already passed through growth phases. (...) about 10 specimens of this population (...) have become available so far. The exact provenance is not known yet and further research

is still necessary".

It appears that the 3 illustrated shells agree in shape, size and pattern with the new species and they may originate from the Barren Islands or another locality. It cannot be confirmed that they belong to the new species. More work and materials are needed.

#### ACKNOWLEDGEMENTS

Our most sincere thanks to:

Jean Paul Duboc and Sabine Pineau for their kindness, when they received the first and third authors in their home, providing clear information on the discovery of the new species and sharing their photos.

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Plate1. *Darioconus nosybarrenensis* sp. nov.



1. 37.22 mm, Holotype MNHN-IM-2000-28668 (ex. Coll. EM),
2. 39.33 mm, Paratype 1, Coll. EM
3. 34.17 mm, Paratype 2, Coll. EM
4. 36.52 mm, Paratype 3, Coll. EM
5. 35.82 mm, Paratype 4, Coll. EM
6. 35.31 mm, Paratype 5, Coll. EM

7. 32.49 mm, Paratype 6, Coll. EM
8. 33.86 mm, Paratype 7, Coll. EM
9. 37.93 mm, Paratype 8, Coll. LL
10. 33.48 mm, Paratype 9, Coll. FP # 5279
11. 34.60 mm, Paratype 10, Coll. FP # 5280
12. 35.19 mm, Paratype 11, Coll. FP # 5281
13. 31.78 mm, Paratype 12, Coll. FP # 5282

1-12 Nosy Andrano, Barren Archipelago, W. Madagascar, detrital coral, 1-4 m

Plate 2. *Darioconus rosiae* Monnier, Batifoix & Limpalaër, 2018



1. 58.28 mm, Ambatomilo, S.W. Madagascar, Holotype MNHN IM-2000-33712
2. 58.16 mm, Paratype 1, Coll. EM (f. mimeticus), Salary, S.W. Madagascar
3. 50.82 mm, Paratype 2, Coll. EM, Salary, S.W. Madagascar
4. 70.66 mm, Paratype 3, Coll. EM, S.W. Madagascar
5. 70.73 mm, Paratype 4, Coll. EM, Salary, S.W. Madagascar
6. 62,36 mm, Paratype 5, Coll. EM, Beangolo, S.W. Madagascar
7. 58.86 mm, Paratype 6, Coll. EM, Ambatomilo, S.W. Madagascar
8. 58.60 mm, Paratype 7, Coll. EM, S.W. Madagascar
9. 51.04 mm, Paratype 8, Coll. EM, Salary, S.W. Madagascar
10. 54,74 mm, Paratype 9, Coll. EM, Salary, S.W. Madagascar
11. 59.04 mm, Paratype 10, Coll. EM, Ambatomilo, S.W. Madagascar
12. 34.90 mm, Coll. EM, S.W. Madagascar



1. 57.02 mm, Coll. EM, Salary, S.W. Madagascar
2. 48.95 mm, Coll. EM, Salary, S.W. Madagascar
3. 55.50 mm, Coll. EM, Salary, S.W. Madagascar
4. 56.92 mm, Coll. EM, Tsiandamba, S.W. Madagascar
5. 55.50 mm, Coll. EM, Salary, S.W. Madagascar
6. 59.22 mm, Coll. EM, Salary, S.W. Madagascar

7. 56.61 mm, Coll. EM, Salary, S.W. Madagascar
8. 47.08 mm, Coll FP # 3428, Salary, S.W. Madagascar
9. 52.71 mm, Coll FP # 2193, Salary, S.W. Madagascar
10. 61.63 mm, Coll FP # 4637, Tsiandamba, S.W. Madagascar
11. 34.13 mm, Coll EM, S.W. Madagascar

| measured values                                      |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|
| op. with operational                                 |  |  |  |  |  |  |  |  |  |  |  |  |
| N°                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| SL                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| MD                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| H height                                             |  |  |  |  |  |  |  |  |  |  |  |  |
| AH                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| HWD                                                  |  |  |  |  |  |  |  |  |  |  |  |  |
| RD                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| PMD                                                  |  |  |  |  |  |  |  |  |  |  |  |  |
| RSH                                                  |  |  |  |  |  |  |  |  |  |  |  |  |
| W                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| RW + W/SL                                            |  |  |  |  |  |  |  |  |  |  |  |  |
| V Volume                                             |  |  |  |  |  |  |  |  |  |  |  |  |
| RW + W/V                                             |  |  |  |  |  |  |  |  |  |  |  |  |
| Repository                                           |  |  |  |  |  |  |  |  |  |  |  |  |
| Locality                                             |  |  |  |  |  |  |  |  |  |  |  |  |
| Darioacou nopharremensis sp. nov.                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 1                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 2                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 3                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 4                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 5                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 6                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 7                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 8                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 9                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 10                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| 11                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| 12                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| Average                                              |  |  |  |  |  |  |  |  |  |  |  |  |
| Extremes                                             |  |  |  |  |  |  |  |  |  |  |  |  |
| Darioacou aff. nopharremensis                        |  |  |  |  |  |  |  |  |  |  |  |  |
| Darioacou rosine Montier, Boiffaux & Unipolier, 2018 |  |  |  |  |  |  |  |  |  |  |  |  |
| 1                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 2                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 3                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 4                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 5                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 6                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 7                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 8                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 9                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 10                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| 11* (juv.)                                           |  |  |  |  |  |  |  |  |  |  |  |  |
| Average                                              |  |  |  |  |  |  |  |  |  |  |  |  |
| Extremes                                             |  |  |  |  |  |  |  |  |  |  |  |  |
| Darioacou carlieri [Bücher, 1994]                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 1                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 2                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 3                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 4                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 5                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 6                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 7                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 8                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 9                                                    |  |  |  |  |  |  |  |  |  |  |  |  |
| 10                                                   |  |  |  |  |  |  |  |  |  |  |  |  |
| 11* (juv.)                                           |  |  |  |  |  |  |  |  |  |  |  |  |
| Average                                              |  |  |  |  |  |  |  |  |  |  |  |  |



**Figure 2a:** Distribution map of *Darioconus nosybarrenensis* sp. nov., and other *Darioconus* around Madagascar.

Graphical morphometric comparisons

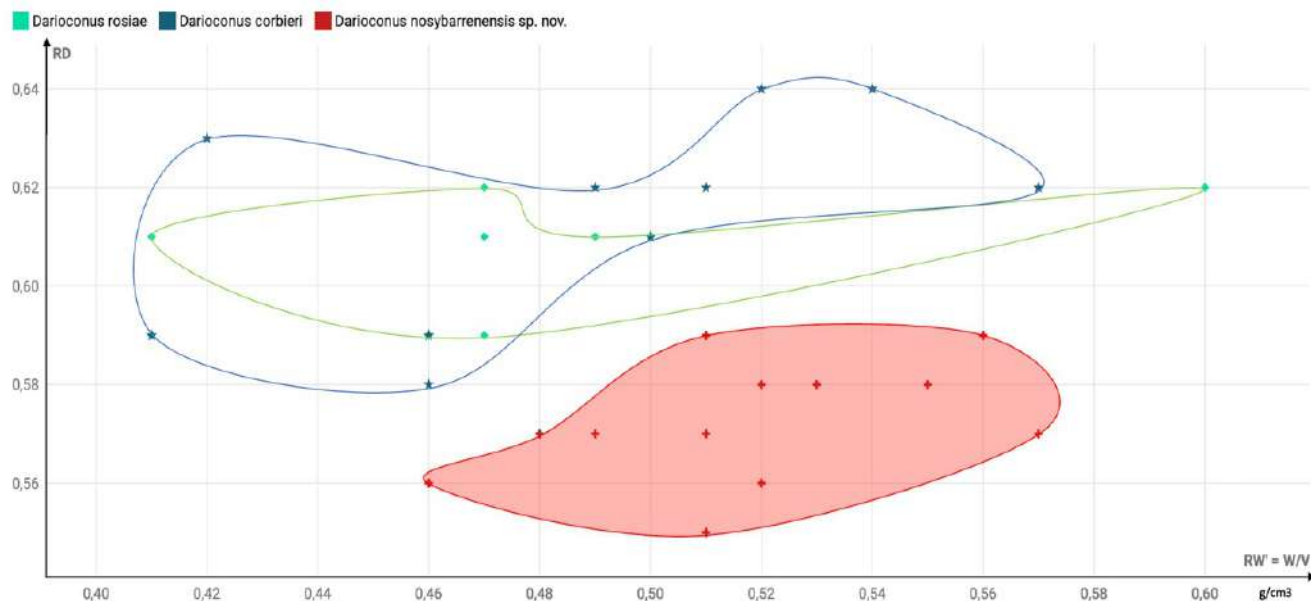


**Figure 8.** Graph of  $RD = f(RW')$  for *Darioconus nosybarrenensis* sp. nov., *Darioconus rosiae* and *Darioconus corbieri*. The new species is figured in red colour.

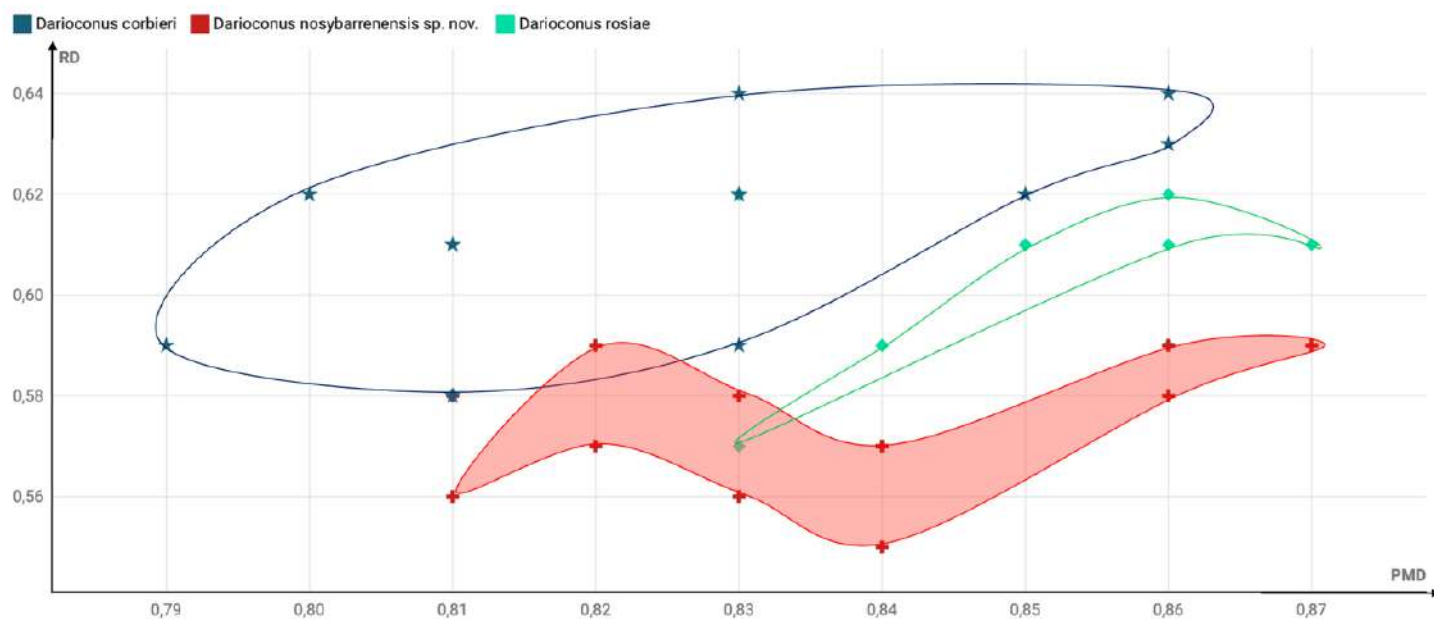


**Figure 9.** Graph of  $RD = f(PMD)$  for *Darioconus nosybarrenensis* sp. nov., *Darioconus rosiae* and *Darioconus corbieri*. The new species is figured in red colour.



*Haminoeidae*

*Alys* sp. 2

Nouméa, quinzaine des nudibranches 2022 (MNHN)

Photographie: Angel VALDES 13/09/2022

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## REVISION OF THE FOSSIL EUROPEAN TAXA IN THE GENUS *TIBIA* RÖDING, 1798 (GASTROPODA: STROMBOIDEA, ROSTELLARIIDAE).

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### ABSTRACT:

We document three species of *Tibia* from the European Oligocene and Miocene, which probably form an anagenetic lineage. Two of them that are found in Europe are revised (*Tibia dentata*, *T. ordalensis*), and a new species is described (*Tibia cluzaudi*). The paleogeographical background is discussed, and challenges for future research are identified.

### RÉSUMÉ:

Nous documentons trois espèces de *Tibia* de l'Oligocène et du Miocène européens, qui forment probablement une lignée anagénétique. Deux d'entre elles trouvées en Europe sont révisées (*Tibia dentata*, *T. ordalensis*) et une nouvelle espèce est décrite (*Tibia cluzaudi*). Le contexte paléogéographique est discuté et les défis pour les recherches futures sont identifiés.

### INTRODUCTION:

The family Rostellariidae Gabb, 1868 has been recognized as closely related but separated from the family Strombidae only recently (Kronenberg & Burger 2002). The oldest representatives in the Rostellariidae probably date back to the Cretaceous (Bandel 2007), a time when the more common representatives of the whole superfamily Stromboidea were members of the Aporrhaidae. The generic name *Rostellaria* Lamarck, 1799 has been extensively used for all sorts of spindle-like shells for a long time, notably Aporrhaidae and Rostellariidae of all genera, including many *Tibia*-like species. The genus *Tibia* has been separated from the bulk of generic Strombidae by Röding in 1798, including species with spindle-shaped shells, sometimes with a long abapical spur and not flaring apertural lip ornamented with some thin and short digits. The name *Tibia* is precedent to *Rostellaria* for only one year, but the publication of Röding in German probably remained poorly known for a long time. Nowadays, the whole family has been split into several genera, given some substantial differences, i.e., in the lip shape of fossil species and in the protoconchs and apex sculpture of recent species formerly included in "*Rostellaria*" (Kronenberg & Burger 2002). Other genera of Rostellariidae fossils, morphologically similar to *Tibia*, present in European strata of various ages, will be treated in papers in preparation.

Apart from characters that are typically also in the other genera of the family (shells with very high spire, a well-developed rostrum as a continuation of the columella, outer lip not or barely flaring, small teeth or digits projecting from the lip border, operculum closing almost all the aperture) the genus

*Tibia* is characterized by a small smooth protoconch (less than 1 mm) made up by few whorls, after which the juvenile part of the spire has a cancellate sculpture that becomes obsolete after a few centimeters (see Kronenberg & Burger 2002). The rest of the shell is smooth and shiny except for very fine growth lines and some spiral grooves on the basal part of the last whorl near the spur. *Tibia* species live in sandy/muddy bottoms, from relatively shallow water to a depth of 100 m or more (Hornell 1951; Bosch et al. 1995; Patterson Edward et al. 2022). Some species come seasonally to shallower water to lay eggs. The fossils are often found in sandy, sandy-clay, or clay strata, confirming the ecological preferences of the recent species of the genus. No detailed information on the feeding preferences of *Tibia* is available. Like the related strombids, they might be herbivores or detritivores.

This characterization can be applied to some fossil shells found in a few areas of Europe. The last revision of the fossil European *Tibias* (Lozouet et al. 2001) united all morphological forms under one name: *Tibia dentata* (Grateloup 1827). The present revision examines all morphological variants by distinguishing three morphologically different and well-defined groups that we consider species.

