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des richesses incalculables mais si vous
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rivage !

Mocharrafoddin Saadi

Célèbre poète persan né à Schiraz en 1184

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Phasmoconus (Phasmoconus) chindeensis sp. nov. (Gastropoda: Conidae), new species from the Mozambique channel

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ABSTRACT

Phasmoconus (P.) chindeensis new species from the Mozambique Channel is described and compared with species from the *Phasmoconus (P.) inscriptus* complex as *P.(P.) adenensis* (E.A. Smith, 1891) from Somalia and Yemen; *P.(P.) inscriptus* (Reeve, 1843) from Red Sea to West India; *P.(P.) maculospira* (Pilsbry & Johnson in Pilsbry, 1922) from Gulf of Bengal to Thailand; *P.(P.) salzmanni* (G. Raybaudi Massilia & Rolan, 1997) and *P.(P.) yemenensis* (Bondarev, 1997) both from Yemen and Somalia and with some other species.

RESUME

Phasmoconus (P.) chindeensis nouvelle espèce du Canal du Mozambique est décrit et comparé avec quelques espèces du complexe *Phasmoconus (P.) inscriptus* telles que *P.(P.) adenensis* (E.A. Smith, 1891) de Somalie et Yémen ; *P.(P.) inscriptus* (Reeve, 1843) de la Mer Rouge jusqu'à l'Ouest de l'Inde ; *P.(P.) maculospira* (Pilsbry & Johnson in Pilsbry, 1922) du Golfe du Bengale à la Thaïlande ; *P.(P.) salzmanni* (G. Raybaudi Massilia & Rolan, 1997) et *P.(P.) yemenensis* (Bondarev, 1997) toutes deux du Yémen et de Somalie et avec quelques autres espèces.

INTRODUCTION

Phasmoconus (P.) inscriptus complex is present in most parts of the Tropical Indian Ocean.

The new species described here was widely confused in the literature with the real *P.(P.) adenensis*.

MATERIAL AND METHODS

The taxonomy used in this paper follows Monnier, Limpalaër, Robin & Roux (2018). We describe shell morphology using the terminology established in Röckel *et al.* (1995) and modified in Monnier, Limpalaër, Robin & Roux (2018).

Adult shells were measured with digital calipers, most of the time the measurements were rounded to 0.01 millimeter.

Manuel J. Tenorio performed analysis of the covariance (ANCOVA) for different shell parameters using species hypothesis as factor and shell length (SL as covariate). Additionally, he compared the mean values of SL statistically using t- and U-tests. Statistical tests were carried out using STATGRAPHICS XVII-X64, after all the measurements sets passed the Normality tests.

Distribution maps were made with Tableau Software using the latitudes and longitudes from the studied specimen data.

REPOSITORIES

KPMY: Kanagawa Prefectural Museum, Yokohama, Japan.

MHNG: Muséum d'Histoire Naturelle, Geneva, Switzerland.

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

MNHN: Musée d'Histoire Naturelle Nice, France.

NHMUK: National Museum of Natural History, United Kingdom.

SMNS: Staatliches Museum für Naturkunde, Stuttgart, Germany.

AV: Armando Verdasca reference collection, Porto Salvo, Portugal.

EM: Eric Monnier reference collection, Paris, France.

FP: Fabrice Prugnaud reference collection, Suresnes, France.

LL: Loïc Limpalaër reference collection, Haudivillers, France.

TJ: Thierry Joly reference collection, Saint-Cyr-sur-Mer, France.

FH: Francis Hennequin, Lamothe-Montravel, France.

Shell morphometry
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

SYSTEMATICS

Family CONIDAE Fleming, 1822
Genus *Phasmoconus* Mörch, 1852

Phasmoconus (Phasmoconus) chindeensis sp. nov.

(Plate 1, Figs. 0–8 ; Plate 2, Figs. 9–17, Plate 3, Figs. 18–28)

Type material: Holotype and 28 paratypes. The holotype is deposited in the Muséum National d'Histoire Naturelle, Paris, France under the number MNHN-IM-2000-35772 (ex-Eric Monnier's collection). The paratypes are stored in private collections.

(see Table 1 for details)

Material examined: 29 specimens (including 27 adults and 2 subadults) of *(Phasmoconus) chindeensis* sp. nov. have been examined and studied.



Figure 1: Holotype of *Phasmoconus (Phasmoconus) chindeensis* sp. nov. MNHN-IM-2000-35772

TYPE	Institution	Dimensions - Weight S _L x MD x W (mm x mm x g)	Locality
Holotype	Holotype MNHN-IM-2000-35772	53.97 x 24.89 x 12.5	Chinde, N. Mozambique, 45-65 m
Paratype 1	Coll. EM	60.99 x 26.84 x 17.1	Quelimane, N. Mozambique, 30-50 m
Paratype 2	Coll. EM	59.23 x 26.37 x 14.4	N. Quelimane, N. Mozambique, 35-45 m
Paratype 3	Coll. EM	52.93 x 23.98 x 11.0	Mozambique
Paratype 4	Coll. EM	57.14 x 26.37 x 15.3	Nacala, N. Mozambique, 60-80 m
Paratype 5	Coll. EM	59.40 x 27.10 x 15.6	S. Mozambique, 50-80 m
Paratype 6	Coll. EM	54.31 x 26.90 x 15.3	Quelimane, N. Mozambique, 30-50 m
Paratype 7	Coll. EM	52.58 x 24.21 x 11.0	South Africa
Paratype 8	Coll. EM	57.73 x 25.74 x 13.6	Quelimane, N. Mozambique, 30-50 m
Paratype 9	Coll. EM	67.60 x 30.85 x 24.0	S. Chinde, N. Mozambique, 35-45 m
Paratype 10	Coll. EM	60.56 x 28.97 x 17.1	Mozambique Isl., N. Mozambique
Paratype 11	Coll. EM	51.41 x 23.72 x 11.0	Mozambique
Paratype 12	Coll. EM	54.29 x 24.80 x 11.9	Mozambique Isl., N. Mozambique
Paratype 13	Coll. EM	52.67 x 24.52 x 12.2	Between Beira & Quelimane, Mozambique, 35-45 m
Paratype 14	Coll. EM	59.95 x 28.56 x 18.2	S. Chinde, N. Mozambique
Paratype 15	Coll. EM	57.24 x 26.22 x 14.6	N. Natal, RSA, 50-70 m
Paratype 16	Coll. EM	50.87 x 23.42 x 10.7	S. Chinde, N. Mozambique, 35-45 m
Paratype 17	Coll. FP	56.84 x 26.89 x 12.5	Mozambique
Paratype 18	Coll. FP	55.17 x 27.34 x 13.6	Mozambique
Paratype 19	Coll. FP	58.78 x 28.97 x 18.4	Natal, RSA
Paratype 20	Coll. EM	52.24 x 24.27 x 12.0	S. Chinde, N. Mozambique, 35-45 m
Paratype 21	Coll. EM	56.27 x 25.14 x 13.3	Quelimane, N. Mozambique, 30-50 m
Paratype 22	Coll. FP	55.16 x 26.61 x 13.3	S. Chinde, N. Mozambique, 40-60 m
Paratype 23	Coll. FP	60.07 x 29.62 x 19.0	S. Chinde, N. Mozambique, 60-80 m
Paratype 24	Coll. FP	55.09 x 25.62 x 13.4	S. Mozambique, 50-80 m
Paratype 25	Coll. AV	77.50 x 36.30 x 50.0	Quelimane, N. Mozambique, 30-50 m
Paratype 26	Col. AV	73.90 x 34.50 x 25.0	Quelimane, N. Mozambique, 30-50 m
Paratype 27	Coll. EM	45.25 x 19.97 x 7.7	Quelimane, N. Mozambique, 30-50 m
Paratype 28	Coll. EM	34.86 x 15.95 x 4.5	Ifaty, S.W. Madagascar, 70 m

Table 1: Types of *Phasmoconus (Phasmoconus) chindeensis* sp. nov.

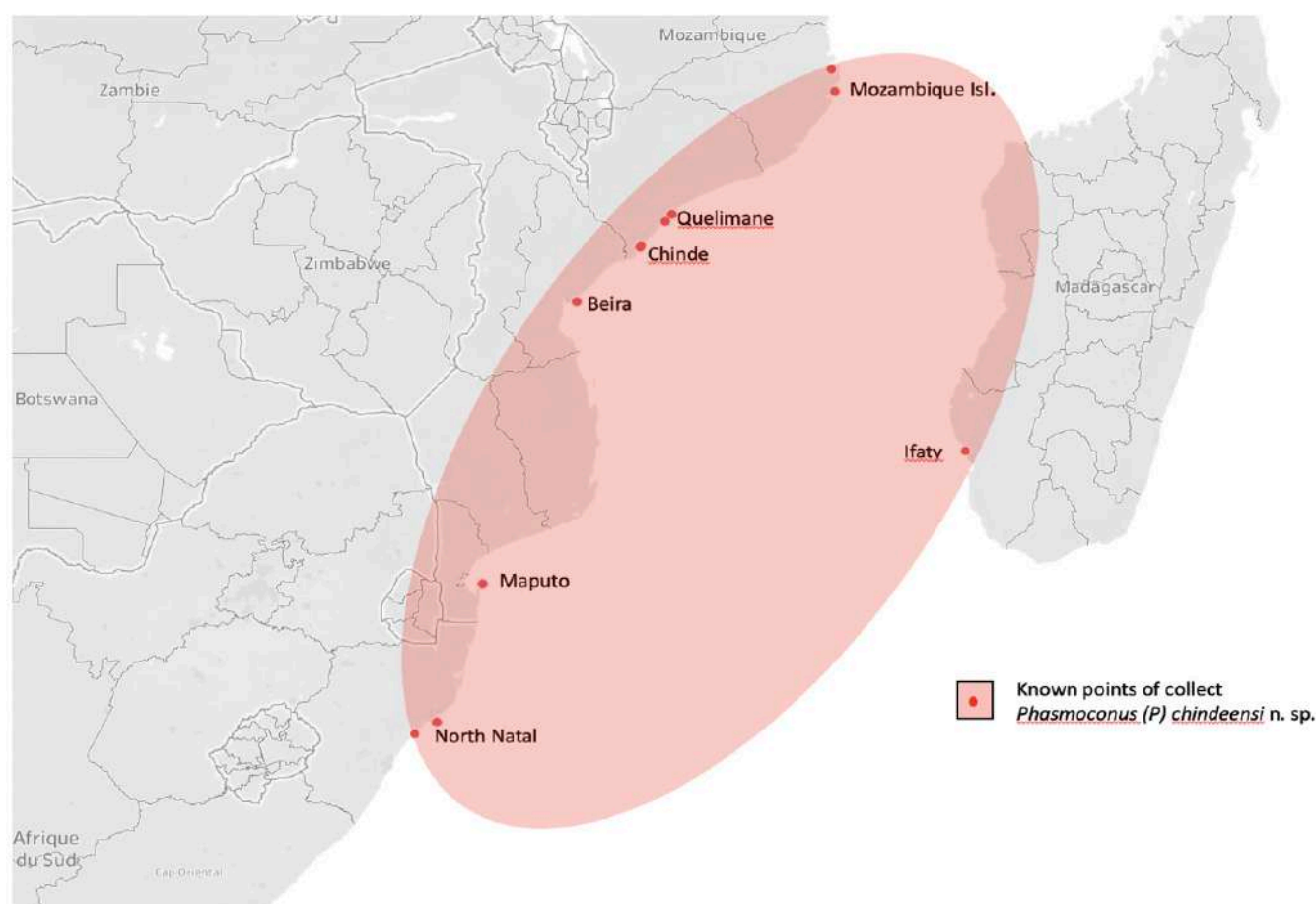


Figure 2: Distribution map of *Phasmoconus (Phasmoconus) chindeensis* sp. nov.

Type locality: Chinde, Northern Mozambique, 30-65 m

Distribution and habitat: The species is mostly collected from shallow water shrimp trawlers in muddy sand bottom between 30 and 70 meters deep in the Northern Mozambique area around south of Chinde. It extends along the Mozambican coasts. The species is also present off the coasts of Natal (Northern South Africa) and Ifaty, near Toliara (South West of Madagascar).

Etymology: the new species is named after the city of Chinde, Mozambique. The holotype was fished off there.

Description of the shell of
Phasmoconus (Phasmoconus) chindeensis sp. nov.

Morphometric parameters: only the adult specimens have been used for these values.

SL = 50-78 mm (mean SL = 57.9 mm); RD = 0.52-0.61 (mean RD = 0.57); PMD = 0.85-0.94 (mean PMD = 0.90); RSH = 0.10-0.21 (mean RSH = 0.18); RW = 2.1-6.5 g/cm (mean RW = 2.7 g/cm); RW' = 0.30-0.51 g/cm³ (mean RW' = 0.39 g/cm³).

Description: Shell medium sized to moderately large, conical in profile. The shell is moderately solid to solid. The apex is white. The protoconch (no observed specimen had a fully intact one) is smooth, translucent and multispiral with more than 2.5 whorls. The shell has 13-14 whorls in full adult specimens. Spire of moderate height, with a concave outline. The 4 to 6 first teleoconch whorls are tuberculated and stepped (**Fig. 3**)

and the last ones are juxtaposed to overlapping. The suture is deep and narrow with linear sutural lines. Teleoconch sutural ramps are convex and raised along the suture - participating to its stepped aspect - with 5 or 6 fine spiral grooves with the stronger being those closer to suture and then rapidly fading and becoming inconspicuous. There are also very fine hardly visible radial threads. The shoulder is subangulate. The profile of the last whorl is convex. Fully adult specimens have an almost smooth last whorl with some wide flat spiral ribs on the abapical half of the last whorl and becoming obsolete in the adapical half. The spiral ribs are much more pronounced for subadult specimens (**see paratype 28**).