### MATERIAL AND METHODS

Several museum collections have been visited: Musée National d'Histoire Naturelle, Paris and Muséum de Bordeaux, France; Natural History Museum, London, England; Naturhistorisches Museum Basel, Switzerland (former repository of the Mayer-Eymar coll., now back in Zurich); Naturhistorisches Museum Vienna, Austria; Museo Regionale di Scienze Naturali, Turin, Italy; Supervisory Authority for Regulatory Affairs, Budapest, Hungary; Magyar Természettudományi Múzeum, Budapest, Hungary, and an intense search for specimens, especially well-preserved ones, had been carried out. Additionally, several private collections had been examined: authors' collections; Alain Cluzaud, Didier Gourgues, Patrick Fremont, Bordeaux area; Laszlo Nadaj, Budapest.

In the past, all here differentiated *Tibia* species were, in most cases, named *Rostellaria dentata* (or, in recent publications, *Tibia dentata*) in literature. To clean up the situation, we decided to attempt, instead of synonymies, to create chresonymies where we separate the species in literature by published drawings/photos. If figures are not showing characteristic morphological traits or there are no figures, we assign them by geography and stratigraphy. Some referenced specimens were outside the considered area; they were only

assigned by stratigraphy and marked by a question mark. Considering the morphs by constantly different characters and different geological age as different species, we apply a phenetic species concept here.

#### Abbreviations:

MNHN: Musée National d'Histoire Naturelle, Paris, France  
 MHNbX: Musée d'Histoire Naturelle de Bordeaux, Bordeaux, France  
 NHMUK: Natural History Museum, London, United Kingdom  
 NMZ: Naturhistorisches Museum, Zurich, Switzerland  
 NMW: Naturhistorisches Museum, Wien, Austria  
 MTTM: Magyar Természettudományi Múzeum, Budapest, Hungary  
 SARA: Supervisory Authority for Regulatory Affairs (former name: Országos Földtani Múzeum - Magyar Állami Földtani Intézet)  
 coll.: collection

#### SYSTEMATICS:

Family Rostellariidae Gabb, 1868.

Genus *Tibia* Röding, 1798

Original Description of *Tibia* by Röding, 1798:

"Die Flöthe." translation: the flute.

#### Diagnosis:

Long-spined shell, whorls smooth except 6-8 apical whorls with fine axial ribs, sometimes with superimposed spiral sulci. Lip not flaring, with small digits projecting from the border. Aperture smooth, with one columellar knob near the posterior canal, and one knob on the lip in front of the columellar one. Abapical end of columella continues with a spur whose length is species-related.

**Type species:** *Murex fusus* Linnaeus, 1758, subsequent designation by Dall, 1906.

#### *Tibia cluzaudi* new species.

#### Chresonymy:

?*Rostellaria dentata* Gratteloup[sic], 1832 - d'Orbigny, 1850, III, p. 58, no. 1022 [partim]

?*Rostellaria curvirostris* Lam. - Bellardi & Michelotti, 1840, p. 115 [partim]

?*Rostellaria dentata* Grat. - Telegdi-Roth, 1914, p. 36

*Tibia dentata* - Dolin, Dolin & Lozouet, 1985, p. 9, 10, 11

?*Tibia dentata* (Grateloup) - Harzhauser & Piller, 2007: p. 24

?*Tibia dentata* (Grateloup, 1827) - Pacaud, 2008, p. 728

**Type stratum:** Chattian, upper Oligocene.

**Type locality:** Estoti, Saint-Paul-lès-Dax, Landes department, France.

Holotype in MHNbX, collection-number MHNbX 2023.11.1, 61,8 mm.

Paratype 1 in coll. Cluzaud, from Abesse, Saint-Paul-lès-Dax, France, 85 mm; paratype 2 in coll. Cluzaud, from Estoti, Saint-Paul-lès-Dax, 79 mm; paratype 3 in coll. Wieneke, from Estoti, Saint-Paul-lès-Dax, 66 mm, incomplete; paratype 4 in coll. Liverani, from Estoti, Saint-Paul-lès-Dax, 79 mm, incomplete.

#### Description:

Total length of complete specimens 65-100 mm, long spire of about 12-13 flat-sided whorls, protoconch about 0.5 mm, worn. The first 8 apex whorls have a distinct sculpture of axial ridges, slightly curved like the opisthocyrta growth lines; the spiral sculpture is not visible. This sculpture becomes obsolete in about half a whorl, leaving the rest of the shell with a shiny, smooth surface, including the last whorl. The last whorl is larger, with a bulging side opposite the lip and a dozen spiral sulci well visible in the abapical part. The lip is thickened on the border, with two strong teeth protruding from the border in the abapical third of the lip length, spaced about 6-7 mm. The lip is sinuous, forming a sinus before the straight posterior canal; this canal is a continuation of the lip border. Parietal/columellar callus thick, well-bordered, thicker in correspondence with the lip sinus and the posterior canal, with a rounded tooth where the posterior canal starts. Spur axially straight, long, about one quarter/one third of the total shell length. (see Plate 1)

**Remarks:** Differs from *T. dentata* by the relatively longer spur, the smaller size, the more sinuous lip border, and the type stratum. Differs from *T. ordalensis* by the smaller size, the more sinuous lip border with only two teeth, the straight posterior canal (curled in *ordalensis*), and the type stratum. Three entries in the chresonymy occur because the locality Dax was mentioned, and it is not clear if the mentioned outcrops are of Oligocene or Miocene origin. The specimens from Hungarian Oligocene outcrops are tentatively placed here. The specimens in SARA and MTTM and the collection of the second author are all missing important descriptive characters (see Plate 4, Figs. 2, 3). Further well-preserved specimens should be studied if the Egerian specimens are to be included in *Tibia cluzaudi*.

Derivatio nominis: dedicated to Alain Cluzaud, from Pessac.

#### Other material examined:

Coll. Cluzaud, Pessac, France:

13 specs., Saint-Paul-lès-Dax, Abesse;

16 specs., Saint-Paul-lès-Dax, Estoti, and many incomplete; coll. Liverani:

5 specs., Saint-Paul-lès-Dax, Abesse (incomplete);

5 specs., Saint-Paul-lès-Dax, Estoti (incomplete); coll. Wieneke:

1 spec., Saint-Paul-lès-Dax, Abesse (incomplete);

1 spec., Saint-Paul-lès-Dax, Estoti (incomplete).

No specimens were seen in the museums visited by us.

#### *Tibia dentata* (Grateloup, 1827)

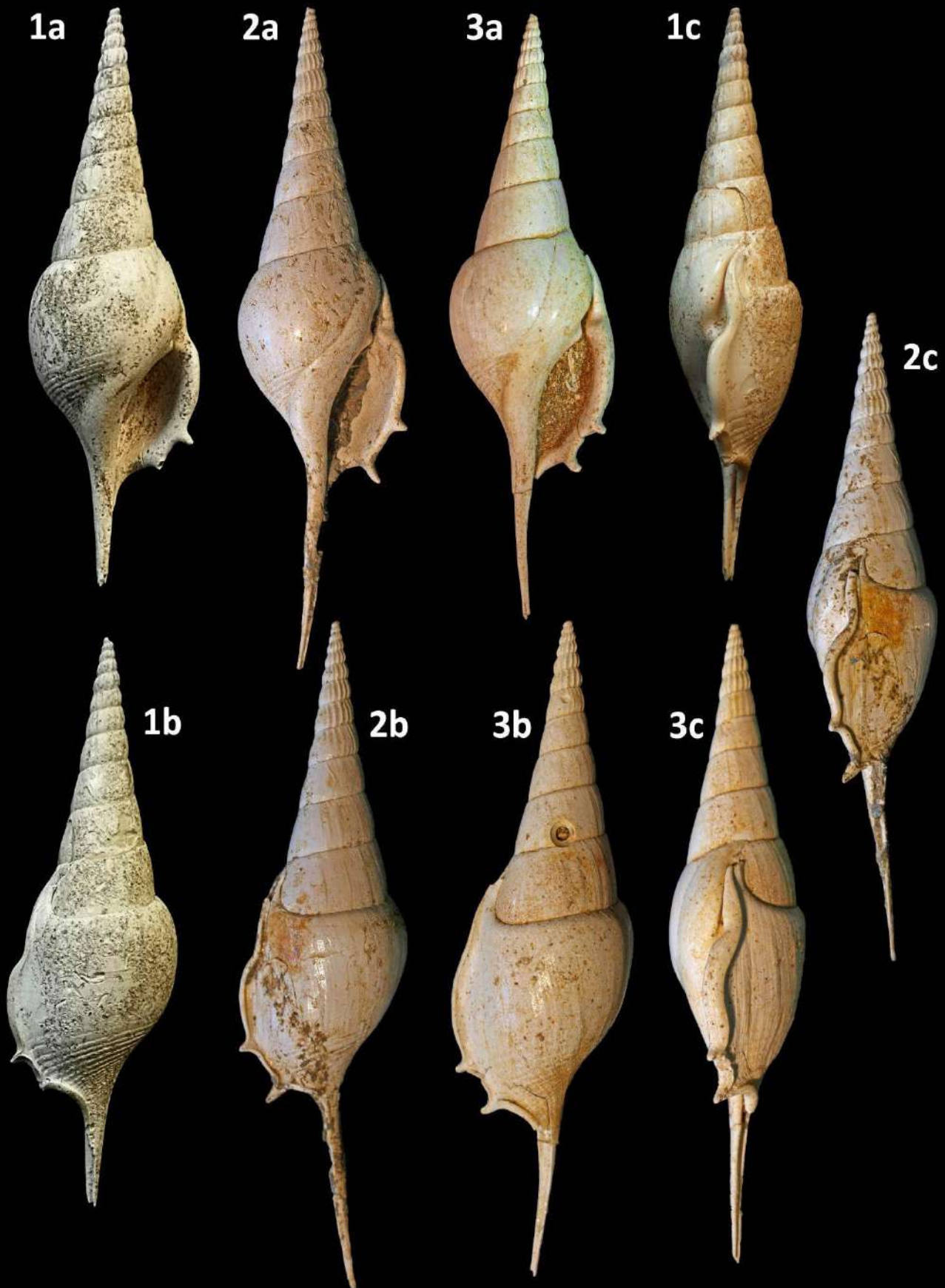


**Plate 1** *Tibia cluzaudi* n. sp.: 1. a, b, c holotype, MHNbX 2023.11.1, 61,8 mm; 2. a, b, c: paratype 1, Abesse, St.-Paul-lès-Dax, France, 85 mm; 3. a, b, c: paratype 2, Estoti, St.-Paul-lès-Dax, France, 79 mm.

**Chresonymy:**

*Rostellaria curvirostris* var.  $\beta$ . - Basterot, 1825, p. 69. n° 2. pl. 4. fig. 1.

*Rostellaria dentata* Grateloup, 1827, p. 17 [basonym]

*Rostellaria dentata* Grat. - Grateloup, 1834, p. 188

*Rostellaria curvirostris* Lam. - Bellardi & Michelotti, 1840: 115 [partim]

*Rostellaria bidentata* Deshayes, 1843, 668 [basonym, junior synonym of *Tibia dentata* Grateloup, 1827]

*Rostellaria dentata* G. - Grateloup, 1845, pl. 1 (*Rostellaires Strombes*), figs. 1-3

*Rostellaria dentata* Grat. [alpha] - Bronn, 1848, 1: 1097

*Rostellaria dentata* Gratteloup[sic], 1832 - d'Orbigny, 1850, III, p. 58, no. 1022 [partim]

*Rostellaria dentata* Grat. - Sismonda, 1847, p. 45

*Rostellaria dentata* var. Grat. - Vézian, 1856, p. 20, 63

*Rostellaria dentata* Grat. - Mayer, C. 1867, p. 13

*Rostellaria dentata* Grat. 1840 - Benoist, 1873: 375 [partim]

?*Rostellaria dentata* Bast. - Fuchs, 1883, p. 22, 27, 32, 36

*Gladius dentatus* (Grat.) - Sacco, 1893: 15

*Gladius dentatus* var. *subadentata* Sacco, 1893: 15 [basonym]

*Gladius dentatus* var. *taurostricta* Sacco, 1893: 15 [basonym]

*Rostellaria dentata* Grat. - Degrange-Touzin, 1898: 190, 203, 205, 206, 209

*Rostellaria dentata* Grat. - Cossmann, 1904, p. 19, 21, pl. 2, figs. 12, 13

*Rostellaria dentata* Grateloup - Cossmann & Peyrot, 1922[1923], 265

?*Rostellaria dentata* race *loandaensis* Douvillé, 1933, p. 102, pl. VII, fig. 2-3

*Rostellaria ordalensis* Almera et Bofill - Magne, 1940, p. 135, 136

*Rostellaria dentata* Grateloup - Magne, 1940, p. 135, 136

?*Rostellaria dentata* Grat. - Zbyszewski, 1954: 139, pl. 16, figs. 94, 95.

?*Rostellaria* (*Rostellaria*) *dentata* Grateloup - Dartevelle & Roger, 1954, p. 255

*Rostellaria* (*Rostellaria*) *dentata* Grat. - Korobkov, 1955, pl. 54, figs 1-2.

?*Rostellaria dentata* Grateloup - Zbyszewski, 1957, p. 165

?*Rostellaria dentata* Grateloup - Brann & Kent, 1960, p. 776

*Tibia* (s.s.) *dentata* Grateloup, 1833 - Glibert, 1963, p. 35

*Tibia dentata* (Grateloup) - Eames & Clarke, 1967, p. 560

*Tibia dentata* (Grateloup, 1827) - Lozouet, Lesport & Le Renard, 2001, p. 38

*Tibia ordalensis* (Almera & Bofill, 1886) - Lozouet, Lesport & Le Renard, 2001, p. 38

?*Tibia dentata* (Grateloup) - Harzhauser, Piller & Steininger, 2002, p. 117, 126

*Tibia dentata* - Cluzaud & Cahuzac, 2006, p. 28

*Tibia dentata* (Grateloup, 1827) - Londeix, 2014, p. 102

*Tibia dentata* Grateloup, 1827 - Calzada, 2018, p. 11

non *Rostellaria dentata* Auct., see *Tibia ordalensis*

non *Rostellaria dentata* Grat. [beta] - Bronn, 1848, 1: 1097,

non *Rostellaria dentata* Grat. - Telegdi-Roth, 1914: 36 [= ?*Tibia cluzaudi* n.sp.]

**Original Description** of *Rostellaria dentata* by Grateloup, 1827, p. 17:

"R. testa fusiformi, turrita, crassa, ponderosa, laevigata; basi transversim semistriata; anfractu majore ventricosus; supremis

anfractibus obsolete plicatis; labro decurrente, crassiusculo, margine uni, bi. vel tridentato; extius revoluto; columella splendide laevisima ab basim subtubercula; rostro praelongo, gracili, rectissimo, canalifero, truncato."

"Notre espèce est remarquable par une ou deux, le plus souvent trois dents qui se développent dans l'âge adulte, sur le bord même de la lèvre externe. Sa columelle est extrêmement lisse, brillante, ayant un tubercule arrondi à la base. Le bec est très-droit, canalifère et tronqué. Le sommet de la spire extrêmement pointu, élégamment strié longitudinalement."

Dimensions: "La longueur de la coquille est de 4 pouces 3 lignes, quelquefois davantage. Son diamètre ventral, de 16 lignes; la longueur du bec, de 9 à 10 lignes."

Locus typicus: "Mandillot, St.-Paul-lès-Dax, Landes Department, France "

Stratum typicum: "Les faluns sablonneux-jaunâtres de Saint-Paul, Burdigalien", lower Miocene.