The columellar fold is strong and cream coloured. The siphonal lip outline is almost straight. Aperture profile is slightly convex and wider at base than near shoulder. The aperture is pale violet or bluish white coloured inside (rarely pale yellowish). The outer lip is convex but becomes straight near the base and the profile of the origin of the lip is receding. The ground color of the last whorl is white to ivory. The last whorl is covered by spirals rows of spots and dashes of orange brown to chesnut colour. Irregular blotches forming spiral rows are overlapping the spots at the shoulder, at the center and at the two-thirds of the last whorl. These rows of blotches are forming a meshwork. The pattern and color of the spire is in accordance with that of the last whorl. Few specimens are ivory coloured with only sparse small dots (**paratypes 4, 21, 22 & 24**).



Figure 3: spire of *Phasmoconus (Phasmoconus) chindeensis* sp. nov. (paratype 28) 34.86 mm

Living animal and radula:

Morphology of the radula and DNA of the new species are not yet known. From a picture of paratype 28 (fig. 4) the foot and siphon appear to have a pale cream ground colour marbled with brown.



Figure 4: living subadult paratype 28 of *Phasmoconus (Phasmoconus) chindeensis* sp. nov. 34.86 mm, Ifaty, S.W. Madagascar, 70 m (photo: FH)

COMPARISONS

Phasmoconus (Phasmoconus) chindeensis sp. nov. can be compared with other species of *Phasmoconus* from Indian Ocean.

A. Differentiating features

-1- *P.(P.) adenensis* (E.A.Smith, 1891) from Somalia. (Plate 4) Holotype of this species (48 x 21.5 mm, Aden, Yemen) is stored in London (NHMUK). *Phasmoconus (P.) chindeensis*, sp. nov. reaches a larger size (Maximum size SL= 78 mm instead of 60 mm for *P.(P.) adenensis*). The new species is less slender (aver-

age value of the relative diameter RD = 0.57 versus 0.54 for *P.(P.) adenensis*) with a straighter and slightly lower spire, average relative spire height (RSH= 0.18 versus 0.19 for *P.(P.) adenensis*).

The new species has a similar but more intricate and darker pattern than *P.(P.) adenensis* but the main difference is probably that in adult shells, the large spiral ribs on the abapical half of the last whorl are always much more pronounced in *P.(P.) adenensis* than in the new species where only the subadult specimens (paratype 28) have strong ribs over the entire last whorl. As shown in fig. 12 teleoconch sutural ramps have about 5 to 6 fine spiral grooves and intervening ribs in the new species instead of 3-4 in *P.(P.) adenensis*. However the structure of this sculpture is identical in both species with the stronger ribs being grouped close to the suture and then rapidly fading. The geographical range of the 2 species is disjunct: *P.(P.) adenensis* being present in the North West of the Tropical Indian Ocean while the new species is only known in the South West along the Mozambique Channel and no *Phasmoconus* populations are presently known to us off Kenya or Tanzania between the respective ranges of the two species.

-2- *P.(P.) inscriptus* (Reeve, 1843) from Southern Red Sea to West India. (Plate 5-6)

This very variable patterned species has a large geographical range from the South of the Red Sea to South India. It is disjunct from the one of the new species. The size, shape and pattern are almost similar with a slightly wider shell for *P.(P.) inscriptus* (average RD= 0.59 versus 0.57 for the new species) and a lower spire (average RSH = 0.15 versus 0.18 for the new species).

The pattern of the new species is most often covered by larger brown irregular blotches over the last whorl. Moreover, *P.(P.) inscriptus* has an albinistic colour variant (known as form *cuneiformis* E.A. Smith, 1877) while the new species has ivory coloured shells with few small blotches. In the new species and in *P.(P.) adenensis* the sutural ramp is raised along the suture, participating to its stepped aspect while it remains flat in *P.(P.) inscriptus* and *P.(P.) maculospira*. The sculpture of the sutural ramp also appears to be different with the spiral ribs grouped in the upper part of the sutural ramp in the new species while they cover the whole sutural ramp with equal strength in *P.(P.) inscriptus*.

-3- *P.(P.) maculospira* (Pilsbry & Johnson in Pilsbry, 1922) from Gulf of Bengal to Thailand. (Plate 7) This species is very similar in shape and size to the new species and to *P.(P.) inscriptus*. It is lighter in color pattern (pale orange to light brown).

The spire is lower than the new species (average RSH= 0.14 versus 0.18 for the new species).

In Röckel et al. (1995) it is mentioned (p.194) that the "larval shell of the population from W. Thailand has about 1.75 whorls" and therefore has a paucispiral protoconch instead of 2.5 (our data) to 3 (Röckel & al. 1995) whorls in the new species that points to a multispiral protoconch. These differences have significant consequences on the development

mode which can be inferred to be direct or lecithotrophic with a short veliger stage in *P.(P.) maculospira* while the new species can be inferred to have a planktotrophic development mode. This information of a completely different type of protoconch is a strong argument to separate both species. The sutural ramp of *P.(P.) maculospira* has the same characters than *P.(P.) inscriptus* and therefore differs from that of the new species in the same way.

-4- *P.(P.) salzmanni* (G. Raybaudi Massilia & Rolan, 1997) from Yemen and Somalia. (Plate 8)

This moderately small species (average SL = 28.8 mm versus 57.9 for the new species) has a restricted geographical range: the Gulf of Aden, very far from the range of *P.(P.) chindeensis*, sp. nov. The protoconch is clearly paucispiral in contrast with the new species. The shape and pattern are similar with those of the new species.

-5- *P.(P.) yemenensis* (Bondarev, 1997) from Yemen and Somalia. (Plate 8)

As for the previous species this small to moderately small species (average SL = 25.5 mm) seems geographically restricted to the Gulf of Aden. The pattern is similar with that of the new species but the shape is quite different with a convex last whorl and an higher spire with strongly stepped spire whorls (RSH= 0.28 versus 0.18 for the new species).

We can also compare *P.(P.) chindeensis* sp. nov. with three other similar species, although it seems unlikely to confuse them with the new species.

-6- *P.(P.) jickelii* (Weinkauff, 1873) from Yemen, Djibouti & Somalia. Medium sized species (35-45 mm), with a paucispiral protoconch, a low and very concave spire outline, a convex last whorl and a brown (or sometimes orange) pattern that is similar to some shells of the new species.



Figure 5: *Phasmoconus (P.) jickelii* 37.25 mm, Calawla, Somalia, Coll. FP.

7- *P.(P.) keatii* (Sowerby II, 1858) from West Indian Ocean. This species is very poorly understood and remains rare in collections. The shell is moderately small to medium sized (30-40 mm) with a similar shape and pattern than the new species but it has a paucispiral protoconch and a more angulate shoulder.



Figure 6: *Phasmoconus (P.) keatii* 38.9 mm, Aden, Yemen, Coll. EM

-8- *P.(P.) tenorioi* Monnier, Monteiro & Limpalaër, 2016 from Dahlak Islands, Eritrea. A very rare medium sized species (43-50 mm) with a paucispiral protoconch and a moderate height of spire (average RSH= 0.14). The shells are more elongated than the other *Phasmoconus* species cited here (average RD= 0.53 versus 0.57 for the new species). The pattern consists in spiral rows of roughly squarish spots.



Figure 7: *Phasmoconus (P.) tenorioi* 48.3 mm, Ras Gurnut, Dahlak Isl., Eritrea., Holotype SMNS-ZI0065744

B. Geographical ranges of members of the complex

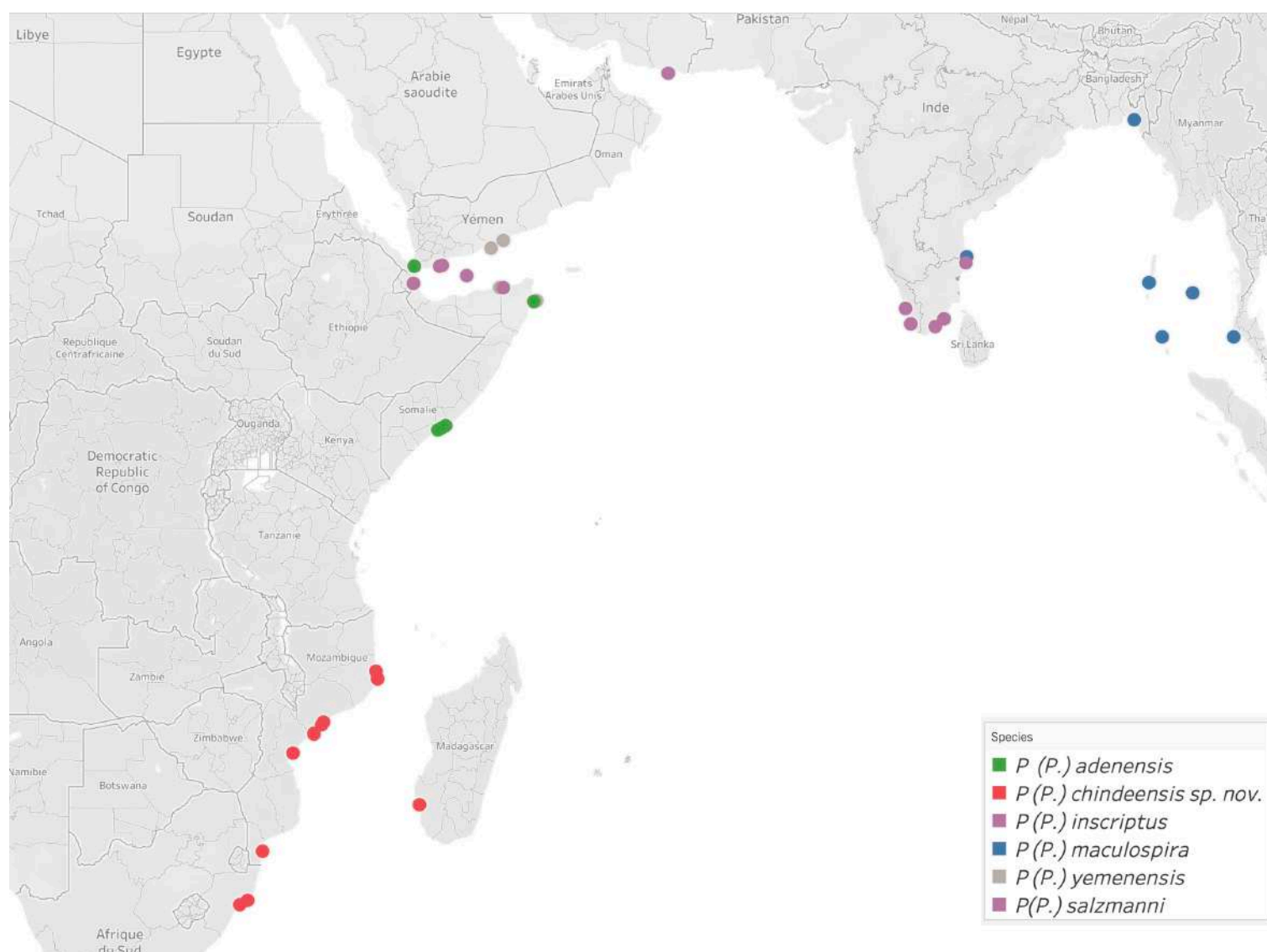


Figure 8: Distribution map of some *Phasmoconus* in the Indian Ocean

Figure 8 show the geographical repartition of *P. (P.) chindeensis*, sp. nov. and five similar *Phasmoconus* species in the Tropical Indian Ocean. The new species is the only known species of this complex who is living in the South Western Part of this Ocean.

C. Morphometric study

1. Morphometric statistic study of *Phasmoconus (P.) chindeensis* sp. nov. by M.J. Tenorio

The shell length (SL) and the morphometric parameters MD, HMD and SH of *P. (P.) chindeensis* sp. nov. (N = 26) were statistically compared with those of *P. (P.) adenensis* (N = 11), *P. (P.) inscriptus* (N = 18) and *P. (P.) maculospira* (N = 15).

The shell length of *P. (P.) chindeensis* (mean SL of 56.1 mm in the sample studied) is significantly larger than that of *P. (P.) adenensis* (mean SL of 50.5 mm). The differences in shell length are statistically significant, according to pairwise *t*- ($t = -2.995$, $p = 0.005$) and *U*-tests ($U = 219.0$, $p = 0.012$). On the other

hand, no statistically significant differences in SL were found between *P. (P.) chindeensis* and *P. (P.) inscriptus* ($t = -0.0734$, $p = 0.942$) or *P. (P.) maculospira* ($t = 0.0973$, $p = 0.923$).