**Additional description:**

Long fusiform shell, total length average 100-120 mm; protoconch pointed, about 3 whorls and 0.8 mm high, smooth; spire of 14-15 flat or slightly convex whorls, the apical 8 whorls of spire axially costulated with very fine spiral cords superimposed. Rest of spire smooth, almost shiny, with only fine axial opistocyrrh growth lines; base of last whorl with about 20 spiral sulci. Lip very slightly flaring, border thickened and slightly abaperturally revolved, with two (uncommonly three) small teeth developing on abapical border, posterior canal long about 1 cm, slightly curved towards the dorsum of shell. Parietal/columellar callus not very thick, not or slightly bordered, with a rounded tooth where the posterior canal starts. Spur axially straight, canalized, 2-3 cm long. (see Plate 2)

**Material examined:**

Coll. Liverani,

1 spec., Mandillot, Saint-Paul-lès-Dax ;

2 specs., Pessac; 2 specs., Merignac;

5 specs., Bordeaux area (all near Bordeaux, France);

1 spec., Valle Ceppi, Torino, Italy (incomplete). Coll. Wieneke:

2 specs., Bordeaux area; coll. Cluzaud:

44 specs from various localities around Bordeaux and Landes Département; MNHN:

2 specs., Mérignac;

1 spec., Bordeaux area;

1 spec., Dax.; NMW: 1 spec., Dax;

1 spec., Bordeaux; NHMUK:

1 spec., Dax;

1 spec., France, no locality;

NMZ:

1 spec., Mandillot, Saint-Paul-lès-Dax.

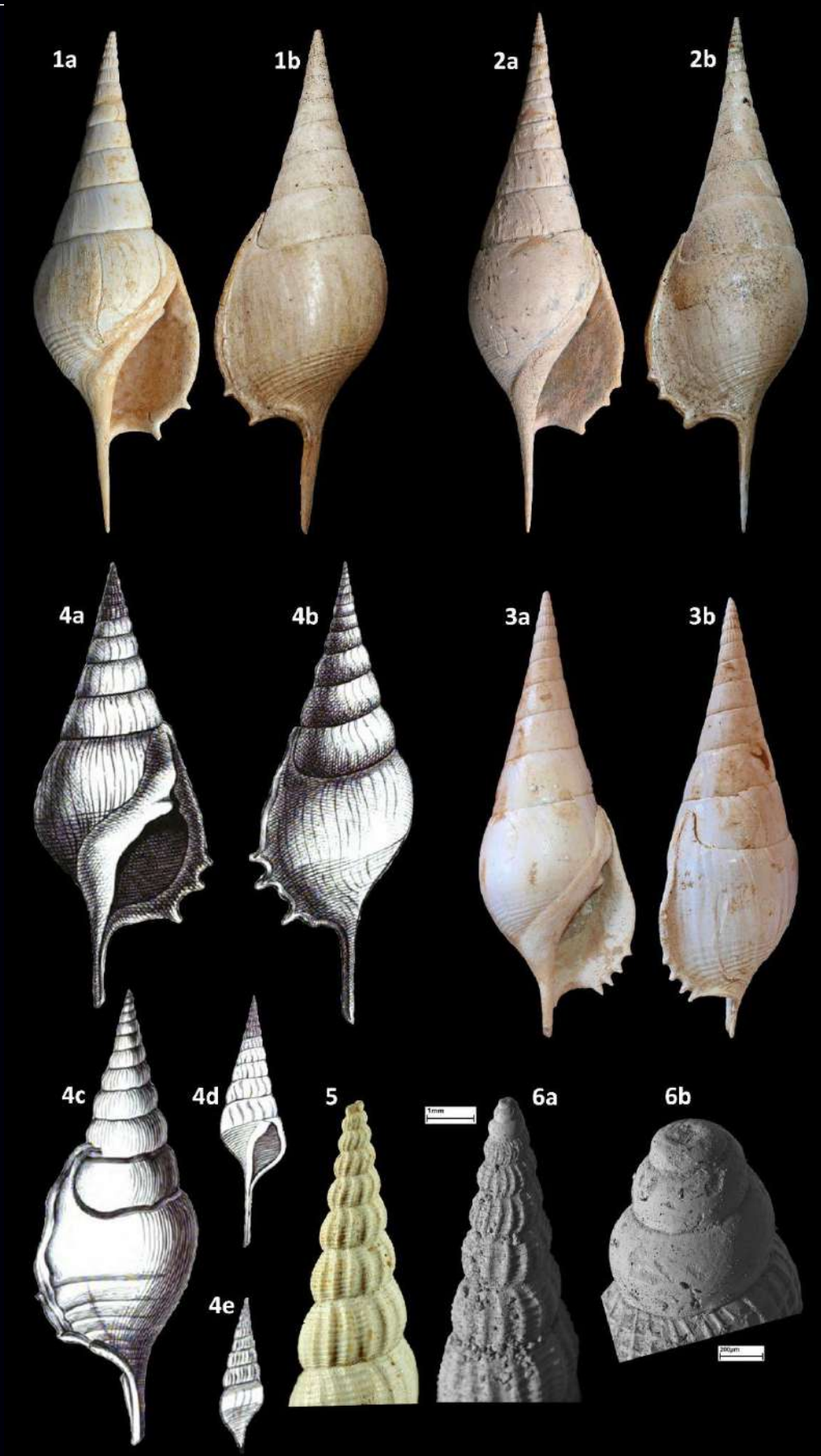


**Plate 2** *Tibia dentata*: 1. a, b: two shells from Mérignac, mm 135, 139, coll. Liverani; 2. a, b: from Bordeaux area, spec. with three teeth, 134 mm, coll. Liverani; 3 a, b: from Mérignac, rare spec. with four teeth, 125 mm, coll. Fremont ; 4 a, b, c, d, e: *Rostellaria dentata* Grateloup, 1845, pl. *Rostellaria* 1, fig. 1 a, b, 2, 3, 4, 5; 5 apex, Coll. Muséum d'Histoire Naturelle de Bordeaux no. 2007.8122.0; 6 a, b: enlargements of protoconch, Saint-Martin-d'Oney, ex-coll. Wieneke; coll. Klaus Bandel

***Tibia ordalensis*** (Almera & Bofill, 1886)**Chresonymy**

*Rostellaria dentata* Grat. - Hörnes, 1852: 192, pl. 18, fig. 1a, b  
*Rostellaria dentata* Grateloup - Neugeboren, 1854, p. 25, 26  
*Rostellaria dentata* Grat. 1840 - Benoist, 1873: 375 [partim]  
*Rostellaria (Gladius) dentata* Grat. - Hoernes & Auinger, 1884: 165, pl. 20, figs. 3-7  
*Rostellaria dentata* Grateloup Var. - Almera & Bofill y Poch, 1885, p. 43, pl. 1, fig. 6, pl. 2, fig. 1-4  
*Rostellaria ordalensis* Almera & Bofill, 1886, p. 40, 41, pls. 10, figs. 3-4, pl. 11, figs. 4-6 [basionym]  
*Gladius dentatus* var. *ordalensis* (Alm. Bof) - Sacco, 1892, p. 15  
*Rostellaria (Gladius) dentata* Grat. - Boettger, 1897, p. 58  
*Rostellaria (Gladius) dentata* Grat. - Boettger, 1902, p. 24  
*Rostellaria (Gladius) dentata* Grat. - Boettger, 1906, p. 37  
*Rostellaria (Gladius) dentata* Grat. - Hoernes, 1906, p. 1543, 1544  
*Rostellaria dentata* Grat. - Łóczy, 1913, p. 238  
*Rostellaria dentata* Grat. - Łóczy, 1916, p. 278  
*Rostellaria dentata* Almera et Bofill - Cossmann & Peyrot, 1922, 268 [partim]  
*Rostellaria dentata* Grat. - Strausz, 1924, p. 88  
*Rostellaria dentata* Grat. - Strausz, 1928, p. 211  
*Rostellaria dentata* Grat. - Friedberg, 1938, p. 108, text fig. 33[sic]  
*Rostellaria (Rostellaria) dentata* Grat. - Sieber, 1958, p. 141  
*Rostellaria (Rostellaria) dentata* Grateloup 1840 - Kojumdzieva, 1960, p. 131, pl. 35, figs. 6, 8; pl. 36, fig. 1  
*Rostellaria dentata* Grateloup, 1840 - Strausz, 1966, p. 220, pl. 23, figs. 5-9  
*Rostellaria dentata* - Kóky, 1971, p. 222  
*Rostellaria dentata* Grateloup - Bałuk & Radwański, 1977, p. 108, pl. 7, fig. 5  
*Tibia ordalensis* Almera y Bofill - Batllori & Martinell, 1992, p. 26, 29  
*Rostellaria dentata* Grateloup, 1840 - Bałuk, 1995, p. 180, pl. 7, figs. 1-3.  
*Tibia (s.s.) dentata ordalensis* (Almera & Bofill, 1886) - Navas, Martinell, Domenech & Batllori, 1996, p. 154, 156, 162  
*Tibia dentata* (Grateloup) - Harzhauser, Mandic & Zuschin, 2003, p. 332, 333, 334, 335  
*Tibia dentata ordalensis* (Almera & Bofill, 1885) - Batllori & Moreno, 2003 p.123  
*Tibia dentata ordalensis* Almera y Bofill, 1886 - Moreno et al., 2003, p. 135, fig. 43  
*Tibia dentata* - Masrera, 2006, p. 155, fig. 119 C  
*Tibia dentata* (Grateloup) - Harzhauser & Piller, 2007: p. 18, 24  
*Tibia dentata* (Grateloup, 1840) - Mikuž, 2009, p. 16, pl. 3, figs. 40-43.  
*Tibia dentata* (Grateloup, 1827) - Kronenberg & Harzhauser, 2011, p. 156  
*Tibia dentata* (Grateloup, 1840) - Mikuž & Šoster, 2014, p. 56, pl. 2, figs. 2a, b, pl. 3, figs. 1-6.  
non *Tibia ordalensis* (Almera & Bofill, 1886) - Lozouet, Lesport & Le Renard, 2001, p. 38

**Original Description** of *Rostellaria ordalensis* by Almera & Bofill, 1886, p. 41:

“R. testa valida, ponderosa, conico-fusiformi, apice subulata, 13-14 anfractibus, primis convexis, longitudinaliter plicatis, coeteris planiusculis, veluti in semetipsos intromissis; in sutura

canaliculatis; ultimo ventricosus ad basim sulcato, in rostrum rectum, gracile, perlongum terminato; apertura ovato-oblonga; labio per callum validum incrassato; labro extus marginato, tri vel quadridentato, superne canali spiriformi usque ad penultimum vel antepenultimum anfractum protracto.”

Type locality: Sant Pau de Ordal, Penedes, Province of Barcelona, Autonomous community of Catalonia, Spain.

Type stratum: Langhian, middle-upper Miocene.

**Additional description:**

Shell fusiform, total length average 130-170 mm; protoconch pointed, about 3 whorls and 0.8 mm high, smooth; spire of 13-14 flat-sided whorls, the apical 8 whorls of spire axially ridged with fine spiral cords superimposed. Rest of spire smooth, almost shiny, with only fine axial growth lines; base of last whorl with 10-12 spiral ridges. Last whorl bulging, with lip slightly flaring, slightly sinuous in the adapical part, border thickened and slightly abaperturally revolved, with four teeth regularly spaced in the abapical half of lip border, the adapical one round, the others thin, pointed, length 5-6 mm; posterior canal short and spirally curled. Parietal/columellar callus thick, sometimes expanding on the ventral part of the last whorl, thicker in correspondence with the lip sinus and the posterior canal, with a rounded tooth where the posterior canal starts. Spur axially straight or slightly curved, canalized, long as much as the spire. (see Plate 3)

**Material examined:**

Coll. Liverani:

2 specs., Sant Pau d'Ordal, Penedes, Barcelona, Spain (complete);

8 specs., Sant Pau d'Ordal, Penedes, Barcelona, Spain (incomplete);

4 specs., Weitendorf, Styria, Austria (complete or restored); coll. Wieneke,

1 spec., Sant Pau d'Ordal, Penedes, Barcelona, Spain, 146 mm;

4 specs., Band, Hungary (incomplete);

2 specs., Weitendorf, Austria (complete); NMW:

1 spec., Liegelei, Austria, incomplete;

1 spec., Lapugy, Romania, incomplete; NMZ:

1 fragment with complete lip (four teeth, coll. Mayer-Eymar), Grund near Vienna, Austria.

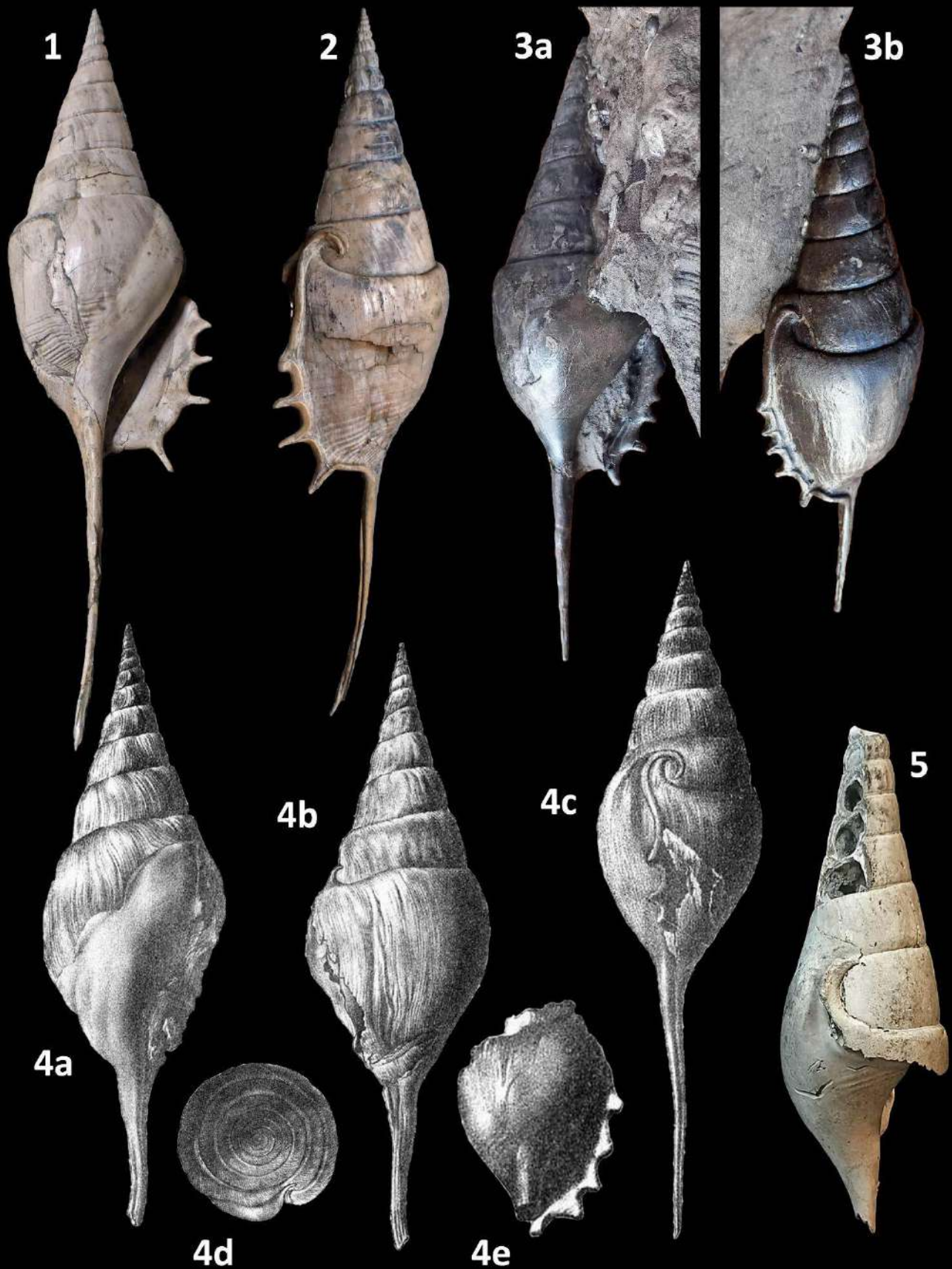


**Plate 3:** *Tibia ordalensis*: **1, 2.** Miocene Langhian, Saint Pau d'Ordal, Catalonia, Spain, size 156-157 mm, coll. Liverani; **3a, b.** Miocene Badenian, Weitendorf, Austria, 162 mm, Coll. José Juárez Ruiz; **4.** original images of *Rostellaria ordalensis* Almera & Bofill, 1886, representing syntypes, **4a.** pl. X, fig. 3, **4b.** pl. X, fig. 4; **4c.** pl. XI, fig. 5, **4d.** pl. XI, fig. 4, **4e.** pl. XI, fig. 6.; **5.** Miocene Langhian, Saubrigues, France, 71 mm.

# Discussion:

Citations of the presence of a *Tibia* in European Oligocene sediments are rare. It is cited in Lozouet & al., 2001 and Dolin & al., 1985 but without further references. However, the new species *Tibia cluzaudi* is relatively frequent in the generally small Chattian outcrops near St.-Paul-lès-Dax. The smaller size, the sinuous lip, the bulging last whorl, and, when complete, the longer spur differentiates it from the Miocene *Tibia dentata* Grateloup, which is bigger in size and does not have the bulge in the last whorl.

|                                     | Spire                                      | Last whorl          | Teeth on lip                                                                   | Posterior canal | Spur  |
|-------------------------------------|--------------------------------------------|---------------------|--------------------------------------------------------------------------------|-----------------|-------|
| <i>T. cluzaudi</i><br>(see Pl. 1)   | thin, 12-13 whorls                         | bulging             | always 2                                                                       | straight        | long  |
| <i>T. dentata</i><br>(see Pl. 2)    | long, conical, 14-15 whorls                | in shape with spire | 2 (pl. 2, figs. 1a, b) - 3 (pl. 2, figs. 2a, b), rarely 4 (pl. 2, figs. 3a, b) | slightly curved | short |
| <i>T. ordalensis</i><br>(see Pl. 3) | shorter than <i>dentata</i> , 13-14 whorls | bulging             | 4 (Pl. 3, figs. 1,2), rarely 5 (Pl. 3, figs. 3a, b)                            | curled          | long  |

**Table 1:** Distinctive characters in the three species of fossil European *Tibia*.

The species *Tibia dentata* was quite common in some outcrops in western France, like Pessac, Merignac, and others not far from Bordeaux (Cossmann & Peyrot, 1922; Grateloup, 1827), and reported by Harzhauser & al., (2002), as common in places in Turkey and Iran. We were not able to verify the identity of the latter. Present in France during Miocene Aquitanian (Lozouet & al., 2001) and Burdigalian, in the Turin basin, N Italy (Sacco, 1893) only in Burdigalian. The variety *taurostricta* by Sacco (Plate 4, figs. 4, 5a, 5b) is represented by a single specimen more slender than the average.

Specimens are often broken, missing apex, lip, and spur. All *Tibia* species resemble one another in these conditions (plate 4 figs 2a,b,c, 5a,b, 6), hence the identification as *Tibia dentata* of almost all records of *Tibia* fossils from any locality and age in Europe. A *Rostellaria dentata* race *loandaensis* is signaled from the Miocene of Angola (Douvill , 1933; Dartevelle & Roger, 1954; Brann & Kent, 1960), and also a *Rostellaria dentata* from the Miocene of Egypt (Fuchs, 1883). We were not able to check this material.

*Tibia ordalensis* was common in some clay quarries near Barcelona, Spain, but very difficult to extract completely cause of compression and fragility (Plate 3, figs. 1,2); to this species have to be also referred all records of *Tibia dentata* from Austrian Badenian localities, like the famous quarry of Weitendorf, from where many complete specimens with a beautiful black color (and 4 teeth) have been recovered (plate 3 fig 3a,b), and from Band area in Hungary (Miocene, Badenian). Also, the big Badenian fragments from Koritnica, Poland (Baluk 1995) are probably *T. ordalensis*. An infrequent occurrence in Saubrigues, Landes, France, Langhian has been confirmed by Alain Cluzaud (Plate 3, fig. 5).

Records of *Tibia dentata* by Austrian authors (i.e., H rnes,

1852; H rnes & Auinger, 1884) are probably triggered by the incomplete preservation of the specimens. It seems strange that a Burdigalian species had survived inside a well-preserved fauna, typically Badenian. A complete specimen resembling a typical *Tibia dentata* has been illustrated by H rnes, 1852, but he explained that it's a drawing reconstructed from Austrian fragments, completed with the lip from a French burdigalian specimen.

Even in the Vienna Natural History Museum, there are no specimens of *T. ordalensis* with the lip. Specimens of *T. ordalensis*, even broken, are recognizable as being shorter

spired, sometimes more massive, and with the last whorl inflated compared with the other species; sometimes, the sign of the curled posterior canal visible on the previous whorl also helps.

*Rostellaria lusitanica* (Mayer, 1869) have been described based on a few steinkerns and external prints found at Forno do Tijolo, Lisbon, Portugal (one illustrated by Pereira Da Costa, 1867, plate xvii; plate 4 fig 1). The shape seems similar enough to *Tibia ordalensis*, except for the presence of a long posterior canal going up the spire, but the size is a lot smaller. We could not examine the original specimens,

and the type of preservation does not permit us to confirm the synonymy at this time. There might be the possibility that *R. lusitanica* is a species in *Sulcogladus* Sacco, 1893, a genus whose species have generally smaller size but a shape similar to *T. ordalensis*.

There are possibly further morphs (and possible phenetic species) in the Egerian (upper Oligocene) of eastern Europe, one characterized by a small size similar to *T. cluzaudi* (plate 4 figs 3a,b,c,d). Fide Baldi, 1973:271 *Tibia dentata* from the Egerian of Hungary, now better named *Tibia* cf. *cluzaudi*, has one single weak knob in the parietal region. The last whorl is bulging. The number of teeth on the outer lip is unknown. Senes, 1958 recorded another morph, similar to Sacco's *taurostricta*. Here, the last whorl is not bulging, and the apical angle is smaller than in the other morph.

The bad preservation of the material does not show major characters: we have handled about two dozen specimens, but the apex and a complete lip are always missing, the last whorl seems to be sometimes bulging, sometimes not, and the posterior canal is also always missing. From some impressions left on the penultimate whorl, this canal appears short and possibly curled like in *T. ordalensis* (Baldi, 1973, pl. 34, fig. 2) (plate 4 figs 2a,b,c).

We can make an addendum to the present paper when better specimens become available for study. This presence is interesting also because the Egerian was in an almost isolated basin in continental Europe, with little connection with the Tethys-Mediterranean sea.

Little is known about the ancestors of this lineage, apart from the presence of a species of *Tibia* in the Lutetian Eocene of Nigeria, Africa: *Tibia bidigitata* Newton, 1922, that is at the moment the oldest known representant of the genus. A second *Tibia*-like species also from the Lutetian Eocene of Nigeria

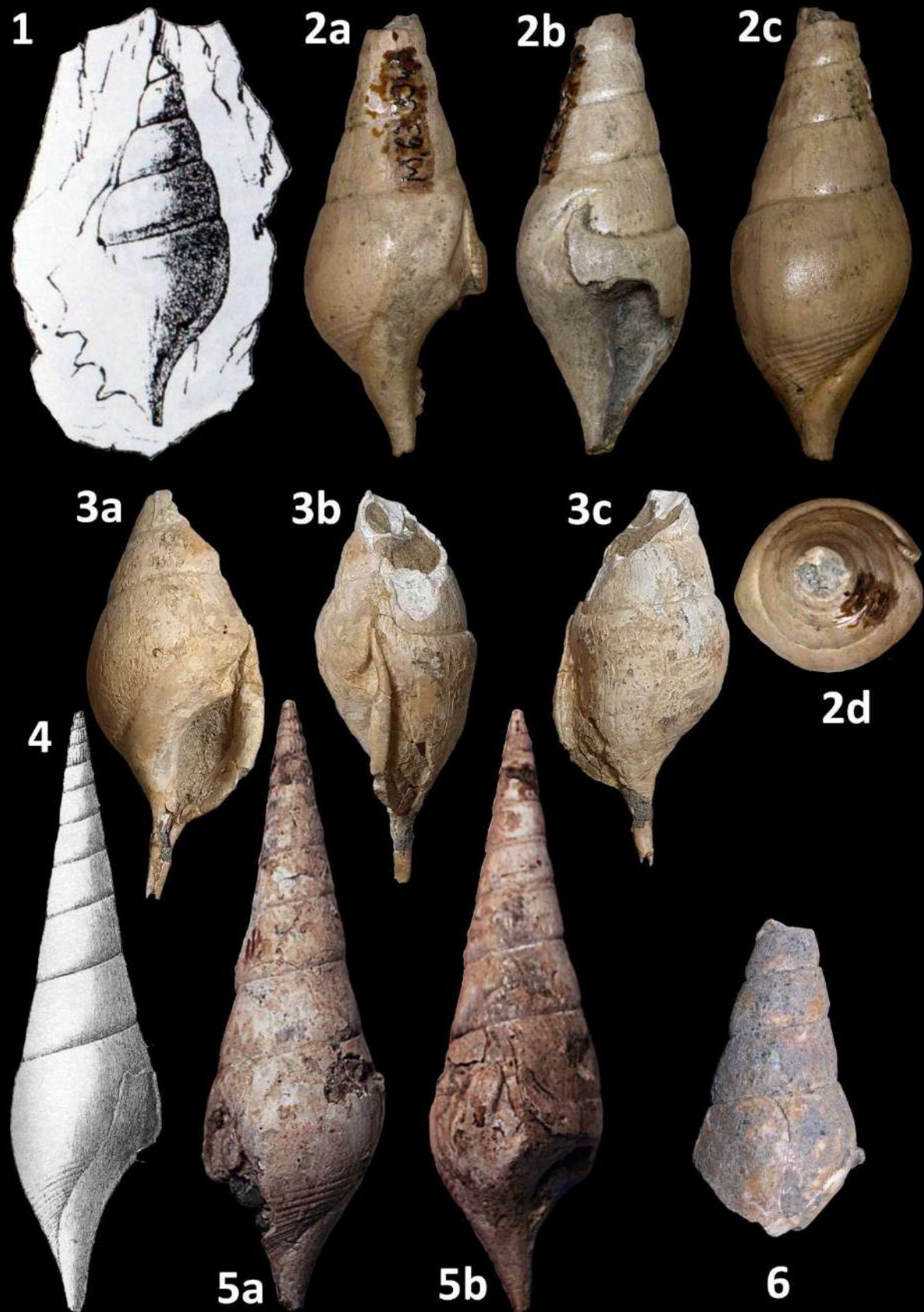


Plate 4. Dubious *Tibia*-fragments: 1. original image of *Rostellaria dentata* Da Costa, 1867, representing syntype of *Rostellaria lusitanica* Mayer, 1869, pl. XVII, fig. 5. 2a-d. *Tibia* cf. *cluzaudi*, Egerian, Eger, Hungary, Coll. MTTM M63/3043 3.a, b, c. *Tibia* cf. *cluzaudi*, Egerian, 1/6-Layer, Wind quarry, Eger Hungary, 64 mm, Coll. Wieneke; 4: original drawing of *Gladius dentatus* var. *taurostrictus* Sacco, 1893; 5 a, b: spec. of *Tibia dentata* var. *taurostricta* Sacco in Turin regional Museum of Natural Sciences, Italy (catalog BS 039.03.002); 6. *Tibia* cf. *dentata*, Valle Ceppi, Torino hills, Burdigalian, 72 mm, coll. Liverani.

is *Cyrtulotibia unidigitata* (Newton, 1922). No well-defined species of *Tibia* is known from the European Eocene. Only in the Ypresian of southern France a fragment of a putative *Tibia* is recorded (Plaziat, 1970: 36, pl. XI, fig. 1).

In the Oligocene, the Mediterranean-Iranian Province and Western Indian-Eastern African Province were connected and were part of the Western Tethys Region (Harzhauser, 2002). *Tibia* is found in both provinces. Latest in the Late Burdigalian, the connection between both provinces vanished because the *Gompothorium* landbridge between Eurasia and the Arabian plate arose. In the Oligocene of the Western Indian-Eastern African Province, *Tibia sindiensis* (Vredenburg, 1925;

In the early Miocene (Aquitanian / Burdigalian), both provinces of the Western Tethys Region were again connected. In the Western Indian-Eastern African Province, two species should be compared with *Tibia dentata*: *Tibia indica* Dey, 1962 (Quilon, Kerala State, Malabar Coast, India, Quilon Limestone, Burdigalian) and *Tibia protofusius* (Vredenburg, 1928) (early? Miocene of Kachchh). Known *Tibia protofusius* specimens are poorly preserved; the species should be considered a taxon inquirendum for the moment. *Tibia indica* has a strongly curved and big posterior canal, larger than in *Tibia ordalensis*, but the spire is smaller than that of *T. ordalensis* (Harzhauser et al., 2017). We think these are two different species that might be

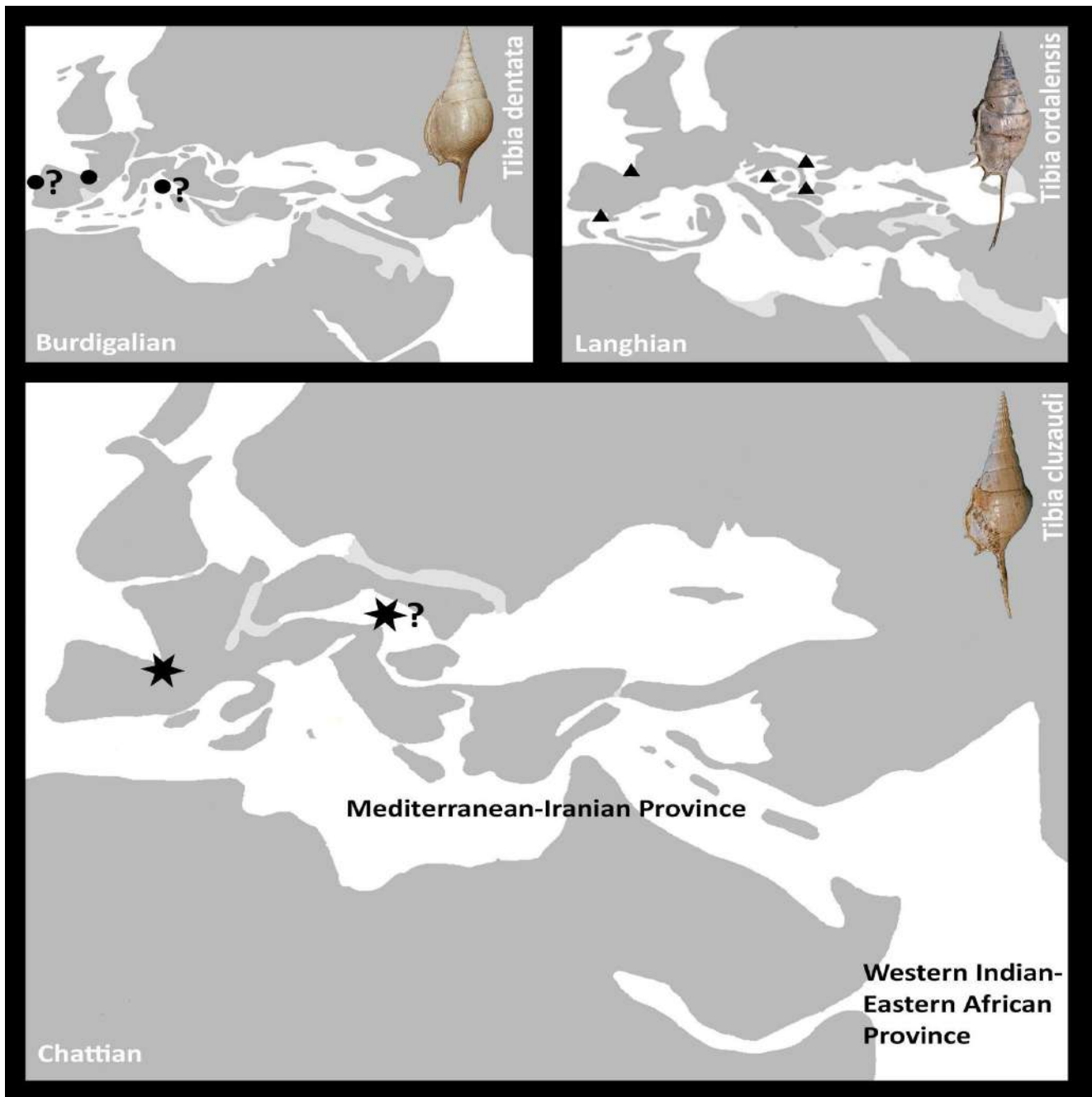


Plate 5. Distribution of "European" *Tibia* sp. from Chattian to Langhian. Maps simplified after Popov et al., 2004.

locus typicus: Nari of Bhagothoro Hill, Sind, Pakistan, stratum typicum: Oligocene) occurred. For comparison of *Tibia cluzaudi* with *T. sindiensis* better material of the latter has to be available. *Tibia sindiensis* should be considered a taxon inquirendum at the moment.

closely related.