We tested for statistically significant differences in MD, HMD and SH among the differences species using analysis of the covariance (ANCOVA) using species hypothesis as factor, the corresponding morphometric parameter as variable, and SL as covariate once all measurements passed the corresponding normality tests. We did find statistically significant differences in morphometric parameters corrected for differences in SL among *P. (P.) chindeensis*, *P. (P.) inscriptus* and *P. (P.) maculospira*, as shown in the table, although comparison between SL and the morphometric parameters of *P. (P.) inscriptus* and *P. (P.) maculospira* did not yield statistically significant differences (all *p*-values > 0.05). At variance with this, only the differences in MD between *P. (P.) chindeensis* and *P. (P.) adenensis* were statistically significant at 95% probability level.

2. Morphometric parameters for *P.(P.) chindeensis* sp. nov. & 5 compared species

Species	Values	SL (mm)	RD	PMD	RSH	RW (g/cm)	RW' (g/cm ³)
<i>P.(P.) chindeensis</i> <i>sp. nov.</i>	our values	50 - 78	0.52 - 0.61	0.85 - 0.94	0.10 - 0.21	2.1 - 6.5	0.30 - 0.51
	medium value	57.9	0.57	0.9	0.18	2.7	0.39
<i>P.(P.) adenensis</i>	our values	45 - 60	0.53 - 0.56	0.84 - 0.94	0.15 - 0.22	1.8 - 2.5	0.38 - 0.46
	medium value	52.4	0.54	0.9	0.19	2.2	0.43
	RKK	40 - 74	0.52 - 0.63	0.79 - 0.90	0.10 - 0.23	0.9 - 4.4	-
<i>P.(P.) inscriptus</i>	our values	47 - 74	0.56 - 0.62	0.84 - 0.91	0.10 - 0.21	2.2 - 3.7	0.29 - 0.42
	medium value	57.3	0.59	0.88	0.15	2.8	0.36
	RKK	"40 - 74"	0.51 - 0.68	0.79 - 0.90	0.10 - 0.15	0.9 - 4.4	-
<i>P.(P.) maculospira</i>	our values	44 - 72	0.51 - 0.63	0.84 - 0.96	0.08 - 0.17	1.5 - 4.3	0.29 - 0.40
	medium value	56.3	0.57	0.89	0.14	2.7	0.34
	RKK	-	0.55 - 0.64	0.79 - 0.90	0.10 - 0.15	0.9 - 4.4	-
<i>P.(P.) yemenensis</i>	our values	19 - 31	0.58 - 0.63	0.90 - 0.97	0.25 - 0.31	0.4 - 0.6	0.4 - 0.6
	medium value	24.5	0.6	0.94	0.28	0.45	0.48
	Rolan & Raybaudi	30.5	-	-	-	-	-
<i>P.(P.) salzmanni</i>	our values	26 - 33	0.56 - 0.61	0.89 - 0.95	0.15 - 0.20	0.6 - 1.1	0.4 - 0.6
	medium value	28.8	0.58	0.92	0.19	0.8	0.49
	Rolan & Raybaudi	27	-	-	-	-	-

Table 2: Morphometric and weight parameters including SL, RD, PMD, RSH, RW & RW' for adult specimens of *Phasmoconus (P.) chindeensis* sp. nov., *P.(P.) adenensis*, *P.(P.) inscriptus*, *P.(P.) maculospira*, *P.(P.) yemenensis* & *P.(P.) salzmanni*

Table.2- Results of the comparison of the morphometric parameters of *P.(P.) chindeensis* and those of the indicated by ANCOVA using species hypothesis as factor, the corresponding morphometric parameter as variable, and SL as covariate. Morphometric parameters with statistically significant differences are marked with *.

From this analysis we can conclude that *P.(P.) inscriptus* and *P.(P.) maculospira* can be separated from *P.(P.) chindeensis* based upon differences in shell shape but not in shell length.

Therefore, we can assume that *P.(P.) chindeensis* has a slightly narrower body whorl with a higher spire than *P.(P.) inscriptus* and *P.(P.) maculospira*, and same mean shell length. *P.(P.) adenensis* only showed a statistically significant difference in MD, which is slightly narrower than in the case of *P.(P.) chindeensis* (25.3 mm in *chindeensis* versus 24.1 mm in *adenensis*).

The results of this morphometric analysis suggest that *P.(P.) chindeensis* occupies an intermediate position between *P.(P.) adenensis*, *P.(P.) inscriptus* and *P.(P.) maculospira* in terms of shell shape and size. However, the results of the comparison with *P.(P.) adenensis* must be considered with due caution due

to the relatively small number of individuals included in the study for this species (N = 11).

3. Graphical morphometric comparisons

Graph of RD = f(PMD) for *Phasmoconus chindeensis* sp. n., *P. adenensis*, *P. inscriptus*, *P. maculospira*

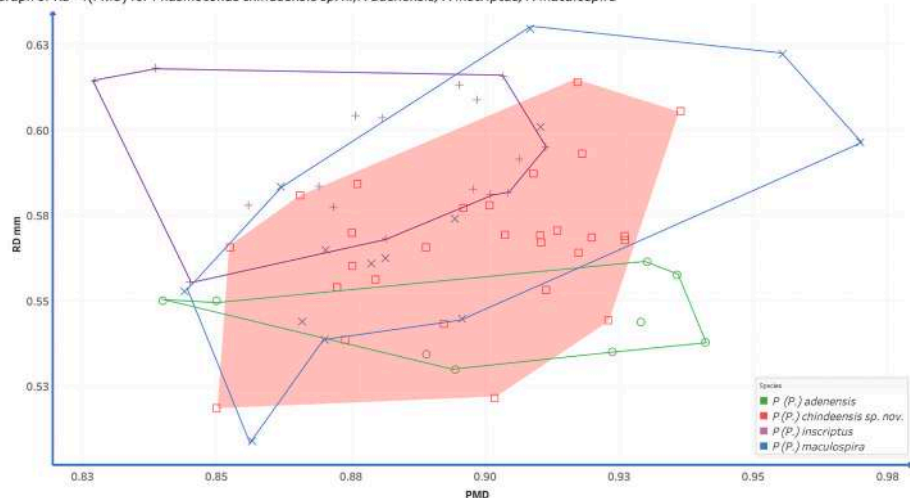


Figure 9: Graph of PMD = f(RD) for 4 species. *Phasmoconus (P.) chindeensis* sp. nov. is figured in red color.

Figure 10 shows that the plotting area of each of the adult specimens of the 2 related species represented on the graph are separated. The new species having a higher aperture height and maximum diameter than *P. (P.) adenensis*.

Graph of AH = f(MD) for *P. (P.) chindeensis* sp. n. & *P. (P.) adenensis*

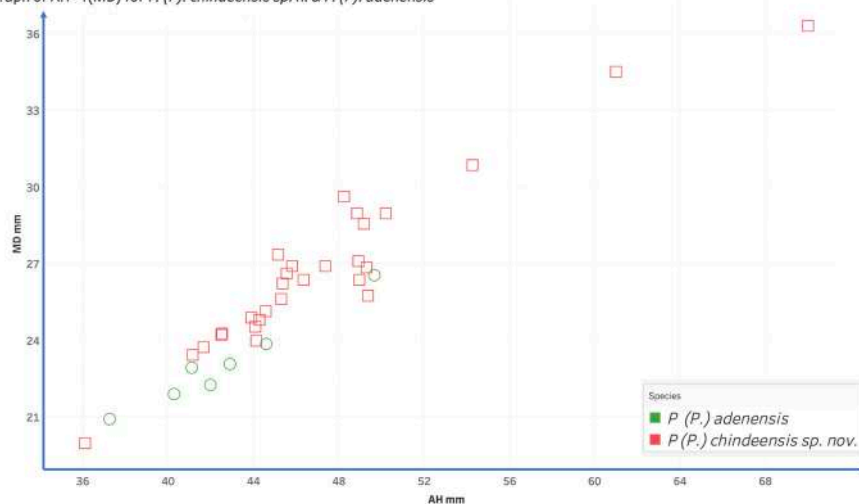


Figure 10: Graph of MD = f(AH) for 2 species: *Phasmoconus (P.) chindeensis* sp. nov. and *P. (P.) adenensis*.

Graph of HMD = f(MD) for *P. (P.) chindeensis* sp. n., *P. (P.) adenensis*, *P. (P.) inscriptus*, & *P. (P.) maculospira*

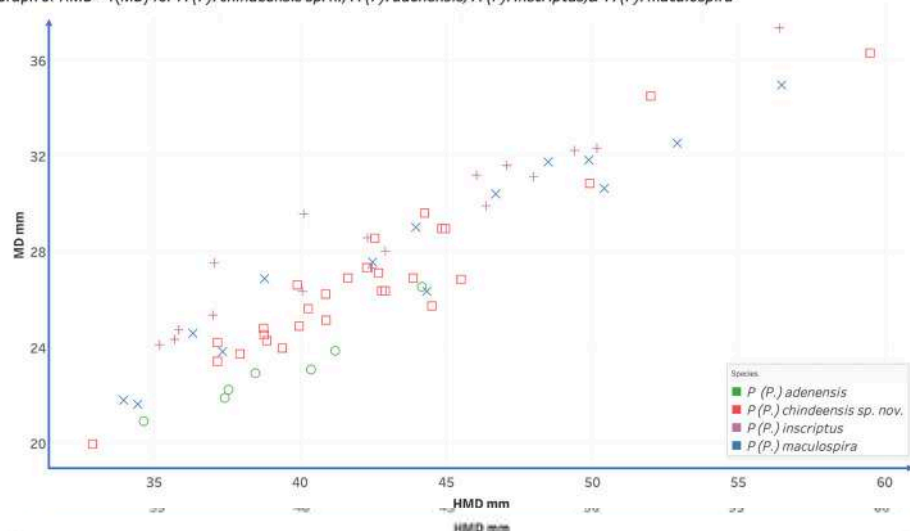


Figure 11 shows that the plotting area of each of the 4 related species represented on the graph are only partially separated.

Figure 11: Graph of MD = f(HMD) for *Phasmoconus (P.) chindeensis* sp. nov. and 3 species of the *Phasmoconus (P.) inscriptus* complex.

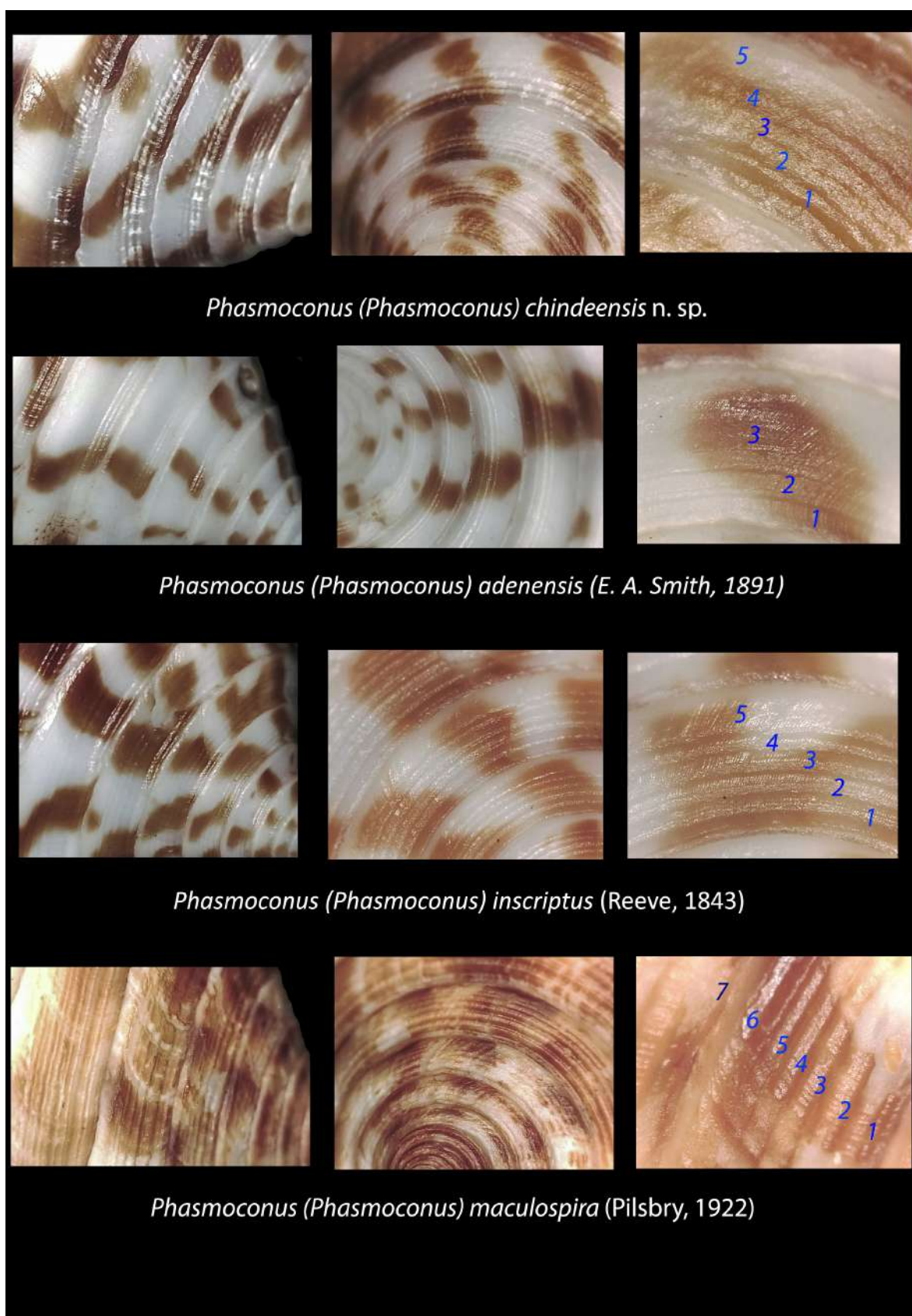


Figure 12: Comparison of the teleoconch sutural ramps on the spires of *Phasmoconus (P.) chindeensis* sp. nov. and 3 species of the *Phasmoconus inscriptus* complex.

The Figure 12 allows us to see the details of the spires and particularly the teleoconch sutural ramps with the spiral grooves of the 4 main species studied here. As for the great majority of *Phasmoconus* the radial threads are hardly visible.

REMARKS

The “*Conus inscriptus* Reeve, 1843” group has been the subject of many publications and discussions. As often, it contains closely related and resembling species that are rather variable and only differing in subtle characters and geographic ranges. Getting a clear vision of the various taxa involved requires to gather many specimens and information in order to sort out the taxonomically significant units. Below is a review of these description for a better understanding of the chronology in which they were described.



-1- *Conus inscriptus* (Reeve, 1843). There were three syntypes in NHMUK that cannot be traced at present (Filmer, 2001). They are of moderately small size (29 to 34.5 mm). No type locality is given in the original description. From the type figure and description, the best fitting actual shells are those from the Southern Red Sea and Peninsular India that were ascribed to this species by Monnier & al. (2018).



-2- *Conus planiliratus* Sowerby III, 1870. The primary type is in NHMUK. It is a junior homonym of *Conus (Leptoconus) planiliratus* Sowerby I, 1850, a fossil shell from Santo Domingo (Caribbean), from Tertiary beds. It was later renamed by Pilsbry & Johnson in 1922 as *Conus maculospira*. The replacement is introduced in just few words and the name is attributed to both Pilsbry in Johnson in a paper authored by Johnson. There is no indication if the species epithet is a noun in apposition or an adjective. In Monnier & al. (2018) the specific epithet was accorded to the Genus name and spelled *maculospiras* and attributed to Pilsbry only. Raybaudi Massilia (1989) did so. Other authors kept “*maculospira*”. Philippe Bouchet (pers. comm.) considers that “*maculospira*” is a noun in apposition. Therefore, the right spelling for the species should now be: ***Phasmoconus (Phasmoconus) maculospira (Pilsbry & Johnson in Pilsbry, 1922)***. In our opinion it represents a valid species that lives in the Tropical central Indian Ocean.



-3- *Conus tegulatus* Sowerby III, 1870, Holotype BMNH 19 x 9 mm. It is a juvenile cone with a generic geographic origin: “China seas”. The juvenile stage of that shell renders identification difficult. It has been considered as a synonym of *Phasmoconus (P.) inscriptus* by Röckel & al. (1995) and Filmer (2001) and we follow here these opinions. The name is still sometimes used in price lists for shells originating from Northern Australia or (in the concept of Walls (1981)) for some *Phasmoconus collisus* complex members.



-4- *Conus cuneiformis* (E.A. Smith, 1877). The lectotype measures 25.2 x 14.1 mm. Described from a juvenile cone from the Cumingian collection now preserved in NHMUK. The author compares it with *Kalloconus (Trovaconus) trochulus* (Reeve, 1844), a West African cone, warning the reader not to confuse both. No locality data is attached to it. It is placed in synonymy with *Conus inscriptus* by Röckel, Korn & Kohn (1995) and Filmer (2001). We follow their opinion in this paper. The name is used today as a white colour form of *Phasmoconus (P.) inscriptus* that turns up in dealer’s lists for Indian shells.



-5- *Conus cavailloni* (Fenaux, 1942). The holotype is in the MNHNI and was rediscovered by Fenzan in 2007 (Fenzan & Filmer, 2013). The shell dimensions are 48.1 x 18.1 mm. The type locality given by Fenaux is “Bermudas”. It must be considered as wrong because no comparable Conid has ever been collected in the Western Atlantic. The opinions about the identity of the species have been based for a long time on the short Fenaux’s text and the picture of the holotype in the original description. Fenzan & Filmer (2013) give a review of these opinions that place *Conus cavailloni* either in synonymy

of *P. (P.) inscriptus* or *P. (P.) keatii*.

Tucker & Bozzetti (2010) reinstated the validity of *P. (P.) cavailoni* and corrected the type locality as Sandraviny, southeast Madagascar. Reviewing their paper, we consider that the two shells presented are most likely *Phasmoconus (P.) lynceus*. They give arguments for their claim that are discussed and refuted by Fenzan & Filmer (2013). Our opinion is the presence of *P. (P.) lynceus* have to wait for future expeditions to be assessed. The MNHN expeditions in the deep Madagascar South failed to collect any such specimens.

In their paper on Fenaux's types W. Fenzan & M. Filmer (2013) make an extensive comparison of Fenaux's type with material of *P. (P.) inscriptus*, *P. (P.) adenensis* and *P. (P.) keatii* and placed it as a synonyme of *P. (P.) inscriptus*. As we could not check the actual holotype and specially its sutural ramps sculpture. We follows partially the opinion of Fenzan & Fimer (2013) In our opinion this is *P. (P.) keati* with an abnormal protoconch.



-6- *Conus (s.s.) keatiformis* (Shikama & Oishi, 1977). The holotype is in KPMY, its dimensions are 62.6 x 31 mm. The given type locality is "East China Sea". The authors describe a shell that is related to *Phasmoconus (P.) keatii*. It is also compared to *Pionoconus stramineus* (Lamarck, 1810). To this day no such shell has been collected on the China sea making the type locality dubious. It was considered to be a synonym of *P. (P.) inscriptus* by Röckel & al. (1995) and a synonym of *Phasmoconus (P.) stigmaticus* (Adams, 1854) or of *Phasmoconus (P.) collisus* (Reeve, 1849) by Filmer 2011.

Conus keatiformis Shikama & Oishi in Shikama, 1977 is a form of *P. (P.) inscriptus* with a darker and less intricated pattern.



-7- *Conus indicus*
Specimen collection
x 21 mm.

introduced without taxonomic intention by the author as a subspecific name with the idea of distinguishing it from the East African variant (our *P. (P.) adenensis* and *P. (P.) chindeensis* sp. nov. that he considered as the true *Conus inscriptus* of Reeve. It is moreover an homonym of *C. magus f. indicus*, Weinkauff, 1874. It is therefore not available for taxonomic purposes. It corresponds to the *P. (P.) inscriptus* from Indian Peninsula.

inscriptus
Röckel, 1979
from Röckel's
in SMNS 41
The name was
introduced



-8- *Conus maculospira bangladeshiana* (da Motta, 1985). Holotype in MHNG # 984-595, its dimensions are 42.7 x 20.23 mm. It was described as a subspecies of *Phasmoconus (P.) maculospira* originating from Bangladesh and characterized by the orange colouration inside the aperture. We believe that this is *Phasmoconus (P.) maculospira* with a orange mouth.



-9- *Conus inscriptus*

meridionalis Raybaudi Massilia, 1989. Although it is presented as a trinomen like a subspecies name in the captions of figures, the text states that the name is introduced without taxonomic purpose. It is therefore an unavailable name (nomen nudum). A end note of the author states that da Motta "suggests that this new population could belong to *Conus adenensis* Smith, 1891. We agree with that opinion.

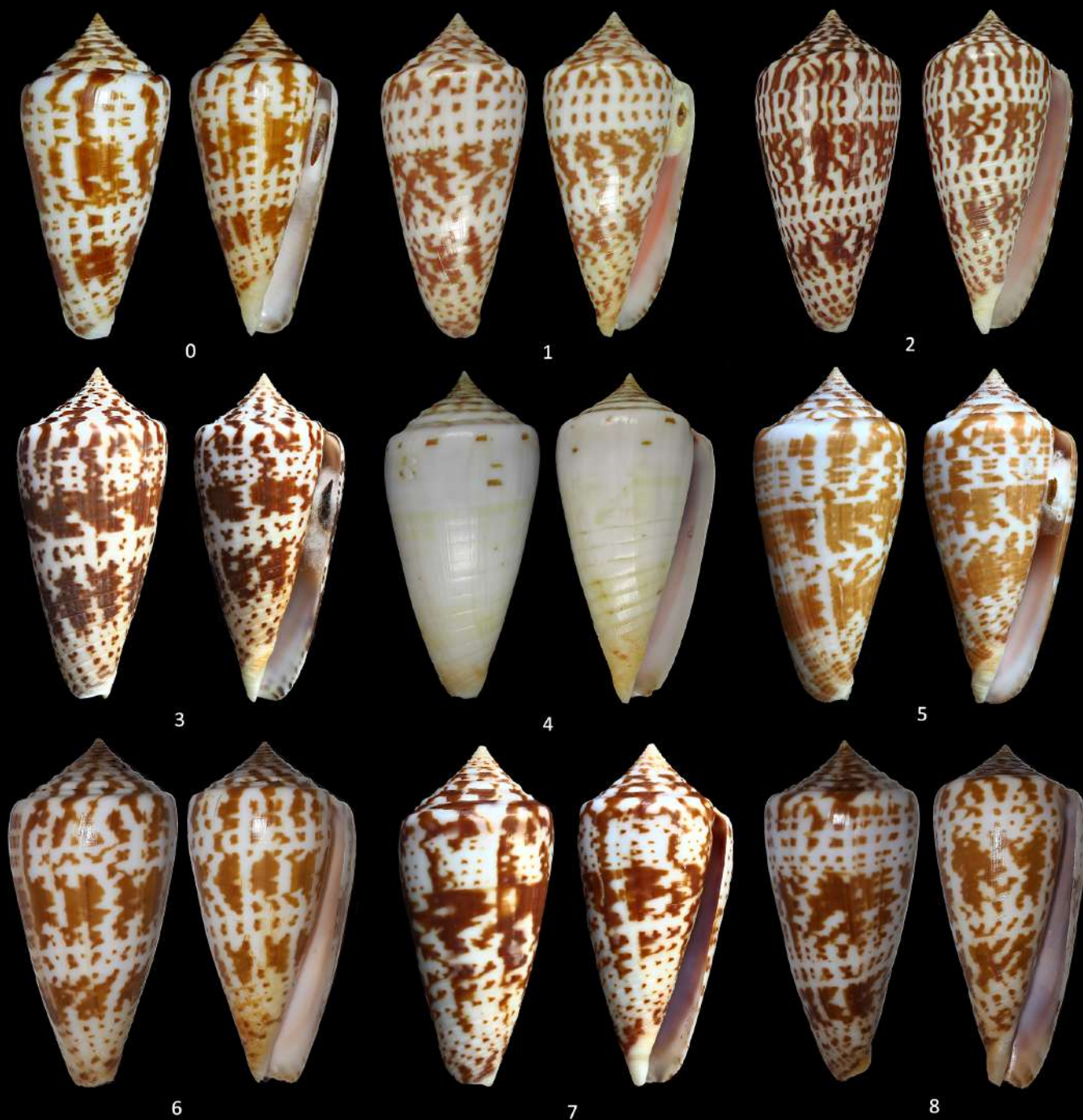
ACKNOWLEDGEMENTS

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Plate 1: *Phasmoconus (Phasmoconus) chindeensis* sp. nov.