In the Langhian, both considered provinces were connected by a short-lived Tethys seaway via the Mesopotamian Trough (Harzhauser et al., 2007). *T. verbeeki* (Martin, 1899) is found in middle to upper Miocene sediments in Borneo (Raven, 2002,

2021) and Java (Martin, 1899; Leloux & Wesselingh, 2009.). Via the geographical connection to the European *Tibia ordalensis*, *Tibia verbeeki* might be a synonym. Due to the bad preservation of *Tibia verbeeki*, further study is needed.

*Tibia* fossils are rare in nearly all known outcrops, and preservation is, in most cases, bad (see typical samples in Pl. 4). That means that the known fossil record needs to be more dense to estimate the evolutionary lineages reasonably. *Tibia* species may already have existed in the European Eocene (Plaziat, 1970; Pacaud, 2008), for sure in the Eocene of Nigeria. Are populations connected through the Trans-Saharan Seaway? Have they spread from Nigeria to France or the other way around? Is their origin in the Western Indian-Eastern African Province? How many radiations reached Europe? One, two, or three? More questions may arise that could only be answered with more and better preserved fossil specimens.

An interesting pattern we discovered is that there seems to be a correlation between the number of denticles on the outer lip and the age of the species: the later in stratigraphy a species occurs, the more denticles it has. Recent *Tibia insulaechorab* Röding, 1798 has up to seven denticles (Wieneke et al., 2023), while Eocene *Tibia bidigitata* only two. Extrapolating this leads to a model where the first *Tibias* would have no denticles. Such a group of early Paleogene gastropods is known as *Amplogladius* Cossmann, 1889. If this correlation has causation, needs further studies.

### Conclusions:

We have here illustrated that at least three species of *Tibia* succeeded in Europe from the Chattian Oligocene to the Langhian/Badenian Miocene. After the Langhian/Badenian, the genus (and family) disappeared from the Tethys-Paratethys-Mediterranean region. However, they survived in the Red Sea and the Indo-Pacific Ocean, where four species of *Tibia* still thrive, along with some other similar Rostellariidae of different genera.

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Library. To their creators, a special thanks.

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# DESCRIPTION OF TWO NEW SPECIES OF *CORALLIOPHILA* FROM SÃO TOMÉ - PRÍNCÍPE AND ANGOLA

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## ABSTRACT.

Two new species from West Africa, belonging to the genus *Coralliophila*, are described below. The first one, *Coralliophila gorii* n. sp., originates from São Tomé and Príncipe, the other, *C. annysi* n. sp., was collected in north Angola. The two new species are compared to close species from the south-east Atlantic area: *Coralliophila raramaculata* KOSUGE & FERNANDES, 1989, *C. africana* SMRIGLIO & MARIOTTINI, 2002, *C. alboangulata* (E. A. SMITH, 1890) and *C. schioettei* SMRIGLIO & MARIOTTINI, 2000. They are also compared to a species widely distributed in the Caribbean area, *C. salebrosa* H. & A. ADAMS, 1863.

## INTRODUCTION.

All the *Coralliophilinae* studied from the Atlantic area have a multispiral protoconch suggesting a planktotrophic larval development. *Coralliophilinae* are parasites of corals and unlike all other *Muricidae*, have no radula. They feed exclusively upon Anthozoan including both *Scleractinarians* (*Hexacorallia*, formerly *Madreporaria*) and *Alcyonarians* (*Octocorallia* including *Gorgonians* and soft corals). Many species of *Coralliophilinae* are dependent of a single coral species. However, a number of species may have several host corals, either *Scleractinarians* or *Alcyonarians*. The dependence of some *Coralliophilinae* on a single species of coral host may explain the limited distribution of these species despite their planktotrophic larvae (GARRIGUES *et al.*, 2022).

## MATERIAL AND METHODS.

This work was carried out with the material collected by all three co-authors over several decades with additional specimens examined or photos sent from other collections (see Acknowledgements).

Species differentiation within the *Coralliophilinae* group, must take into account not only environmental parameters, such as habitat, depth and host coral (s), but also above all the conchological characteristics. One of the main keys allowing the identification of these very close species has

been the study of the spiral sculpture. The descriptive method established by Merle (2001) proved to be very useful in this respect.

## TERMINOLOGY.

P: primary cord  
IP: infrasutural primary cord  
P1: shoulder cord  
P2–P6: primary cord of the convex part of the teleoconch whorl  
ADP: adapertural primary cord on the siphonal canal  
MP: median primary cord on the siphonal canal  
ABP: abapertural primary cord on the siphonal canal  
s: secondary cord  
adis: adapical infrasutural secondary cord  
abis: abapical infrasutural secondary cord  
s1–s6: secondary cords of the convex part of the teleoconch whorl  
ads: adapical secondary cord of the siphonal canal  
ID, D1–D6: internal denticles of the aperture

## Other abbreviations and repository of specimens:

NHMUK: Natural History Museum of United Kingdom, London, United Kingdom.  
ZMC: Zoologisk Museum, Copenhagen, Denmark.  
CAA: Andre Annys collection  
CFS: Frank Swinnen collection  
CJA: José Ahuir collection  
CJH: Juan Horro collection  
CPR: Peter Ryall collection  
CSG: Sandro Gori collection

## SYSTEMATICS.

Superfamily Muricoidea Rafinesque, 1815  
Family Muricidae Rafinesque, 1815  
Subfamily *Coralliophilinae* Chenu, 1859

### Genus *Coralliophila* H. Adams, & A. Adams, 1853

Type species: *Murex neritoideus* Gmelin, 1791 accepted as *Coralliophila violacea* (Kiener, 1836) by subsequent designation.

***Coralliophila gorii* n. sp.** (Pl. 1, Figs A–S)

**Type material.** Holotype (MNHN-IM-2000-38807), 1 paratype (MNHN-IM-2000-38808), 1 paratype (CFS), 1 paratype (CPR), 1 paratype (CBG), 2 paratypes (CSG).

**Type-locality.** Santana, São Tomé, 12 m.

**Distribution.** São Tomé and Príncipe Islands, living between 10 and 35 m deep.

**Host coral.** The hard coral *Montastrea cavernosa* (Linne, 1767) as well as the base of *Gorgonia* sp..

**Description of the holotype.** Obconical shell, up to 18.3 mm in length and 11.3 mm in width. Protoconch of 3 bulbous whorls with axial ribblets (Pl. 1, Fig. E). Teleoconch of 6 shouldered whorls. Suture impressed, undulated. Conical spire. Apical angle 60°. Infrasutural ramp sloping.

Shell background cream, first whorls of teleoconch fawn, brown maculations between axial ribs, aperture white.

Axial sculpture consisting of 9 broad, rounded ribs. Spiral sculpture of primary, secondary and tertiary cords. On infrasutural ramp: adis, IP and abis; carinated shoulder with P1 cord spine and P1 more important than other primary cords; on convex part of whorl: P2 to P6 similar, smaller secondary and tertiary cords interspersed between primary cords; on siphonal canal: ADP, MP and ABP. Aperture pyriform, wide, with adherent columellar lip extended to end of siphonal canal. Crenulate and sharp outer lip with irregular cord spines. Inner side of outer lip slightly striated. Moderately long, broad and wide open siphonal canal. Squamous microsculpture. Operculum unknown

**Discussion.** *Coralliophila gorii* n. sp., characterized by a carinate shoulder, is a relatively large species for the genus. Its adult size varies from 15 to 30 mm in length. Several adult specimens have a longer siphonal canal constricted at the junction of the convex part of the whorl and the canal (Pl. 1, Fig. K).

In some specimens, the apertural inner denticles are more apparent with thickened outer lip (Pl. 1, Fig. L). On the other hand, others specimens have a wide expansion of the outer lip with a narrower edge (Pl. 1, Figs A–C, M–N, O–P). This character, already observed in other species of *Coralliophila* such *C. meyendorffii* (CALCARE, 1845) corresponds to a sexual dimorphism. The specimens with a wide outer lip expansion are females with eggs capsules in the mantle cavity.

The operculum examined in other specimens is D-shaped with subapical nucleus in lower right.

**Remarks.** *Coralliophila gorii* n. sp. is compared to the closest species known from the West African area: *C. raramaculata* KOSUGE & FERNANDES, 1989, *C. africana* SMRIGLIO & MARIOTTINI, 2002, *C. alboangulata* (E. A. SMITH, 1890) and *C. schioettei* SMRIGLIO & MARIOTTINI, 2000. It is also compared to *C. Salebrosa* H. & A. ADAMS, 1863, a species widely distributed in the Caribbean area.

*Coralliophila gorii* n. sp., differs from *C. raramaculata* (Pl. 3, Figs A–B) which has also been described from Sao Tomé, and is present from Cape Verde to north Angola between 1 and 5 m deep. All specimens of *Coralliophila gorii* n. sp. have a carinated shoulder, whereas, the shoulder is clearly more rounder in *C. raramaculata*. Another distinctive characters is the different

spiral sculpture. The primary cords are narrower and regularly spaced in *C. gorii* n. sp., while the primary cords are broader with P2 cord connected to P1 in *C. raramaculata*. Additionally, in the latter species, the apertural inner denticles are lacking. *Coralliophila africana* (Pl. 3, Figs C–D) was described from Sierra Leone at 45 m deep. *Coralliophila gorii* n. sp. differs from this species by a more elongated shell with a more constricted last teleoconch whorl and narrower primary cords.

*Coralliophila gorii* n. sp. can also be compared to a poorly known species, endemic to St Helena Island: *C. alboangulata* (Pl. 3, Figs E–F). Both species have a biconical shape with a carinated shoulder but their spiral sculpture is very different. The primary spiral cords are much broader and the secondary cords are lacking in *C. alboangulata*.

Compared to *Coralliophila schioettei* (Pl. 3, Figs G–H), *C. gorii* n. sp. has a more elongated shell with more tapered siphonal canal, a more constricted last teleoconch whorl and a wider pyriform aperture. In addition, their spiral sculpture is quite different. The cords are less protruding in *C. gorii* n. sp. with P2 separated from P1 by a secondary cord, whereas P2 is connected to P1 in *C. schioettei*.

*Coralliophila salebrosa* (Pl. 3, Figs I–J) is a very variable Caribbean species which superficially resembles *C. gorii* n. sp., but their spiral sculpture are very different. *Coralliophila gorii* n. sp. has regularly spaced primary cords while in *C. salebrosa*, the P2 cord is connected to P1, both being separated from P3 by a space (GARRIGUES *et al.*, 2022). Moreover, the outer apertural lip of *C. gorii* n. sp. is less flared.

**Etymology.** The new species is named in honor of Sandro Gori (Livorno, Italy) who has personally collected many specimens of this species, which he brought to the attention of the third author.

***Coralliophila annysi* n. sp.**

(Pl. 2, Figs A–R)

**Type material.** Holotype (MNHN-IM-2000-38809), 1 paratype (MNHN-IM-2000-38810), 1 paratype (CFS), 1 paratype (CAA), 1 paratype (CPR), 1 paratype (CBG).

**Type-locality.** Luanda environs, Angola, dredged between 40 and 50 m.

**Distribution.** Angola, living between 15 and 60 m.

**Host coral.** Unknown.

**Description of the holotype.** Thin biconical shell, rather elongate, up to 9.8 mm in length and 5.8 mm in width. Eroded protoconch. Teleoconch of 5 shouldered whorls. Suture impressed. Conical spire. Apical angle 49°. Infrasutural ramp sloping. Background color fawn, last whorl lighter colored, aperture white, protoconch white.

Axial sculpture consisting of 9 broad, rounded ribs, from first whorl of teleoconch. Ribs almost faded on last whorl. Spiral sculpture of primary and secondary scabrous cords: on infrasutural ramp: adis, IP and abis; angulated shoulder with small P1 cord spine; on convex part of whorl: P2, P3, s3, P4, s4, P5 and P6 roughly equivalent in size, smaller secondary cords in s1 and s2; on siphonal canal: ADP, ads, MP and ABP. Pyriform and wide aperture with adherent columellar lip extended to

end of siphonal canal. Crenulate and sharp outer apertural lip. Inner side of outer lip smooth. Moderately long, broad, wide, open siphonal canal. Operculum unknown.

**Discussion.** The protoconch of two of the paratypes (MNHN and CBG) consists of 3 ½ bulbous whorls with axial ribblets and one spiral keel (Pl.2, Figs F, N). The adult size of this small species varies from 7 to 12 mm in length. A denticulation appears on the inner side of the outer lip in a single gerontic specimen (Pl. 2, Fig. L). While some specimens are rather short with a subtriangular shape, others have a more elongated appearance with a longer siphonal canal. The axial ribs are more protruding until the end of the last whorl in the adult smallest specimens with a thicker outer lip, (Pl. 2, Figs J–L). It is probable that as in other species of *Coralliophila*, the expansion of the convex part of the last whorl is used to house the egg capsules. The last axial ribs are flattened when such an expansion occurs (compare Pl. 2, Figs C and J).

**Remarks.** *Coralliophila annysi* n. sp., must be separated from *C. raramaculata* KOSUGE & FERNANDES, 1989, a species occurring from Cape Verde to north Angola between 1 and 5 m, from *C. africana* SMRIGLIO & MARIOTTINI, 2002, described from Sierra Leone at 45 m deep, and from *C. gorii* n. sp. from São Tomé and Príncipe between 10 and 35 m.

All specimens of *C. annysi* n. sp. have a carinated shoulder, whereas in *C. raramaculata* (Pl. 3, Figs A–B), the shoulder is clearly more rounded. As other distinctive characters, a different spiral sculpture should be noted. In *C. annysi* n. sp., the primary cords are narrower and regularly spaced, while in *C. raramaculata* these cords are broader with P2 cord connected to P1. Additionally the apertural inner denticles are lacking in the latter species.

*Coralliophila annysi* n. sp. can also be compared to *C. africana*. Both species have a biconical shape with a carinated shoulder but *Coralliophila annysi* n. sp. has a more elongated shape, a more tapered siphonal canal and a pyriform wider aperture. Primary cords are narrower and equivalent to secondary cords s3, s4 in *C. annysi* n. sp.