0 Holotype: 53.97 mm Chinde, N. Mozambique 45-65 m
MNHN-IM-2000-35772

1 Paratype 1: 60.99 mm Chinde N. Mozambique 30-50 m Coll. EM

2 Paratype 2: 59.23 mm Chinde N. Mozambique 35-45 m Coll. EM

3 Paratype 3: 52.93 mm Chinde N. Mozambique Coll. EM

4 Paratype 4: 57.14 mm Nacala, N. Mozambique Coll. EM

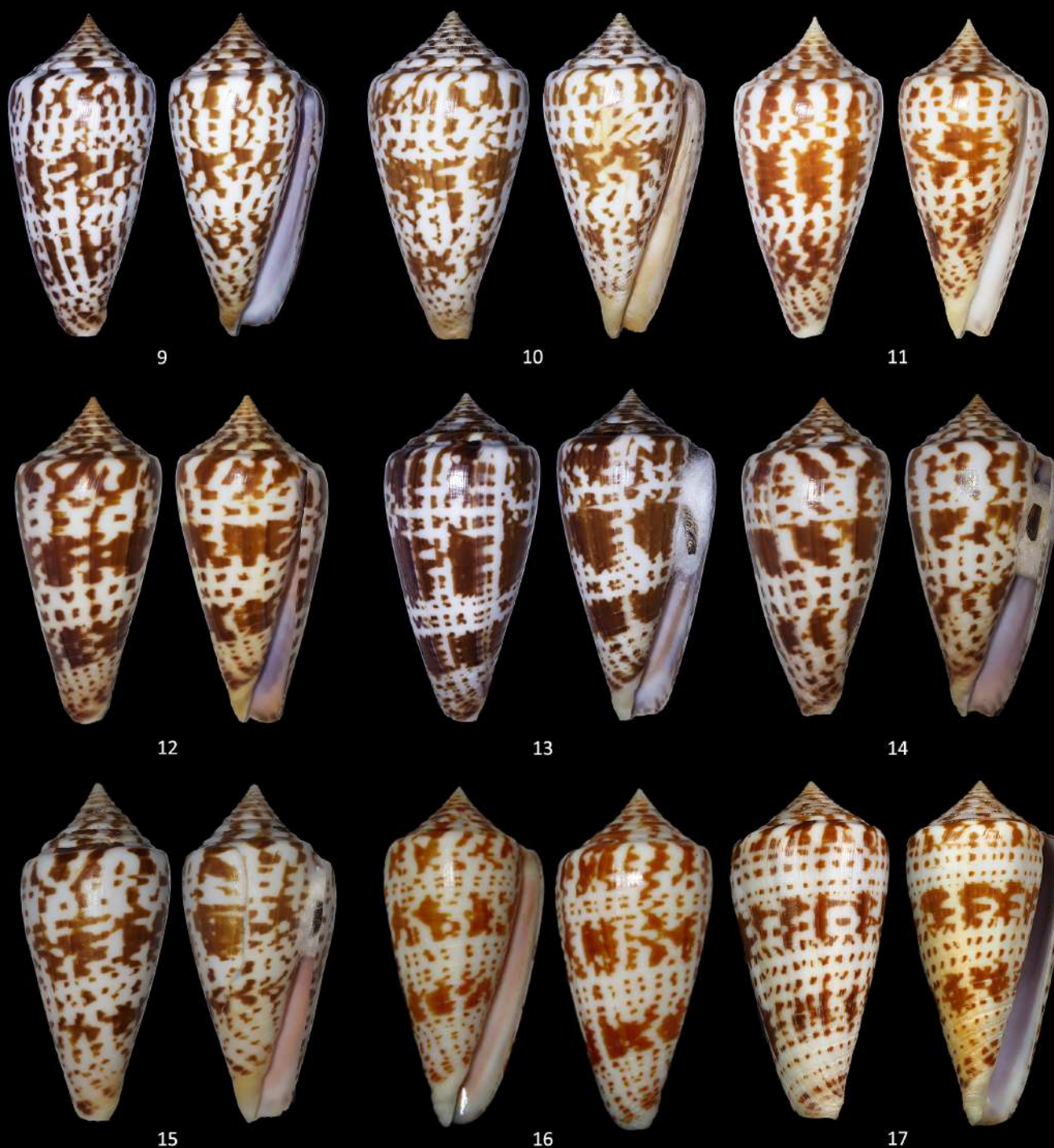
5 Paratype 5: 59.40 mm S. Mozambique 50-80 m Coll. EM

6 Paratype 6: 54.31 mm Coll. EM

7 Paratype 7: 52.58 mm South Africa Coll. EM

8 Paratype 8: 57.73 mm Coll. EM

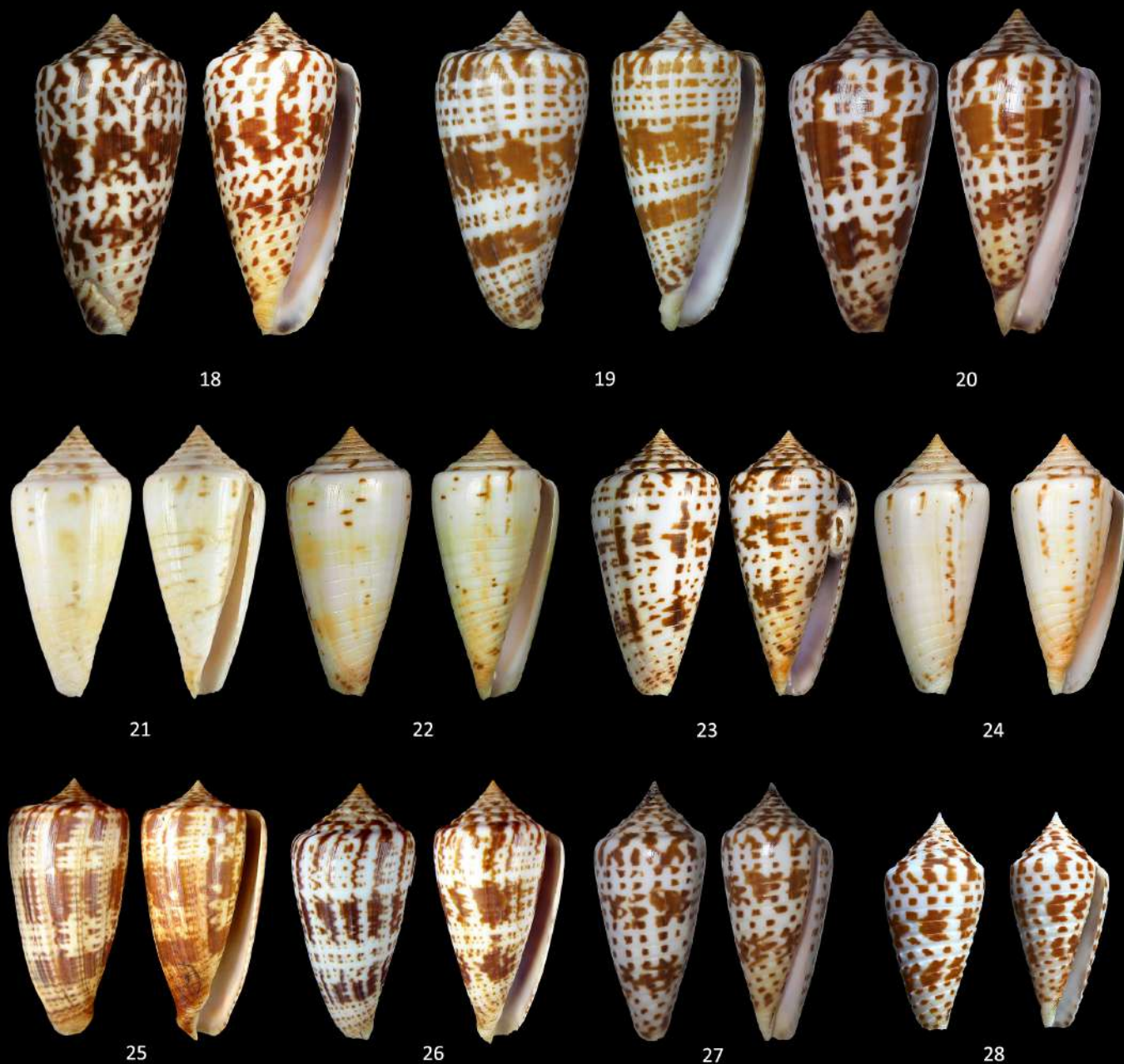
Plate 2: *Phasmoconus (Phasmoconus) chindeensis* sp. nov.



9 Paratype 9: 67.60 mm S. Chinde, Mozambique 35-45 m Coll. EM
 10 Paratype 10: 60.56 mm Mozambique Isl., Mozambique Coll. EM
 11 Paratype 11: 51.41 mm Mozambique Coll. EM
 12 Paratype 12: 54.29 mm Mozambique Isl., Mozambique Coll. EM
 13 Paratype 13: 52.67 mm S. Mozambique Coll. EM

14 Paratype 14: 59.95 mm S. Chinde, Mozambique Coll. EM
 15 Paratype 15: 57.24 mm Natal, South Africa 50 m Coll. EM
 16 Paratype 16: 50.87 mm S. Chinde, Mozambique Coll. EM
 17 Paratype 17: 56.84 mm S. Chinde, Mozambique Coll. FP

Plate 3: *Phasmoconus (Phasmoconus) chindeensis* sp. nov.



18 Paratype 18: 55.17 mm Chinde, Mozambique Coll. FP
 19 Paratype 19: 58.78 mm Natal, South Africa Coll. FP
 20 Paratype 20: 52.24 mm S. Chinde, Mozambique Coll. EM
 21 Paratype 21: 56.27 mm Quelimane, Mozambique Coll. EM
 22 Paratype 22: 55.16 mm S. Chinde Mozambique Coll. FP
 23 Paratype 23: 60.07 mm S. Chinde Mozambique Coll. FP

24 Paratype 24: 55.09 mm Chinde, Mozambique Coll. FP
 25 Paratype 25: 77.50 mm Quelimane, Mozambique Coll. EM
 26 Paratype 26: 73.90 mm Quelimane, Mozambique Coll. EM
 27 Paratype 27: 45.25 mm Quelimane, Mozambique Coll. EM
 28 Paratype 28: 34.86 mm Ifaty, S.W. Madagascar Coll. EM

Plate 4: *Phasmoconus (Phasmoconus) adenensis* (E. A. Smith, 1891)



- 0 Lectotype: 48mm Aden, Yemen NHMUK
 1 51.25 mm Mogadiscio, Somalia Coll. EM
 2 50.97 mm Somalia Coll. EM
 3 39.90 mm Somalia Coll. EM
 4 56.03 mm Merka, Somalia, -80-150 M Coll. EM
 5 52.61 mm Mogadiscio, Somalia Coll. EM
 6 52.80 mm Somalia Coll. FP

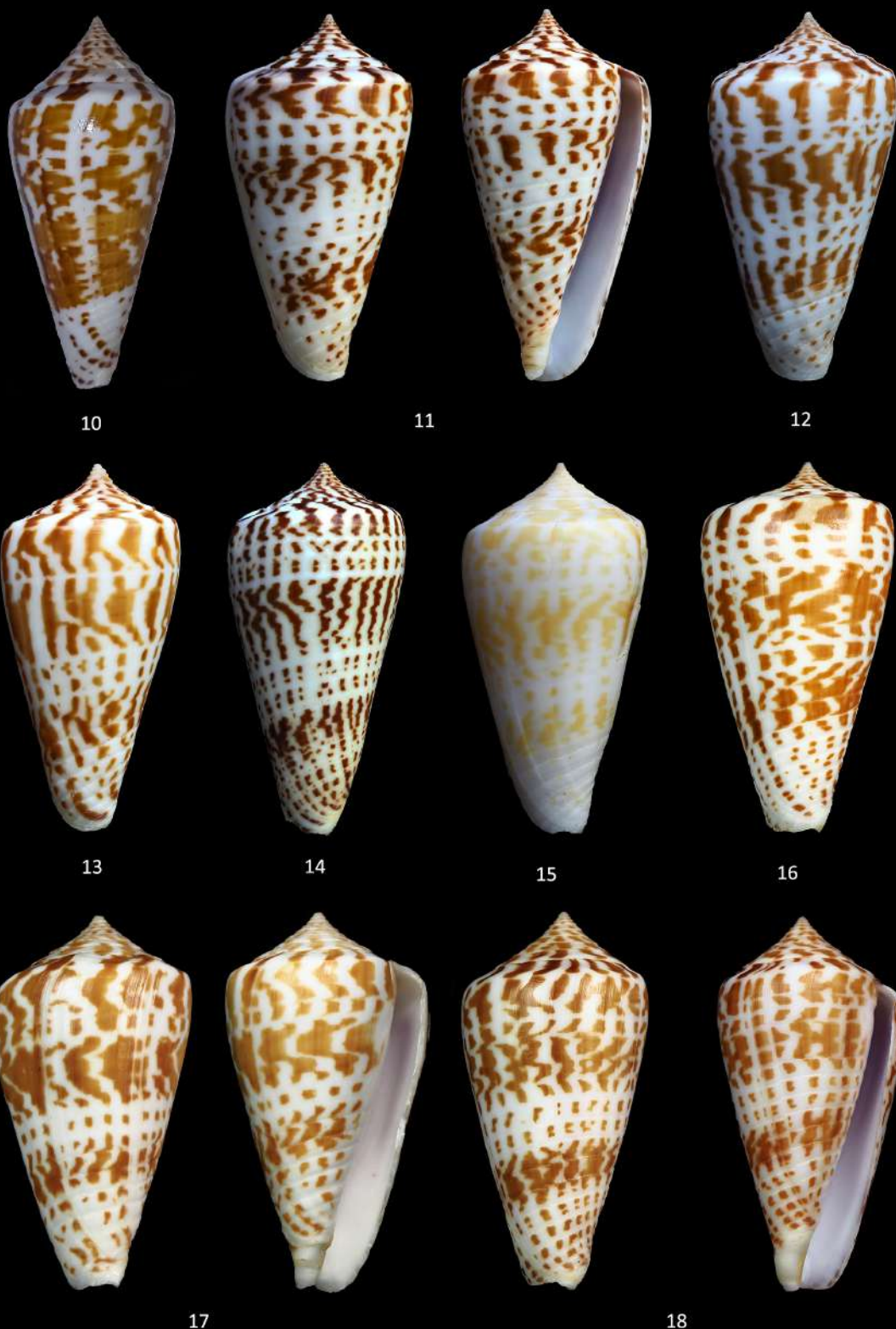
- 7 45.63 mm Somalia Coll. FP
 8 58.25 mm Somalia Coll. FP
 9 37.98 mm Somalia Coll. FP
 10 50.60 mm Red Sea Coll. EM
 11 59.21 mm Coll. LL

Plate 5: *Phasmoconus (Phasmoconus) inscriptus* (Reeve, 1843)



- | | | | |
|---|---|---|--|
| 0 | Lectotype 34 mm NHMUK | 5 | 59.91 mm f. <i>keatiformis</i> , India Coll. EM |
| 2 | 55.81 mm Kollam, Kerala, India Coll. EM | 6 | 55.90 mm Madras, Tamil Nadu, India Coll. EM |
| 3 | 47.93 mm Kollam, Kerala, India Coll. EM | 7 | 54.76 mm Kollam, Kerala, India 250-300 M Coll. EM. |
| 4 | 48.29 mm f. <i>cuneiformis</i> India Coll. EM | 8 | 64.42 mm India Coll. EM |
| | | 9 | 63.57 mm India Coll. EM |