*Coralliophila annysi* n. sp. differs from *C. gorii* n. sp. by a more elongated shape, an higher spire, and by a more bulbous and striated protoconch. The shells in *C. annysi* n. sp. does not exceed 12 mm in length in the largest specimens, whereas it is from 15 to 30 mm in length in *C. gori* n. sp. Moreover, in *C. annysi* n. sp., the spiral sculpture consists of primary and secondary cords that are slightly expressed and roughly equivalent, whereas in *C. gorii* n. sp. the primary cords are more protruding and the secondary cords are smaller.

**Etymology.** The new species is named in honor of Andre Annys, a very dear friend of the second author.

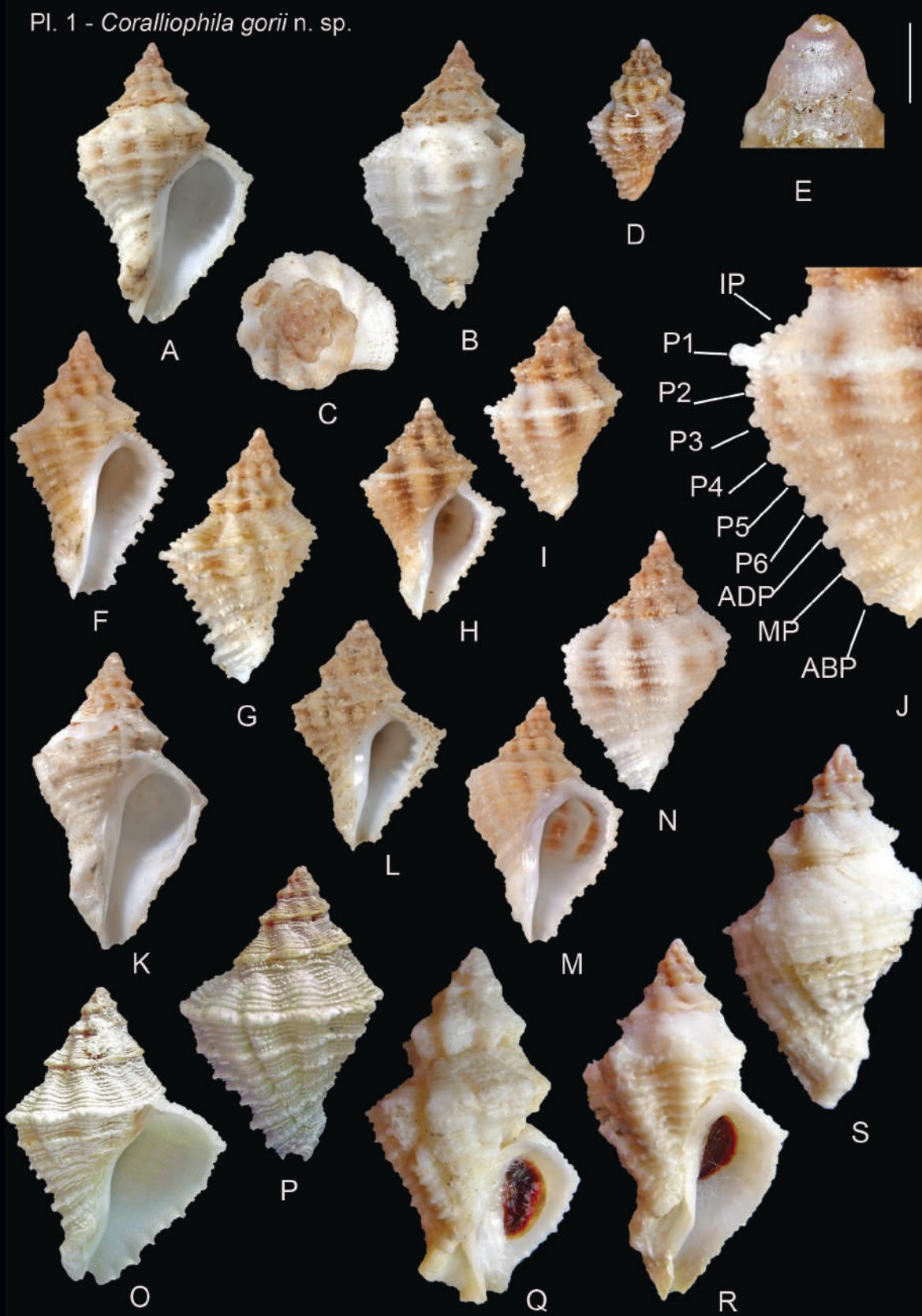
#### ACKNOWLEDGEMENTS.

We are very thankful to Andreia Salvador (NHMUK) and Tom Schiotte (ZMC) for the photos and the loan of the types specimens, to José Ahuir for the photo of *Coralliophila africana*, to Juan Horro for the photo of *Coralliophila annysi* and to Sandro Gori for inviting one of us (PR) to examine part of his collection. We also thank Fabrice Prugnaud (Xenophora Taxonomy), along with Roland Houart and Jean-Pierre Pointier who corrected this manuscript.

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Pl. 1 - *Coralliophila gorii* n. sp.



–A–S. *Coralliophila gorii* n.sp.

A–C. Holotype (MNHN-IM-2000-38807), Santana, São Tomé Islands, 12 m, ex CFS, 18.3 mm.

D–K. Rolas Isl., São Tomé, 10–30 m, CFS; D–E. 9.4 mm; F–G. 17.7 mm; H–J. 13.5 mm;

K. Paratype (CFS), Santana, São Tomé, 12 m, 22.9 mm.

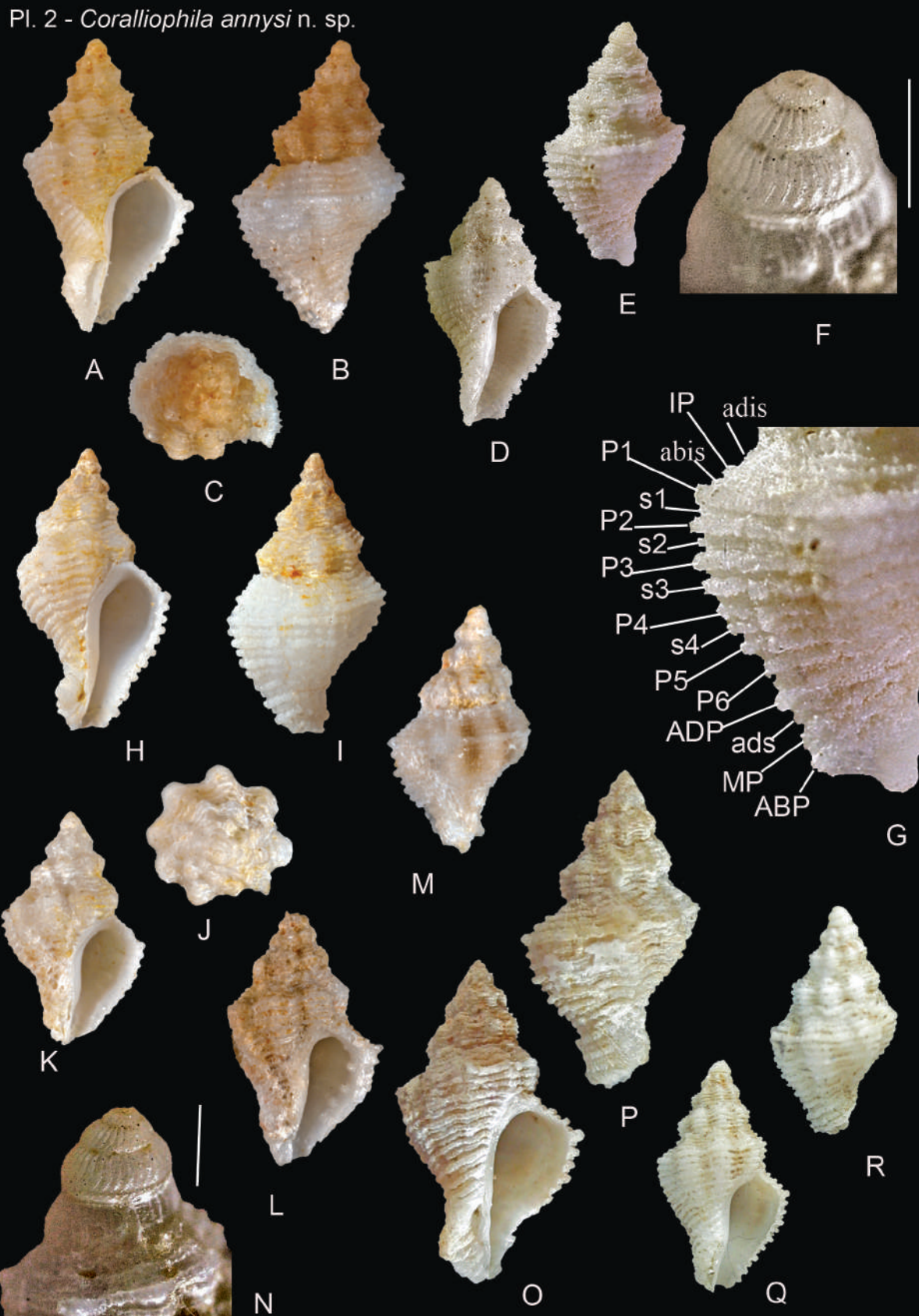
L. Club Santana, São Tomé, 20 m, CFS, 13.5 mm.

M–N. Paratype (MNHN-IM-2000-38808), Rolas Isl., São Tomé, 10–30 m, ex CFS, 17.6 mm.

O–P. Paratype (CPR), Ilhues dos Monsteiros, Príncipe Isl., 22 m, 19.6 mm.

Q–S. Paratypes (CSG), Tinhosa Grande Isl., Príncipe Isl., 35 m ; P. 33 mm ; R–S. 30 mm.

Scale bar: 0.5 mm.



—A–R. *Coralliophila annysi* n. sp.

A–G. Luanda, Angola, 40–50 m; A–C. Holotype (MNHN-IM-2000-38809), ex CFS, 9.4 mm; D–G. Paratype (MNHN-IM-2000-38810), ex CFS, 8.3 mm; J–K. Paratype (CAA), ex CFS, 7.3 mm; L. 10.4 mm, CFS; M–N. Paratype (CBG), ex CFS, 7.2 mm.

H–I. Paratype (CFS), Farol das Lagostas, Angola, 20–25 m, 9.9 mm.

O–P. Paratype (CPR), Luanda, Angola, 60 m, 12.2 mm.

Q–R. Palmeirinhas, Angola, 15–20 m, 7.9 mm, CJH.

Scale bar: 0.5 mm.

Pl. 3

**Pl. 3 - *Coralliophila*, comparative plate.**

A–B. *Coralliophila raramaculata* KOSUGE & FERNANDES, 1989; Esprainha, São Tomé, 1 m, 8.5 mm, CPR.

C–D. *Coralliophila africana* SMRIGLIO & MARIOTTINI, 2002, near Alboran Isl., Mediterranean Sea, 8.5 mm, CJA.

E–F. *Coralliophila alboangulata* (E.A. SMITH, 1890), St. Helena (W. H. Turton coll.); lectotype (NHMUK 1889.10.1.2381), 7.7 mm.

G–H. *Coralliophila schioettei* SMRIGLIO & MARIOTTINI, 2000, holotype ZMC (ZMUC-GAS-1618), Sierra Leone, survey “Atlantide”, stn. 145, 11.4 mm.

I–J. *Coralliophila salebrosa* H. & A. ADAMS, 1863; I. syntype (NHMUK 1984109a), from Cuming collection, Guadeloupe, 24 mm; J. Le Robert, Martinique, 15–20 m, 15.7 mm (MNHN).

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#### SUMMARY:

The intent of the author is to demonstrate that the genus *Athleta*, well diversified during the Eocene, is today represented in two continents with species of the same genus. There is therefore no justification for a split by describing any new genera for the particular purpose of African species.

**KEYWORDS:** *Volutidae*, *Athletinae*, *Athleta*, *Neoathleta*, *Volutocorbis*

#### DISCUSSION:

The modern shells of the genus *Athleta* exist in two continents nowadays, Africa and Oceania. But they were present in all continents during the Eocene and with a strong diversity, containing about 40 species and 5 subgenera (*Athleta* ss, *Neoathleta* synonymized recently with *Volutocorbis*, *Volutospina*, *Volutopupa*, and *Ternivoluta*).

Our objective is to demonstrate that there are similarities between modern species and fossil species at a level that excludes a mere convergence.

The modern species *Athleta epigona* (Von Martens, 1904) from Tanzania (fig 1 to 3) and *Athleta rosavittoriae* (Rehder, 1981) (fig 4) from Somalia have huge similarities with some fossil *Athleta* from different continents, including Europe, Africa, and Asia. One can easily compare their spiral and axial sculptures, as well as their similar shape with the following fossil species : *Athleta (Neoathleta) digitalinus* (Lamarck, 1810) (fig 5) from France and England Eocene

*Athleta (Neoathleta) burtoni* Vredenburg, 1923 (fig 6) and *Athleta (Neoathleta) eugeniae* Vredenburg, 1923 (fig 7) from Pakistan Early Eocene

*Athleta (Neoathleta) gruneri* (Oppenheim, 1915) (fig 8) from Togo and Nigeria Eocene.

Jean-Michel Pacaud from MNHN did recommend to call *Athleta epigona* as *Athleta (Neoathleta) epigona*, due to its similarity with *Athleta (Neoathleta)* fossil species.

Another example can be given concerning a comparison between the modern species *Athleta boswellae* (Rehder, 1969) (fig 9) and *Athleta (Neoathleta) bicorona* (Lamarck, 1803) from France Eocene, with similar axial sculpture, and subsutural ramp.

Darragh talked about fossil *Athleta* in 1988: "The only true cosmopolitan genera are *Athleta*, *Lyria* and their allies which in the early Tertiary make up a large proportion of the volute fauna of the world. A possible inference from this is that the cosmopolitan genera had planktonic larval stages at least in the early Tertiary and that direct development which lead to the marked provincialism evolved in the middle Tertiary", and further on: "*Athleta (Athleta)*, Late Paleocene ... A single species is known similar to those present in the Early Tertiary of Europe. The genus (*comment: subgenus*) had virtually a cosmopolitan distribution in the Paleogene, became more restricted during the Neogene and at present is confined to the Indian and the Atlantic Oceans off the coast of Southern Africa".

#### CONCLUSION:

S and J H Veldsman, in their Taxonomic Revision of the Volutidae of Southern Africa, described in 2022 three new genera, namely *Afriathleta*, *Nataliavoluta* and *Capensisvoluta* under the main argument that "As the genus *Athleta* is associated with fossil volutes species , and the living volutes previously classified under *Athleta* do not seem to be directly related , it is proposed here to reclassify all the living African *Athleta* species into three new genera."

We believe that we clearly demonstrated that there are real similarities between the fossil *Athleta (Neoathleta)* and the modern African *Athleta*, and that there is therefore, no need to split *Athleta* into three genera, but that instead a subgenus level is justified.