Plate 6: *Phasmoconus (Phasmoconus) inscriptus* (Reeve, 1843)



- 10 65.03 mm Cochin, Kerala, India Coll. EM
 11 57.56 mm Bosaaso, Somalia Coll. EM
 12 49.16 mm India Coll. EM
 13 38.11 mm Djibouti Coll. EM.
 14 73.66 mm Keelakarai, Tamil Nadu, India, Coll. EM

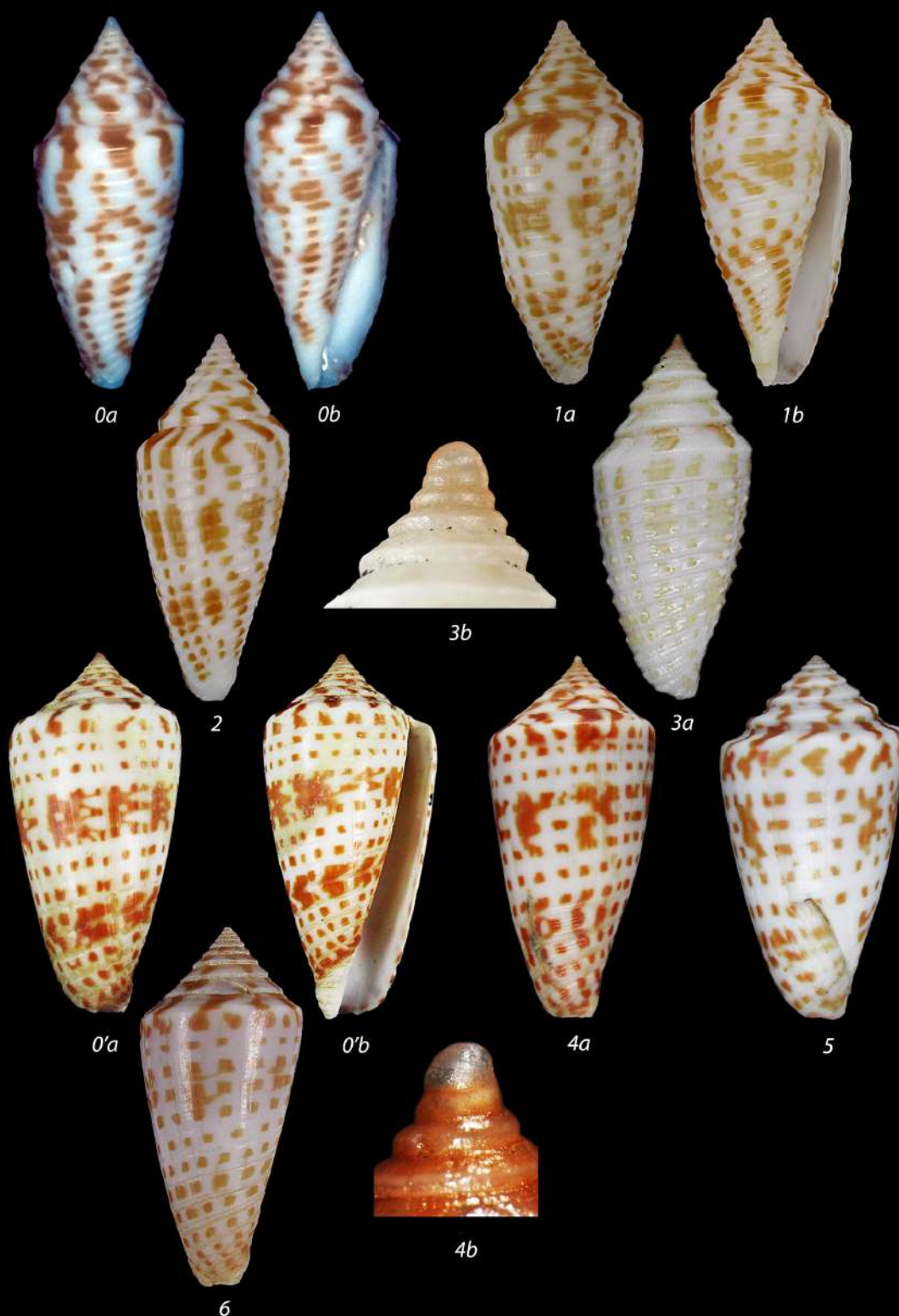
- 15 55.10 mm Keelakarai, Tamil Nadu, India, Coll. EM
 16 50.56 mm Bay of Bengal, India Coll. FP
 17 54.83 mm Kollam, Kerala, India Coll. FP
 18 47.36 mm Kollam, Kerala, India Coll. FP

Plate 7: *Phasmoconus (Phasmoconus) maculospira* (Pilsbry, 1922)



- | | | | |
|---|--|----|--|
| 0 | Holotype 41 mm <i>Phasmoconus (Phasmoconus) planiliratus</i> (Sowerby III, 1870) NHMUK | 7 | 64.32 mm Chennai, Tamil Nadu, India, 50M Coll EM |
| 1 | 48.96 mm Chennai, Tamil Nadu, India Coll. EM | 8 | 66.43 mm Chennai, Tamil Nadu, India, 50M Coll EM |
| 2 | 46.10 mm Andaman Isl. Coll EM | 9 | 71.67 mm Chennai, Tamil Nadu, India, 50M Coll EM |
| 3 | 50.20 mm India Coll. EM | 10 | 64.98 mm Chennai, Tamil Nadu, India Coll FP |
| 4 | 35.61 mm Andaman Sea Coll. EM | 11 | 43.72 mm Thailand Coll. FP |
| 5 | 58.71 mm Thailand Coll. EM | 12 | 61.36 mm Chennai, Tamil Nadu, India Coll FP |
| 6 | 57.11 mm Chennai, Tamil Nadu, India, 50 M Coll. EM | 13 | 51.74 mm Chennai, Tamil Nadu, India Coll FP |
| | | 14 | 59.23 mm Nicobar Isl., Andaman Sea, Coll FP |

Plate 8: *Phasmoconus (Phasmoconus) yemenensis* (Bondarev, 1997) &
Phasmoconus (Phasmoconus) salzmanni (G. Raybaudi Massilia & Rolán, 1997)



0a & 0b Holotype 30.2 mm Sikha, Yemen, NHMUK
 1a & 1b 27.81 mm Gulf of Aden, Yemen Coll. EM
 2 23.99 mm Gulf of Aden, Yemen Coll. EM
 3a 21.59 mm Somalia Coll EM
 3b Protoconch of Fig. 3, Somalia Coll EM

0'a & 0'b Holotype 33.20 mm Aden SMNS
 4a 26.31 mm Paratype 21 Little Aden, Yemen Coll. EM
 4b Protoconch of Paratype 21, Fig 5 Coll EM
 5 28.90 mm Aden Coll. EM
 6 27.00 mm Paratype 1, Aden Coll. TJ

Annex 1: Measurements and calculations

*tail/suit not used in averages
estimated values

N°	SL mm	MD mm	H Height mm	AH mm	HMD mm	RD	PMD	RSH	W g	RM=VJ/SL g/cm	V Volume cm ³	RM=V/V g/cm ³	Reptiliary	Locality
<i>Phasmoconus (P.) chindeensis</i> sp. nov.														
0	53.97	24.89	23.24	43.89	39.95	0.57	0.51	0.19	12.5	2.32	31.22	0.40	Holotype, MNHN-JM-2006-15772	Chinda, N. Mozambique, 45-55 m
1	60.99	26.84	25.05	45.31	45.51	0.54	0.52	0.19	17.1	2.89	41.99	0.41	col. EM	Quelimane, N. Mozambique, 30-50 m
2	59.23	26.37	25.01	44.96	47.79	0.54	0.47	0.17	14.4	2.43	39.06	0.37	col. EM	N. Quelimane, N. Mozambique, 35-45 m
3	52.93	23.98	23.02	44.14	39.39	0.54	0.49	0.17	11.0	2.08	29.23	0.38	col. EM	Mozambique
4	57.14	26.37	25.02	46.35	42.92	0.57	0.53	0.19	15.3	2.68	38.60	0.40	col. EM	Nacala, N. Mozambique, 60-80 m
5	59.40	27.10	25.88	48.92	47.68	0.58	0.47	0.18	15.6	2.63	41.66	0.37	col. EM	S. Mozambique, 30-80 m
6	54.31	26.90	25.24	45.81	41.64	0.59	0.51	0.18	15.3	2.82	36.87	0.41	col. EM	Quelimane, N. Mozambique, 30-50 m
7	52.59	24.21	23.10	42.48	37.18	0.57	0.48	0.19	11.0	2.09	29.41	0.37	col. EM	South Africa
8	57.73	25.74	24.87	49.36	44.51	0.52	0.40	0.14	13.6	2.36	36.96	0.37	col. EM	Quelimane, N. Mozambique, 30-50 m
9	67.69	30.85	29.37	54.26	48.91	0.57	0.52	0.20	24.0	3.55	61.25	0.39	col. EM	S. Chinde, N. Mozambique, 35-45 m
10	60.39	28.97	27.76	50.19	44.97	0.56	0.50	0.17	17.1	2.82	48.74	0.35	col. EM	Mozambique Id., N. Mozambique
11	51.41	23.72	22.71	41.67	37.93	0.57	0.51	0.19	11.0	2.14	27.16	0.41	col. EM	Mozambique Id., N. Mozambique
12	54.29	25.72	23.09	44.27	38.75	0.56	0.48	0.18	11.9	2.19	31.09	0.38	col. EM	Mozambique Id., N. Mozambique
13	52.97	24.52	23.21	44.08	38.77	0.56	0.48	0.16	12.2	2.32	29.97	0.41	col. EM	between Beila & Quelimane, Mozambique, 35-45 m
14	59.95	28.56	27.50	49.17	47.56	0.58	0.47	0.18	18.2	3.04	47.08	0.39	col. EM	S. Chinde, N. Mozambique
15	57.24	26.22	24.76	45.37	40.87	0.58	0.40	0.21	14.6	2.55	37.16	0.39	col. EM	N. Natal, RSA, 50-70 m
16	50.87	23.42	22.49	41.14	37.18	0.57	0.50	0.19	10.7	2.10	26.79	0.40	col. EM	S. Chinde, N. Mozambique, 35-45 m
17	56.84	26.89	24.32	47.36	43.86	0.57	0.53	0.17	12.5	2.70	37.17	0.34	col. FP	Mozambique
18	55.17	27.34	24.35	45.15	42.78	0.61	0.54	0.18	13.6	2.47	36.73	0.37	col. FP	Mozambique
19	58.78	28.97	26.27	48.95	44.85	0.59	0.52	0.17	18.4	3.14	44.73	0.41	col. FP	Natal, RSA
20	57.24	24.27	23.38	42.54	38.86	0.57	0.51	0.19	12.0	2.30	29.64	0.40	col. FP	S. Chinde, N. Mozambique, 35-45 m
21	56.27	25.14	24.02	44.57	40.89	0.56	0.52	0.21	13.3	2.36	33.98	0.39	col. EM	Quelimane, N. Mozambique, 30-50 m
22	55.16	26.61	24.01	45.55	39.91	0.58	0.48	0.17	13.3	2.42	35.24	0.38	col. FP	S. Chinde, N. Mozambique, 40-50 m
23	60.07	29.62	26.67	48.24	44.25	0.61	0.52	0.20	19.0	3.17	47.45	0.40	col. FP	S. Chinde, N. Mozambique, 60-80 m
24	55.09	25.62	23.39	45.30	40.27	0.57	0.49	0.18	13.4	2.43	33.01	0.41	col. FP	S. Mozambique, 50-80 m
25	77.50	36.30	35.00	70.00	59.50	0.52	0.45	0.20	25.0	4.45	98.46	0.51	col. AV	Quelimane, N. Mozambique, 30-50 m
26	71.90	34.50	33.00	61.00	52.00	0.57	0.45	0.17	25.0	3.38	84.14	0.30	col. AV	Quelimane, N. Mozambique, 30-50 m
27*	45.25	19.97	15.05	36.10	32.90	0.55	0.51	0.20	7.7	1.70	17.21	0.45	col. EM	Quelimane, N. Mozambique, 30-50 m
28*	34.86	15.95	15.26	26.42	25.32	0.57	0.56	0.24	4.5	1.29	8.48	0.53	col. EM	fatty, S.W. Madagascar, 70 m
Average	57.9					0.57	0.50	0.18	2.71			0.39		
EXTREMS	50 - 78					0.52 - 0.61	0.45 - 0.94	0.10 - 0.21	2.1 - 6.5			0.30 - 0.51		
<i>Phasmoconus (P.) adenensis</i> (E.A.Smith, 1891)														
0	48.00	21.50	21.13	41.08	37.55	0.53	0.49	0.18	10.6	2.07	24.08	0.44	Holotype, HMVUK	Aden, Yemen
1	51.25	22.24	21.13	40.28	37.42	0.54	0.53	0.21	9.4	1.84	23.42	0.40	col. EM	Mogadishu, Somalia
2	50.97	21.90	20.98	40.28	37.42	0.54	0.53	0.21	9.4	1.84	23.42	0.40	col. EM	Somalia
3*	39.91	17.47	16.42	31.08	27.94	0.56	0.50	0.22	5.0	1.75	11.45	0.44	col. EM	Somalia
4	56.03	23.86	22.85	44.60	41.20	0.53	0.52	0.20	13.4	2.39	30.55	0.44	col. EM	Merka, Somalia, 90-150 m
5	52.61	22.92	22.06	41.11	38.47	0.56	0.54	0.22	11.3	2.15	25.60	0.42	col. EM	Mogadishu, Somalia
6	52.80	23.07	22.40	42.90	40.37	0.54	0.54	0.19	11.9	2.25	27.29	0.44	col. FP	Somalia
7	45.63	20.91	20.15	37.25	34.65	0.56	0.53	0.18	8.8	1.93	19.23	0.46	col. FP	Somalia
8	58.25	25.24	23.23	45.97	44.10	0.53	0.49	0.15	14.8	2.34	39.04	0.38	col. FP	Somalia
9*	37.98	16.40	15.96	29.28	26.78	0.56	0.50	0.23	4.6	1.71	9.94	0.46	col. FP	Somalia
10	50.69	22.91	22.06	41.47	34.85	0.55	0.44	0.18	11.9	2.25	27.29	0.44	col. LL	Red Sea
11	59.21	26.94	26.42	48.79	41.35	0.55	0.45	0.18	11.9	2.25	27.29	0.44	col. LL	Red Sea
Average	52.4					0.54	0.50	0.19	2.20			0.43		
EXTREMS	45 - 60					0.53 - 0.56	0.44 - 0.94	0.15 - 0.22	1.8 - 2.5			0.38 - 0.46		
RKK	40 - 74					0.52 - 0.63	0.79 - 0.90	0.10 - 0.23	0.9 - 4.4					
<i>Phasmoconus (P.) insculptus</i> (Reeve, 1843)														
1	65.84	32.33	30.76	56.90	50.16	0.57	0.48	0.14	22.1	3.36	65.48	0.34	col. EM	India
2	55.81	28.02	26.78	47.10	42.92	0.59	0.51	0.16	15.4	2.76	41.88	0.37	col. EM	Kolam, Kerala, S.W. India
3	47.93	24.73	23.42	40.98	35.85	0.60	0.48	0.15	11.1	2.37	27.76	0.40	col. EM	Kolam, Kerala, S.W. India
4	45.29	24.11	22.85	39.95	35.19	0.60	0.48	0.17	10.8	2.24	25.60	0.41	col. EM	f. Cuddalore, India
5	59.91	31.60	30.16	54.15	47.06	0.56	0.47	0.10	20.7	3.49	57.10	0.36	col. EM	f. Kanyakumari, India
6	59.90	31.20	29.83	51.24	44.04	0.61	0.50	0.14	17.0	2.84	55.75	0.30	col. EM	f. Kanyakumari, Chennai, Tamil Nadu, S.E. India
7	54.76	26.34	25.06	47.43	40.08	0.56	0.45	0.13	12.8	2.34	36.15	0.35	col. EM	Kolam, Kerala, S.W. India, 250-300 m
8	64.42	30.91	30.91	54.49	49.39	0.59	0.51	0.15	23.9	3.71	64.18	0.37	col. EM	Kolam, Kerala, S.W. India, 250-300 m
9	63.57	31.14	29.31	53.44	47.98	0.58	0.40	0.16	21.2	3.33	58.02	0.37	col. EM	India
10	65.03	29.91	28.82	51.47	46.37	0.58	0.50	0.21	18.5	2.84	56.06	0.33	col. EM	Cochin, Kerala, S.W. India, 20-25 m
11	57.59	28.57	27.64	49.43	42.31	0.56	0.46	0.14	15.5	2.69	45.45	0.34	col. EM	Bombay, Somalia
12	49.16	25.35	24.34	41.34	37.01	0.51	0.40	0.16	12.1	2.46	30.33	0.40	col. EM	India
13*	38.11	18.60	17.97	32.69	28.53	0.57	0.47	0.14	5.1	1.34	12.24	0.40	col. EM	Djibouti
14	73.66	37.36	33.76	64.70	56.40	0.58	0.47	0.12	27.4	3.72	98.91	0.29	col. EM	Kochikarai, Tamil Nadu, S.E. India, 20-50m
15	55.10	27.32	26.03	46.97	41.47	0.58	0.50	0.15	14.6	2.65	39.18	0.37	col. EM	Kochikarai, Tamil Nadu, S.E. India, 20-50m
16	50.56	24.01	23.01	41.80	37.06	0.61	0.43	0.11	12.3	2.43	33.41	0.37	col. FP	Gulf of Oman, Saudi Arabia
17	54.83	29.57	26.15	47.84	40.12	0.62	0.44	0.13	16.3	2.98	42.40	0.38	col. FP	Kolam, Kerala, S.W. India, 50 m
18	47.36	24.34	21.38	39.53	35.71	0.62	0.40	0.17	10.3	2.17	24.65	0.42	col. FP	Kolam, Kerala, S.W. India, 50 m
Average	57.3					0.59	0.48	0.15	2.80			0.36		
EXTREMS	47 - 74					0.56 - 0.62	0.44 - 0.91	0.10 - 0.21	2.2 - 3.7			0.29 - 0.42		
RKK	40 - 74*					0.51 - 0.68	0.79 - 0.90	0.10 - 0.15	0.9 - 4.4					