#### ACKNOWLEDGMENT:

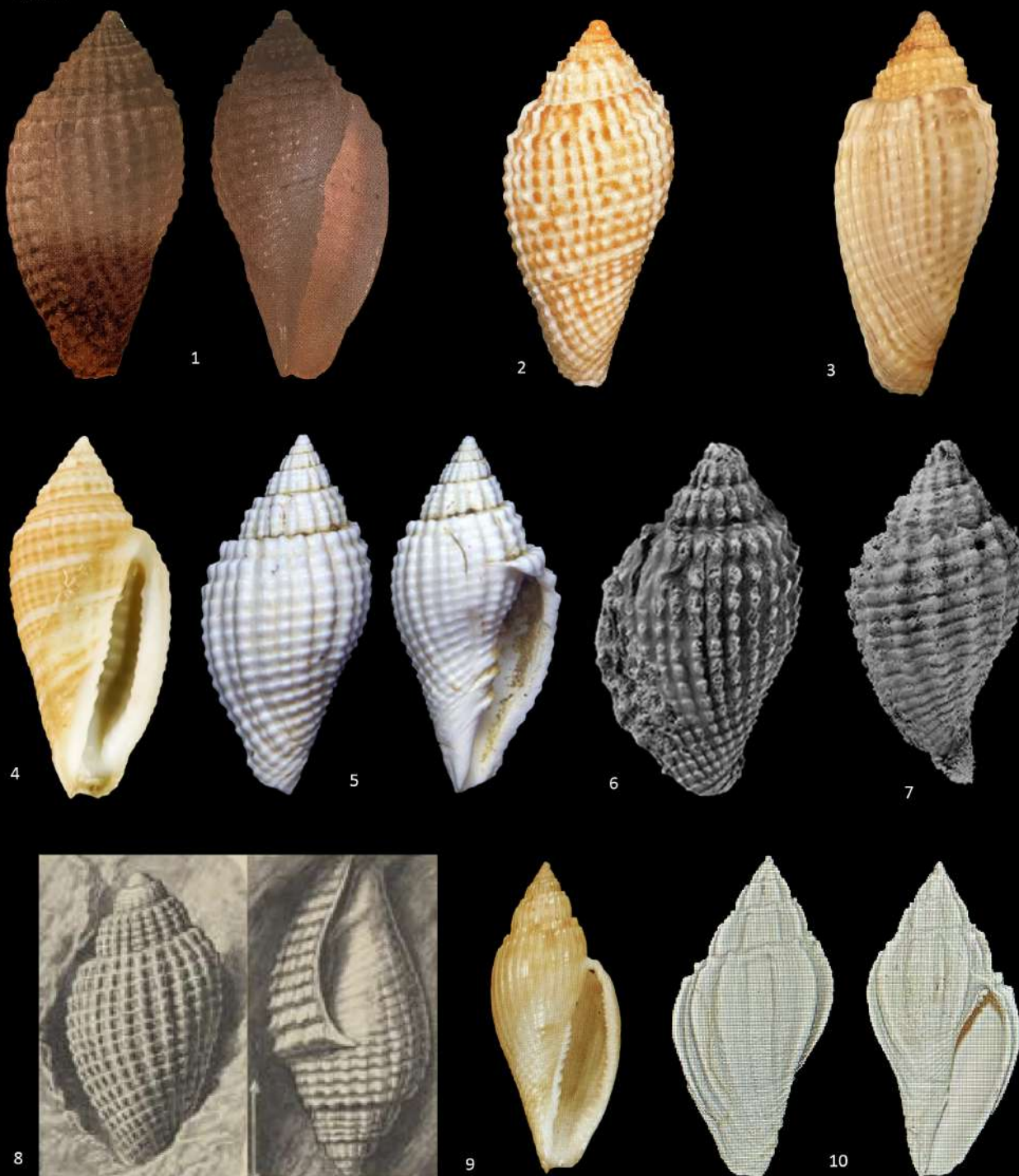
To Jean Michel Pacaud from Museum National d'Histoire Naturelle, Paléontologie, Paris, who helped find examples of foreign fossil shells publications.

To the regretted Patrice Bail who did build a well-balanced taxonomical classification of Volutidae

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- WEAVER C S AND DU PONT J E: *The living Volutes*, 1970, Delaware Museum of Natural History, USA

Plate 1.



1. *Athleta* (*Neoathleta*) *epigona* (von Martens, 1904) Holotype as *Voluta epigona*, Institut für Spezielle Zoologie und Zoologisches Museum, Berlin, Germany
2. *Athleta* (*Neoathleta*) *epigona* from Petuch and Berschauer book, Tanzania
3. *Athleta* (*Neoathleta*) *epigona* courtesy of Mauricio Araujo from Donax Seashells, Tanzania
4. *Athleta rosavittoriae* (Rehder, 1981) courtesy of J Traudel and F Slieker, info@malacopics.nl, Somalia
5. *Athleta* (*Neoathleta*) *digitalinus* (Lamarck, 1810) from Reefshells, France, Eocene
6. *Athleta* (*Neoathleta*) *burtoni* (Vredenburg, 1923) from Merle, Pacaud and al, Pakistan, Eocene
7. *Athleta* (*Neoathleta*) *eugeniae* (Vredenburg, 1923) from Merle, Pacaud and al, Pakistan, Eocene
8. *Athleta* (*Neoathleta*) *gruneri* (Oppenheimer, 1915) from Oppenheimer, Togo, Eocene (p. 146 f.2-3)
9. *Athleta boswellae* (Rehder, 1969) courtesy of J Traudel and F Slieker, info@malacopics.nl, South Africa
10. *Athleta* (*Neoathleta*) *bicorona* (Lamarck, 1803), MNHN, Reclinat (ANR-11-INBS-0004), Mouchart 2015, France, Eocene

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**KEYWORDS:** Terebridae, *Neoterebra*, *Neoterebra pruvosti* sp. nov., Guadeloupe, Martinique, West Atlantic, Caribbean Sea.

**ABSTRACT:** A new deeper water species of *Neoterebra* is described from off Guadeloupe and Martinique and compared to its shell morphological congeners.

### INTRODUCTION

A recent revision of the W Atlantic taxa of Terebridae (Terryn, 2023) yielded a preliminary total of 48 different taxa presently comprised in 5 different genera, most being comprised preliminarily in the umbrella-genus *Neoterebra*. The revision didn't distinguish between those taxa found in the Gulf of Mexico and those found in the Caribbean, and those that have a (presumed) overlapping or mixed range. A rough estimate yields an occurrence of about 40% for each of the two basins with about 20% of the taxa presumed to be present in both basins (predominantly deeper water). In general, our knowledge on the terebrid fauna of the W Atlantic is poor in comparison to that of the (sub)tropical Indo-Pacific. Terebrid samples originate mostly from intertidal to shallow water collecting, occasionally up to diving depths and specimens/species are rarely known from deeper water dredging or trawling efforts. Molluscan sampling in the W Atlantic below 10 m is in fact in its infancies compared to the vast commercial and scientific efforts undertaken in the Indo-Pacific. Most of the deeper water taxa of Terebridae were until recently only known from the type material collected during a limited number of scientific dredging operations. Unsurprisingly, the recent (deeper water) sampling undertaken by the MNHN in the waters off French Guiana, Guadeloupe and Martinique (MADIBENTHOS 2016-, KARUBENTHOS 2012-2015- and GUYANE 2014-2015-expeditions) yielded an interesting assemblage of 13 morpho-species, including shallow water collecting. The variability and shell morphology of uncommonly encountered species such as *Bathyterebra benthalis* (Dall, 1889) and *Profunditerebra evelynae* (Clench & Aguayo, 1939) could be studied for the first time, and the dredging efforts yielded furthermore six morpho-species, represented by one or few specimens, that were (probably) undescribed. One could already by described and compared to congeners (*Neoterebra guadeloupensis* Malcolm, Terryn & Fedosov, 2020) and a second one, already figured in Terryn (2011) is here below described as new from Guadeloupe and Martinique.

### ABBREVIATIONS

DL Private collection of David Lamy, Guadeloupe  
INVEMAR Instituto de Investigaciones Marinas y Costeras  
- Museo de Historia Natural Marina de Colombia,  
Cerro de Punta Betin, Santa Marta, Colombia  
MNHN Muséum national d'Histoire naturelle, Paris, France  
USNM United States National Museum, Washington DC, USA  
YT Private collection of Yves Terryn, Belgium

### SYSTEMATICS

The systematics for the species described and discussed in the present paper follows the systematics as proposed in Fedosov et al. (2020). The description of the new species is based solely on shell morphology, the anatomy of the soft part is not studied at present.

Superfamily **CONOIDEA** Fleming, 1822

Family **TEREBRIDAE** Mörch, 1852

Genus *Terebra* Bruguière, 1789

Genus *Neoterebra* Fedosov, Malcolm & Terryn, 2020

*Neoterebra pruvosti* sp. nov.

Pl. 1 Figs 9-13

Terryn, 2011: 70, fig. 17 (as *Terebra* species 2)

**Holotype:** MNHN-IM-2013-20350, 27.9 mm.

**Paratypes:** **paratype 1:** MNHN-IM-2013-20351, from the type locality, 23.2 mm; **paratype 2:** MNHN-IM-2013-20352, from the type locality, 29.5 mm (BOLD ID = CONO1740-14, GenBank accession number = KJ672197.1); **paratype 3:** DL, Guadeloupe, off Fajou Island, dredged at 80-90 m, 23.3 mm (BOLD ID = CONO1741-14, GenBank accession number = KJ672181.1); **paratype 4:** DL, Guadeloupe, off Port Louis, dredged at 100 m, 29.8 mm; **paratype 5:** YT, Martinique, off SW Borgnesse Point, MADIBENTHOS Stn AN217, 14°26.1'N-60°54.5'W, 65 m, 10SEP2016, 26.5 mm; **paratypes 6-10:** YT, Guadeloupe, off Fajou Island, dredged at 80-90 m, 17.5-24.4 mm (fragments).

**Type Locality:** Guadeloupe, off Fajou Island, KARUBENTHOS 2012 Stn GD02, 16°22'34.32"N-61°34'07.14"W, 80 m (04MAI2012).

**Description (holotype):** Shell overall lightly yellowish hued, subsutural band white, remainder of the whorl light pinkish. Globular white protoconch of about 1.5-2.0 whorls with a large swollen globose nucleus, transition to teleoconch not clearly visible. Outline of whorls convex, indented suturally and somewhat less below the subsutural band. Subsutural band ornamented with widely spaced axial ribs, interspaces about three times as wide as ribs, interstices beset with numerous spiral grooves, only well visible on the last whorl. Subsutural band bordered by a deep interrupted furrow; axial sculpture continued within, creating deep rectangular pits. Remainder of the whorl beset with widely spaced, low axial ribs, with 6 spiral rows of riblets in between (on the last whorl), crossing over the crests of the axial ribs. On spiral ribs themselves, fine microscopic spiral striae can be discerned, similar to those on the subsutural band. Aperture elongate-quadrate, columella straight.

**Distribution:** Only known from off Guadeloupe and Martinique.

**Discussion and remarks:** Largest specimen known measures 29.8 mm (paratype 4). The morphology of the sculpture is stable throughout the studied material, except for paratype 9 (Pl. 1 Fig. 7). The specimen sustained damaged or injury at various stages of life evident on the first teleoconch whorls which led to the disproportionate continuation of the sculpture, seaming almost as aberrant or even a different species. The composition of the sculpture is identical, yet markedly coarser. Both the holotype and paratype 1 portray the colour composition of the shell as described above, while most (dead-collected) specimens are pure white or hued faintly yellowish. Correct protoconch whorl count hampered due to the eroded surface of the protoconch/first teleoconch impairing the discernibility of the transition.

The species bears some resemblance to *Neoterebra sterigma* (Simone, 1999) and *Neoterebra sterigmoides* (Simone & Gracia, 2006) in terms of the characteristics of the sculpture of the shell.

Compared to *N. sterigma*, the density of the spiral and axial sculpture is rather different. The sculpture is wider spaced and coarser, and the apical angle is slenderer with less convex outline of the whorls than in *Neoterebra sterigma*.

A discussion on *N. sterigmoides* known from Columbian waters is not straightforward. The type specimens could not be studied in person and thus the following observations are based on the description and figures alone. The holotype and paratype differ considerably in apical angle, whorl outline, sculptural features and even protoconch size (see Pl. 1 Figs 2-3). The description of the taxon is somewhat hybrid, based on description of features drawn from both specimens. Based on the holotype of *N. sterigmoides*, *N. pruvosti* sp. nov. has a narrower apical angle with less convex whorls. The general spiral sculpture on the remainder of the last whorl of the holotype of *N. sterigmoides* is characterised by fine incisions that cut slight into the crest of the axial ribs in contrast to relatively broad spiral ribs that cross over the axial ribs. A future revision of the type material of *N. sterigmoides* is needed to ascertain its identity and descriptive notes.

**Derivatio nominis:** The species is named in honor of Mr Laurent Pruvost, who personally dredged the first specimens of this new species off Guadeloupe.

## ACKNOWLEDGEMENTS

The molecular sequencing (for *Neoterebra pruvosti* sp. nov.) was supported by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement no. 865101) to Nicolas Puillandre (MNHN). Specimens of the MNHN from Guadeloupe were obtained during the KARUBENTHOS 2012 expedition conducted by the MNHN.

The following persons are sincerely thanked for their valued contributions in the various stages of the study of these specimens (in alphabetical order): Dr Philippe Bouchet (MNHN), Virginie Heros (MNHN), Laurent Pruvost (Guadeloupe), Philippe Maestrati (MNHN), Wilfried Nees (Belgium), Kyriakos Papavasileiou (Greece), Andreia Salvador (NHMUK) and Dr Ellen Strong (USNM).

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**1. *Neoterebra sterigma*** (Simone, 1999), holotype, MNHN-IM-2000-2187, off SE Brazil, MD55 Stn 53-CB92, N/O *Marion Dufresne*, 19°34'0.0084"S-38°55'0.0192"W, 340-360 m, 29MAY1987, 16.4 mm.

**2-3. *Neoterebra sterigmoides*** (Simone & Gracia, 2006), **2.** Holotype, INV MOL2388, MARCORaL Cruises Stn E98, Colombia, La Guajira, off Manaure, 11°53'05"N-72°36'39"W, 21 m, 16MAR2001, 13.7 mm. (Picture taken from Simone & Gracia, 2006: 129, fig. 16), **3.** Paratype, INV MOL5479 (1 of 3), MARCORaL Cruises Stn D21, Colombia, 9°46'36.9"N-76°12'48.1"W, 102 m, 29APR2005, 24.2 mm. (Picture taken from Simone & Gracia, 2006: 130, fig. 22),

**4-8. *Neoterebra pruvosti* sp. nov.** **4.** Holotype, MNHN-IM-2013-20350, Guadeloupe, off Fajou Island, KARUBENTHOS 2012 Stn GD02, 16°22'34.32WN-61°34'07.14"W, 80 m, 4APR2012, 27.9 mm. **5.** Paratype 1, MNHN-IM-2013-20351, idem, 23.2 mm. **6.** Paratype 2, MNHN-IM-2013-20352, idem, 29.5 mm. **7.** Paratype 9, YT, Guadeloupe, E off Fajou Island, dredged at 80-90 m, 23.4 mm – specimen with deformed sculpture due to sustained damages at earlier teleoconch stages. **8.** Paratype 3, DL, Guadeloupe, E off Fajou Island, dredged at 80-90 m, 23.3 mm, detail of protoconch and first teleoconch whorls.

**9. *Neoterebra limatula*** (Dall, 1889), lectotype USNM 93971, USA, Florida, between Mississippi Delta and Cedar Keys, 203 m, 17.9 mm. (Picture courtesy of Dr Ellen Strong, USNM).

**10. *Neoterebra guadeloupensis*** Malcolm, Terry, & Fedosov, 2020, holotype, MNHN IM-2013-61448, Guadeloupe, S Marie-Galante, KARUBENTHOS 2015 Stn DW4638, N/O *Antea*, 15°50'N-61°19'W, 305-312 m, 17.2 mm.

## ADDITIONAL INFORMATION ON MOLLUSCA FOR THE SEAS OF CYPRUS

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### KEYWORDS

Alien molluscs, Mediterranean Sea, New Records

### ABSTRACT

Additional new findings from the continuing study on the marine malacofauna of Cyprus by September 2023. It presents 4 image documented species for the Cypriot Seas. Taxonomic characteristics, ecological data and distributional expansion are presented and discussed.

### INTRODUCTION

The previous faunistic study on the Cypriot marine malacofauna has been presented in Kolokotronis *et al.* (2023) and the relevant biodiversity was last presented in an annotated catalogue by Kolokotronis *et al.* (2022). Attentive search based on material management and various research activities in the field continue to produce additional information for the area.