*subadult not used in averages
estimated values

N°	SL mm	MD mm	H Height mm	AW mm	HMD mm	RD	PMD	RSH	W g	RW = W/SL g/cm	V Volume cm ³	NW = W/V g/cm ³	Repository	Locality
<i>Phasmoconus</i> (<i>P.</i>) <i>maculosipira</i> (Pilsbry, 1922)														
0	42.7	23											Holotype C. bangladeshianus, MHNG	Bangladesh, Bay of Bengal
1	48.96	23.83	22.35	42.49	37.34	0.56	0.88	0.13	9.3	1.90	26.08	0.36	coll. EM	Chennai, Tamil Nadu, S.E. India
2	46.10	21.63	20.81	39.77	34.44	0.54	0.87	0.14	7.1	1.54	20.75	0.37	coll. EM	Andaman Isl.
3	50.39	24.59	23.26	42.15	36.33	0.58	0.86	0.16	10.7	2.12	28.82	0.37	coll. EM	India
4*	35.61	16.33	15.72	30.35	27.25	0.54	0.90	0.15	4.0	1.12	9.14	0.44	coll. EM	Nicobar Isl., Andaman Sea
5	58.71	26.34	25.04	51.76	44.34	0.51	0.86	0.12	11.1	1.89	38.72	0.29	coll. EM	Andaman Sea
6	57.11	27.57	26.18	48.81	42.48	0.56	0.87	0.15	14.9	2.61	41.22	0.36	coll. EM	Thailand
7	64.32	30.65	29.77	52.77	50.40	0.54	0.90	0.13	17.9	2.78	58.69	0.30	coll. EM	Chennai, Tamil Nadu, S.E. India, 50 m
8	66.43	31.75	29.64	57.44	48.48	0.55	0.84	0.14	20.3	3.66	62.52	0.32	coll. EM	Chennai, Tamil Nadu, S.E. India, 50 m
9	71.67	34.96	33.23	64.91	56.48	0.54	0.87	0.09	30.7	4.28	83.26	0.37	coll. EM	Chennai, Tamil Nadu, S.E. India, 50 m
10	64.98	32.53	31.67	54.54	52.90	0.60	0.97	0.16	20.2	3.11	66.94	0.30	coll. FP	Chennai, Tamil Nadu, S.E. India, 50 m
11	43.72	21.79	21.16	37.96	33.95	0.57	0.89	0.13	6.6	1.51	20.16	0.33	coll. FP	Chennai, Tamil Nadu, S.E. India
12	61.36	31.83	31.12	56.59	49.88	0.56	0.88	0.08	24.0	3.91	60.78	0.40	coll. FP	Thailand
13	51.74	26.88	26.07	42.69	38.78	0.63	0.91	0.17	12.4	2.40	36.26	0.34	coll. FP	Chennai, Tamil Nadu, S.E. India
14	57.47	29.02	27.98	48.29	43.96	0.60	0.91	0.16	14.4	2.51	46.66	0.31	coll. FP	Chennai, Tamil Nadu, S.E. India
15	59.23	30.41	29.68	48.87	46.69	0.62	0.96	0.17	20.6	3.48	53.46	0.39	coll. FP	Chennai, Tamil Nadu, S.E. India
Average	56.3					0.57	0.89	0.14	2.7			0.34		
EXTREMS	44 - 72					0.51 - 0.58	0.86 - 0.88	0.12 - 0.16	1.5 - 2.1			0.29 - 0.37		
RKK						0.55 - 0.64	0.79 - 0.90	0.10 - 0.15	0.9 - 4.4					
<i>Phasmoconus</i> (<i>P.</i>) <i>yemenensis</i> (Bondarev, 1997)														
0	30.20	12.50	12.00	21.36	20.47	0.59	0.96	0.29	-	-	4.53	-	Holotype, NHMUK	Sikha I area, Yemen, Gulf of Aden, 50-60 m
1	27.81	12.04	11.74	19.24	17.84	0.63	0.93	0.31	1.7	0.61	3.93	0.43	coll. EM	Gulf of Aden, Yemen, 60 m
2	28.99	10.15	9.74	17.46	15.73	0.58	0.90	0.27	0.9	0.38	2.37	0.38	coll. EM	Gulf of Aden, Yemen, 65 m
3	21.59	9.24	8.70	15.71	14.45	0.59	0.92	0.27	1.0	0.46	1.74	0.58	coll. EM	Somalia
4	18.97	8.51	8.17	14.25	13.88	0.60	0.97	0.25	0.7	0.37	1.32	0.53	coll. LI	Cap Ras Hatan, Somalia
Average	24.5					0.60	0.94	0.28	0.45			0.48		
EXTREMS	19 - 31					0.58 - 0.63	0.90 - 0.97	0.25 - 0.31	0.4 - 0.6			0.4 - 0.6		
<i>Phasmoconus</i> (<i>P.</i>) <i>salzmanni</i> (G. Raybaudi Massilia & Rolan, 1997)														
0	33.00	15.50	15.09	27.62	24.76	0.56	0.89	0.15	-	-	7.67	-	Holotype, SMNS	Gulf of Aden, 50-150 m
1	26.31	12.32	11.42	21.08	19.79	0.58	0.94	0.20	1.6	0.61	3.70	0.43	Paratype 21, coll. EM	Little Aden, Yemen
2	28.90	14.15	13.71	23.21	22.06	0.61	0.95	0.20	3.1	1.07	5.61	0.55	coll. EM	Aden
3	27.00	12.12	11.50	21.70	19.80	0.56	0.91	0.20	-	-	3.70	-	Paratype 1, coll. TJ	Aden
Average	28.8					0.58	0.92	0.19	0.80			0.49		
EXTREMS	26 - 33					0.58 - 0.61	0.94 - 0.95	0.200	0.6 - 1.1			0.4 - 0.6		

New records of Mollusca for the Mediterranean and the Hellenic Seas

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Abstract

With this study we continue the contribution to the knowledge of the Hellenic marine malacofauna accumulating data from the entire Greek territory during the period from October 2019 to January 2020. It includes 34 identified species out of which 3 are new for the Mediterranean Sea, 12 are new for the Eastern Mediterranean Sea, 6 are known Lessepsian migrants and 21 are new for the Hellenic malacofauna. Main taxonomic characteristics and ecological information such as habitat, distribution and origin, are given and discussed.

Introduction

The molluscan biodiversity of the Hellenic Seas has been influenced by environmental and anthropogenic changes described and discussed by a number of investigators (e.g. Galil, 2000; Galil & Zenetos, 2002; Zenetos *et al.*, 2005; Abdulla & Linden, 2008; Galil *et al.*, 2008; Zenetos *et al.*, 2009; Skliris *et al.*, 2011; Tsiaras *et al.*, 2012). Recent faunistic works revealed some 200 new species (Streftaris & Zenetos, 2007; Manousis *et al.*, 2012; Tzomos *et al.*, 2012; Manousis and Galinou-Mitsoudi, 2014; Crocetta *et al.*, 2013; Manousis *et al.*, 2017; Micali *et al.*, 2017; Romani *et al.*, 2017; Manousis *et al.*, 2018a,b; Manousis *et al.*, 2019; Mbazios *et al.*, 2020; Manousis *et al.*, 2020a-c, accepted). This work continues with the publication of the new findings for the Hellenic malacofauna.

Methods

Sampling, handling and species recognition were conducted according to Manousis & Galinou-Mitsoudi (2014) and Mbazios *et al.* (2019) from October 2019 to February 2020 in certain locations throughout the Hellenic Seas. All 1st and 2nd documented records from the Hellenic Seas are listed in Table 1 with collection data. A brief description of certain findings is given below whenever additional information is supportive to their identification. They are all presented in Figures 1 to 9. The

specimens are deposited in the premises of C. Kontadakis, Dr. T. Manousis, G. Mbazios, A. Porfyrus and G. Zaminos. Scientists are welcome to have access to the biological material for inspection by appointment.

Results

The records

This work includes 34 species out of which 3 are new for the Mediterranean Sea, 13 are new for the Eastern Mediterranean Sea, 5 are known Lessepsian migrants and 22 are new for the Hellenic malacofauna.