### METHODS

Sampling, handling and species recognition were conducted according to Manousis & Galinou-Mitsoudi (2014) and Mbazios *et al.* (2020). The specimens are deposited in the premises of D. Kolokotronis and Y. Varnava. Scientists are welcome to have access to the biological material for inspection by appointment.

### RESULTS AND DISCUSSION

#### The records

#### Bivalvia

***Magallana gigas*** (Thunberg, 1793) (Fig. 1a, b). 2 live adult individuals, stony bottom, 20 m, Xylophagou, Cyprus 34°57'N - 33°49'E, September 2023, first record for Cyprus (description in: Amaral & Simone, 2014). The species has been referred as an established alien and

introduced for aquaculture all around the Mediterranean Sea (Alf *et al.*, 2020), and is now reported for Cyprus. The occurrence of our specimens close to a cage of aquaculture gives rise to suspicion that they may be “escapees” from that aquaculture. It is considered as a rather usual practice worldwide farmers to keep oysters in a multi-trophic sustainable aquaculture systems for commercial purposes (Reid *et al.*, 2018; Hossain *et al.*, 2022).

***Gafrarium savignyi*** (Jonas, 1846) (Fig. 1c). 1 live individual, sandy bottom, 5 m, south of Potamos, Liopetri, Cyprus 34°58'08N - 33°54'06E, June 2023, second record for Cyprus (description in: Huber, 2010). This alien species from the Red Sea (Huber, 2010; Alf *et al.*, 2020) has been referred from all over the E Mediterranean Sea ([www.marinespecies.org](http://www.marinespecies.org)) and is now extending its distribution to the south of Cyprus.

***Corippa corbis*** (R. A. Philippi, 1836) (Fig. 1d). 2 valves, beached, Liopetri, Cyprus 34°58'08N - 33°54'06E, June 2023, first image documented record for Cyprus (Cecalupo & Quadri, 1995; Öztürk *et al.*, 2004). Helpful details on the species identification and on its hinge, in particular, are given by van Aartsen (1985).

#### Cephalopoda

***Sepioteuthis lessoniana*** d'Orbigny, 1826 (Fig. 1e-g). Several live individuals (7-9 cm long) Ormideia, Cyprus, 34°58'08N - 33°46'28E. Filming of a shoal of squids while hunting in the Cypriot waters. An already reported species (Tzomos *et al.*, 2010) is now observed in the SE of the island.

The climate change transforms the Mediterranean Sea from a temperate to a subtropical environment while human activities induce an increase in the alien biodiversity by means of species introduction from tropical or subtropical seas. It is becoming ever more crucial for the scientists to turn and focus their attention on the effects of alien species on the native ones.

## ACKNOWLEDGEMENTS

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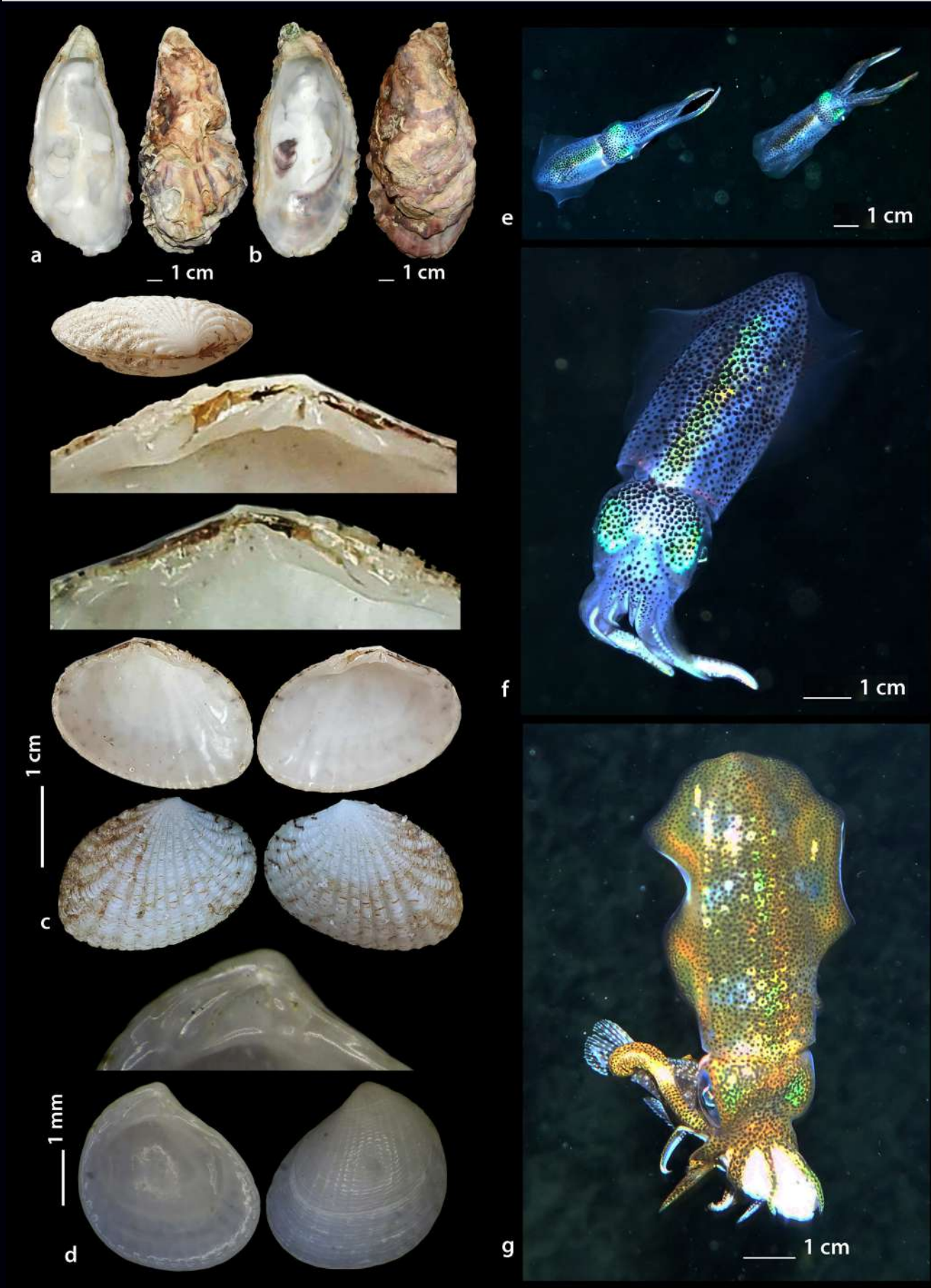


**Figure 1:** a and b. *Magallana gigas* (Thunberg, 1793); c. *Gafrarium savignyi* (Jonas, 1846); d. *Coripia corbis* (R. A. Philippi, 1836); e-g. *Sepioteuthis lessoniana* d'Orbigny, 1826, four filmed individuals, one with prey.

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**Abstract:** We describe here a new *Enaeta* sp. from Abrolhos Island, Bahian Subprovince, Brazil, named *Enaeta baili* n. sp.

**Résumé :** Nous décrivons ici une nouvelle espèce d' *Enateia* n. sp. de l'île d' Abrolhos, Province de Bahia, Brésil, nommée *Enaeta baili* n. sp.

**Keywords:** Brazilian Molluscan Province, Bahia subprovince, Abrolhos Arquipelago, Family *Volutidae*, *Lyriini* tribe, *Enaeta*, lecythotrophic development

**Abbreviations:**

NHUK National History Museum of United Kingdom, London, UK  
USNM National Museum of Natural History, Washington, USA  
MNRJ Museu Nacional Rio de Janeiro, Brazil  
OC Olivier Cravos reference collection.

**Introduction:**

The genus *Enaeta* H Adams & A Adams 1853 contains the smallest Volutidae after the neighbouring species *Leptoscapa crassilabrum* (Tate 1883). Initially represented by two medium sized shells from the Pacific Ocean, *E. barnesii* (Gray, 1825) and *E. cumingii* (Broderip, 1832), two smaller sized species from North Atlantic Ocean were added by G B Sowerby I in 1844, *E. cylleniformis* and *E. guildingii*.

Dall described *Enaeta reevei* in 1907, then Petuch described 3 species, *E. leonardhilli* Petuch 1982 from Fernão de Noronha Island and Atol das Rocas, Brazil, *E. bessei* Petuch 2013 from Rosalind Bank, Honduras and *E. lindae* Petuch 2013 from Bahamas.

In their 2004 book The Tribe Lyriini, Patrice Bail and Guido Poppe observed that two *Enaeta* species present a strange geographical distribution for species with non-planktotrophic development, *E. reevei* and *E. guildingii*. Both would be present in the Caribbean region and the Brazilian Sub province, with some doubt if there were no cryptic species covered by these taxa, especially if we consider the theoretically limited dispersal of these species due to lecithotrophic development. In addition, it is well known that the Amazon River delta makes it very difficult, if not impossible, for larvae and adults to cross over due to salinity variation and very strong stream.

Some shells were found by Femoral Team (Coltro José and Marcus company) in 2001, diving under rocks in the Abrolhos Archipelago, South of Bahia State, designating it as *Enaeta* sp. 23284. The initial identification from Bail and Poppe consisted in calling it to *Enaeta* aff. *leonardhilli* Petuch 1982. We want to show here it is indeed a distinct species.

**Systematic**

Order Neogastropoda Wenz 1938

Superfamily Volutioidea Rafinesque 1815

Family Volutidae Rafinesque 1815

Tribe Lyriini Pilsbry & Olsson 1954

Genus *Enaeta* H Adams & A Adams 1853

*Enaeta baili* n. sp. Crabos 2023, new species

**Description**

Type material:

Holotype MNRJ code 36302, 11,6 x 4,2 mm ((plate 1 fig 1, plate 2 fig 1)), paratype 1 with 11,2 x 4,4 mm in author's collection (plate 1 fig 2, plate 2 fig 2), paratype 2 with 10,5 mm in author's collection (plate 2 fig 3), paratype 3 with 10,1 mm from author's collection ex Greg Curry (plate 2 fig 4).

Type locality: Abrolhos Archipelago, 70 km from Alcobaça, 3 to 10 meters under rock, Southern Bahia State, Brazil

Distribution: only known from the type locality, and probably isolated to reefs at 70 km from Alcobaça coast.

Description: Shell small (10 to 13 mm) and slender with a straight outline, pale beige color with a variable pattern made of pale triangles and darker blotches, sculpture of 13-14 wavy axial ribs less visible on last whorl, spiral cords on the first whorls, white protoconch with two bulbous whorls, typical *Enaeta* blunt tooth on the inner edge of the mouth, aperture measuring 42 to 44% of the shell

Ecology: under rocks or on coral sand and rubble at 3 to 30 meters, same ecology as *Plicoliva zelindae* called *oceanica* form

**Discussion**

As mentioned earlier the key point is to show the differentiation between *Enaeta baili* n. sp., *Enaeta leonardhilli* and *Enaeta guildingii*, as it is different from the other species of the genus, from both Atlantic species by its far smaller size and more slender shape, and from North Atlantic species *Enaeta cylleniformis*, *E. lindae* and *E. reevei* by smaller size and more slender shape as well.

It is differentiated from *E. guildingii* (plate 1 fig 3, plate 2 fig 5 and 6 showing syntype 1967616 from NHMUK) which is more pointy shaped, more strongly ribbed on the whole teleoconch, bearing shoulders on each whorl giving it a more convex shape, with a brown protoconch and is only found in Martinique and St Vincent.

The main differences with *E. leonardhilli* (plate 1 fig 4, plate 3 fig 7) are, the more globulose protoconch for the new species (protoconch ratio height/width 0,65 against 0,68 for *E. leonardhilli*), white protoconch for *E. baili* compared to brown protoconch for *E. leonardhilli*, smaller shell (10,0-13,0 mm

against 12-17 mm for *E. leonardhilli*), less axial ribs (13-14 for the new species against 16-18 for *E. leonardhilli*) as observed by Bail and Poppe, and there are no shells with dark brown/black and white zebra pattern like it is frequently found for *E. leonardhilli* (see *E. leonardhilli* holotype).

We foresee other description of new Brazilian *Enaetas* as there are still two undescribed species: *Enaeta aff. reevei* (plate 1 fig 5, plate 3 fig 10) found in Espirito Santo and in Rio Grande do Norte (Bail and Poppe 2004) compared here with *Enaeta reevei* (Dall 1907) (plate 3 fig 9, with syntype 1968148\_2 from NHMUK), and also *Enaeta aff. cylleniformis* (plate 3 fig 11) found on Canopus Bank in Ceara. We show here pictures of these shells to be described when more specimens become available.

### Etymology

This species is named after Patrice Bail, Volute expert and gentleman, former Honorary President of AFC, who suggested that this was a new species. Knowing that I was a Volute connoisseur, he engaged the author to describe this Volutidae species.

### Acknowledgement:

I thank José and Marcus Coltro from Femorale, Bergeggi, Italy, and São Paulo, Brazil, as well as Peter Stimpson from Loudon, Tennessee, USA, for kindly offering the holotype. José agreed to read my text and made useful observations.

Alexandre Pimenta from Museu Nacional, Rio de Janeiro, Brazil, took the pictures, measured the shells, and helped with this description.

Andreia Salvador from Natural History of the United Kingdom, London, supplied pictures of holotypes and syntypes of diverse *Enaeta* species.

Last but not least, Patrice Bail, Volutidae expert, Honorary President of AFC (French Association of Conchology)

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PLATE 1. Protoconch comparison.



1. *Enaeta baili* n. sp. Holotype MNRJ code 36302, protoconch., Abrolhos Archipelago, Brazil, 11,2 mm, Coll. OC
2. *Enaeta baili* n. sp. Paratype 1, protoconch., Abrolhos Archipelago, Brazil, 11,2 mm, Coll. OC
3. *Enaeta guildingii* (G B Sowerby I, 1844), protoconch, St Vincent, 15 mm, Coll. OC
4. *Enaeta leonardhilli* Petuch, 1988, protoconch, Fernão de Noronha Island, Praia da Conceição, Brazil 16 mm Coll. OC
5. *Enaeta aff. reevei*, protoconch, Natal RN, Brazil, 15 mm Coll. OC

Plate 2.



1. *Enaeta baili* n. sp. Holotype MNRJ 36302, Abrolhos Arquipelago
2. *Enaeta baili* n. sp. Paratype 1, 11,2 mm, Abrolhos Arquipelago
3. *Enaeta baili* n. sp. Paratype 2, 10,5 mm, Alcobaça
4. *Enaeta baili* n. sp. Paratype 3, 10,1 mm, Alcobaça
5. *Enaeta guildingii* (G B Sowerby I, 1844), Syntype NHMUK 1967616, 12,9 mm, St Vincent
6. *Enaeta guildingii* (G B Sowerby I, 1844), Coll. O.C., 15 mm, St Vincent

Plate 3.



7. *Enaeta leonardhilli* Petuch, 1988, Holotype USNM 859943, 14 mm, Fernão de Noronha Island, Brazil

8. *Enaeta leonardhilli* Petuch, 1988, Coll. O.C., 16 mm, Fernão de Noronha Island, Praia da Conceição

9. *Enaeta reevei* (Dall, 1907), Syntype NHMUK 1968148/1 14.75 mm, Honduras

10. *Enaeta* aff. *reevei*, Coll. O.C., 15 mm, Natal RN, Brazil

11. *Enaeta* aff. *cylleniformis*, Coll. O.C., 17 mm, Canopus Bank CE, Brazil



Flabellinidae  
*Coryphellina lotos*

Korshunova, Martynov, Bakken, Evertsen, Fletcher, Mudianta, Saito, Lundin, Schrödl & Picton, 2017  
Touho, Nnouvelle Calédonie  
Photographie: Alain Daoulas 18/08/2023

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