Abbreviations: **Be** - Beached, **BS** - Black Sea, **CMS** - Central Mediterranean Sea, **Co** - Common, **CB** - Coralligenous Bottom, **CMS** - Central Mediterranean Sea, **Cos** - Cosmopolitan, **EMS** - East Mediterranean Sea, **EMS1** - First record for the East Mediterranean Sea, **G1** - First record for Greece, **G2** - Second record for Greece, **IP** - Indo-Pacific, **KLM** - Known Lessepsian Migrant, **Ktl** - Known from type locality, **LM** - Lessepsian Migrant, **Mad** - Madeira, **Mat** - matte, **MB** - Mixed Bottom, **MS** - Mediterranean Sea, **MS1** - First record for the Mediterranean Sea, **Mu** - Muddy Bottom, **NEA** - North East Atlantic, **NEP** - North East Pacific, **NLM** - New Lessepsian Migrant, **NW** - North-West, **Ra** - Rare, **Sh** - Shipwreck, **TSP** - Tasmanian Sea Pacific, **Un** - Uncommon, **Unk** - Unknown, **VRa** - Very Rare, **WA** - West Atlantic, **WCMS** - West and Central Mediterranean Sea, **WMS** - West Mediterranean Sea, **ZB** - Zostera bed.

Trochacis versiliensis Warén, Carrozza and Rocchini, 1992 (Fig. 4a).

Shell small, globose, solid, transparent, skeneimorph. Protoconch of total 0.75 whorls (according to Verduin 1976), with tubercles arranged in a spiral pattern which becomes more loosely arranged towards teleoconch, a prominent lip, and size of about 250 x 190 µm. Teleoconch 1.25 mm wide, 1.20 mm high, of 2.2 whorls swollen, regularly growing whorls. Apical part of first whorl distinctly flattened and bearing a single spiral rib, which disappears on the second whorl. Outline globose, suture shallow, joined near the mid-line of the

penultimate whorl. Aperture large, broader in its lower part, strongly prosocline and tangential. Umbilicus narrow, deep and open, bearing one slowly descending, outer spiral ridge and a more steeply descending central rib, which eventually joins the inner lip. Surface texture smooth and glossy with faint incremental lines more evident below the suture and faint spiral cords by the suture and the periumbilical area. *T. versiliensis* is similar to *Lopheliella moundforceae* Hoffman, van Heugten & Lavaleye, 2008 but the latter lacks the spiral rib at the start of the teleoconch and the periumbilical area lined with spiral cords (Warén, 1992; Hoffman *et al.*, 2008, 2018).

***Melanella* sp. (Fig. 6a)**

Two shells (3.20 mm and 3.00 mm long, 0.80 mm and 0.75 mm wide, respectively, $h/w = 4$). Shell hyaline, smooth, slender and translucent. Pointed conoidal protoconch of some 4 curved whorls followed by 7 whorls of the high spire teleoconch. Whorls almost flat, with a slightly distorted axis in two different directions up to the middle of the shell and separated by a well marked suture. The growth marks are aligned all along the teleoconch. Under high magnification the surface exhibits no sculptural decoration but very faint incremental lines. False suture mark of the *Melanella* type. The body whorl occupies approximately 46% of the shell's length, forms a smoothly curved base and a drop-shape aperture with its inner lip oblique and exhibiting a moderately thick columellar callus continuous with the parietal callus. The outer lip is orthocline, only slightly arched at its 2/3 and its upper border with the shell turns slightly backwards in respect to the prolongation of the suture. *M. sp.* bears an outer lip very similar to that of *M. compactilis* (Locard, 1891) (Fig. 6b) but the latter is straight, with a cylindrical protoconch and a much shorter body whorl. *M. sp.* shell also resembles superficially that of *M. polita* (Linnaeus, 1758) (Fig. 6c) but in its slenderness, the protoconch and the arcuated outer lip. Finally, Campani (2001) shows the image of a very slender specimen of similar outlook presented as *Crinophtheiros* sp. but the lack of a detailed description and photographic presentation make a comparison with our specimen impossible.

***Alvania* sp. (Fig. 7c)**

Shell small (one intact live specimen), 2.60 mm high, 1.45 mm wide, ($h/w = 1.8$), conic-ovate, fairly solid, translucent, opaque, of yellowish colour. Protoconch planktotrophic (multispiral) of nearly 2 whorls, 260 μ m high, 330 μ m wide. Embryonic shell (protoconch I) globose, bright and smooth but 5 spiral and equidistant lines, of 0.75 whorls (according to Verduin (1976), 190 μ m maximum diameter (D), nucleus circa 70 μ m. Larval shell (protoconch II) of 1.75 convex whorls, with 5 spiral cords consisted of tubercles arranged in a zic-zac pattern. Transition to the teleoconch marked with dense, narrow and sinuous axial riblets. Teleoconch of 3.5 whorls and well rounded base. Body whorl 0.65 of the total height, aperture 0.45 (M). Axial sculpture on the body whorl of 21 ribs as wide as the interspaces, spiral sculpture of 2 cords on the first whorl, 3 on the second and 12 thick ones on the body whorl of which 6 above the aperture. Intersections conspicuously nodulose. The aperture is rounded anteriorly and somewhat angulose posteriorly. Outer lip with a well-pronounced orthocline varix. No microsculpture on teleoconch but the incremental scars. Suture deep, peristome continuous. Dried animal colour light burgundy-red, operculum straw-yellow. Size-wise, it predisposes for *A. subcrenulata*

(Bucquoy, Dautzenberg & Dollfus, 1884) but they differ in their protoconches (lecithotrophic of 1.5 whorls in *A. subcrenulata*) and their sculptural decoration both on protoconch and teleoconch (Giannuzzi-Savelli *et al.*, 2002, Gofas *et al.*, 2011). Protoconch-wise, *A. sp.* bears a protoconch similar to those of *A. beani* (Hanley in Thorpe, 1844) and *A. cimicoides* (Forbes, 1844) from both of which it differs in the number of teleoconch whorls and spiral cords on the body whorl, as well as the teleoconch overall shape and size (Gofas *et al.*, 2011). Contour-wise, *A. sp.* is reminiscent of *A. marmarisensis* Bitlis & Öztürk, 2017 (Bitlis & Öztürk, 2017) but it bears a multispiral protoconch vs paucispiral, has 3.5 teleoconch whorls vs 4.5 and some 20 axial ribs vs 15 (Bitlis & Öztürk, 2017). At the same time, *A. sp.* exhibits a very similar outline to that of *A. marmarisensis*, the same type of slope between the first and second spiral cords in the penultimate and last whorls and sizes of its protoconch I and nucleus related to those of *A. marmarisensis* by a factor of 0.7937 (see Discussion).

***Ringicula* sp. (Fig. 9b)**

Mature shell, typical for the genus but small, 2.45 mm high, 2.05 mm wide ($h/w = 1.2$), spire scarcely elevated, apical angle 88°, suture well impressed. Protoconch planktotrophic of 1.2 whorls, nuclear diameter 80 μ m, protoconch I 210 μ m and 0.75 whorls, protoconch II 270 μ m. Teleoconch of 3 whorls, body whorl 83% of the shell's height, suture well impressed, 7 spiral striae equally spaced on body whorl, aperture large squared, peristome thick and angled anteriorly, one columellar tooth, two columellar folds with larger the lower one. The specimen does not fit any description in the available literature including those for members of the *Ringicula leptocheila* Brugnone, 1873 complex (Mariottini *et al.*, 2000).

***Ovatella aequalis* (R. T. Lowe, 1832) (Fig. 9d)**

The specimens' morphological characteristics fit the description of Gofas *et al.* (2014).

Discussion

The first finds for Greece of *Lottia pelta* (Rathke, 1833) can be considered similar to all those of Pacific and Indo-Pacific molluscan migrants which have been a popular study object since the opening of the Suez Canal in 1869. A plethora of articles, ranging from short faunistic notes to classic textbooks (e.g. Por, 1978), has been devoted to this subject. However, taking into account other recently published first finds of minute gastropod Lessepsian migrants for the Mediterranean Sea, such as *Teretia* cf. *neocaledonica* Morassi & Bonfitto, 2015 (Manousis *et al.*, 2018b), *Murchisonella anabathron* (Hedley, 1906) (Manousis *et al.*, 2020c), *Aliculastrum cylindricum* (Helbling, 1779), *Elysia nealae* Ostergaard, 1955, *Notobryon bijecurum* Baba, 1937, *Philine angasi* (Crosse, 1865) and *Philine powelli* Rudman, 1970 (Manousis *et al.*, 2020c) we are inclined to believe that the Hellenic territory deserves further attention and search. To reinforce this view comes the fact that species of Atlantic origin are also reported for the first time for the area and the Mediterranean Sea as a whole, e.g. *Acrochalix* cf. *callosa* Bouchet & Warén, 1986 (Manousis *et al.*, 2018a), *Rissoa janusi* (Nordsieck, 1972) (Manousis *et al.*, 2019), *Ammonicera lignea* (Palazzi, 1988) and *Omalogyra disculus* Palazzi, 1988 (Mbaziros *et al.*, 2020), *Odostomia eremita* Peñas & Rolán,

1999 and *Odostomia schrami* van Aartsen, Gittenberger E. & Goud, 1998 (Manousis *et al.*, 2020a), *Adontorhina similis* Barry & McCormack, 2007, *Goodallia gofasi* Giribet & Peñas, 1999, *Mendicula ockelmanni* (Keuning & Schander, 2010) and *Yoldiella propinqua* (Leche, 1878) (Manousis *et al.*, 2020b), *Retusa tornata* (Watson, 1886) (Manousis *et al.*, 2020c) and now *Melanella conoidea* (Kurtz & Stimpson, 1851). As the Mediterranean basin is for decades under extensive search by other scholars from adjacent countries, we wonder if the above finds are due to factors other than our efforts - the answer to which requires additional investigation and data. Apparently, global geopolitical relations change and affect the Hellenic Seas from the shipping point of view. These later advances may make us spectators of an even greater change in the composition of the local malacofauna.

Melanella conoidea (Kurtz & Stimpson, 1851) must have been encountered in the Hellenic waters before. We are of the opinion that *Melanella* sp. 2 described in Mbazios *et al.* (2020, Fig. 5a) belongs to the same species but as an immature specimen could not be easily identified as such. Our specimen is identical in its protoconch and teleconch to that shown in Souza *et al.* (2018, Fig. 11-L).

The case of *Alvania* sp. is reminiscent of the intrinsic problem of the morphological or typological concept of a species (morphospecies) historically accepted by many generations of naturalists, zoologists, and even today, by many biologists. Many presently known Mediterranean species of *Alvania* have been described on a limited number of individuals - the most recurrent problem in morphospecies description being the lack of consideration for natural variation – or from one location. When wider sampling is possible, it may become difficult to draw a clear limiting line between simple geographical variation and species difference. Although the idea that morphological differences are the reflection of biological divergence, it may happen that morphology appears disconnected from other biological properties. *Alvania* sp. and *A. beani* could be two morphospecies, but they could also be the same biological entity awaiting genetical analysis for verification. *A. sp.* protoconch I nucleus is circa 70 µm, while that of *A. marmarisensis* 150 µm (Bitlis & Öztürk, 2017). At the same time, *A. sp.* protoconch I maximum diameter is 190 µm, while that of *A. marmarisensis* 340 µm (Bitlis & Öztürk, 2017). Both characters' sizes in *A. sp.* correspond to 3 additional mitotic divisions prior to meiosis as of that of *A. marmarisensis* – a possible case of poecilogony according to Manousis *et al.* (2017, 2019).

Fusinus rusticulus (Monterosato, 1880) has been originally described as *Trophon rostratus* var. *rusticula* Monterosato, 1880 e.g. belonging to the species *Trophon rostratus* (Olivi, 1792) = *Murex rostratus* Olivi, 1792 = *Fusinus rostratus* (Olivi, 1792) = *Gracilipurpura rostrata* (Olivi, 1792) - a rather common and polymorphic inhabitant of the Aegean Sea. *F. rusticulus* is endemic to the Gulf of Gabes (Buzzurro & Russo, 2007) while all other reports for various areas of the Mediterranean Sea are considered as without foundation (Russo, 2019). As our specimens are rather indistinguishable from existing *F. rusticulus* lectotype and syntypes we are looking forward to molecular markers analysis which would clarify the situation.

Ovatella aequalis (R. T. Lowe, 1832) specimens fit the relevant description by Gofas *et al.* (2014). These authors propose the

possibility that *Ovatella firminii* (Payraudeau, 1827) of the inner Mediterranean Sea may represent a geographical variation of the same species.

With the new findings, the Hellenic bivalve fauna is raised from 356 (Manousis *et al.*, 2020b) to 360 while that of the gastropods from 729 (Manousis *et al.*, 2020c) to 746.

Acknowledgements

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Erratum

In a previous publication of ours (Mbazios *et al.*, 2020) we have by mistake and to our regret included the species *Chauvetia procerula* (Monterosato, 1889), *Dikoleps marianae* Rubio, Dantart & Luque, *Dikoleps templadoi* Rubio, Dantart & Luque, 2004 and *Skenea serpuloides* (Montagu, 1808) as ours. They belong to our ex collaborator Georgios Polyzoulis and as such we recognize his right to include them in a publication of his as first records for Greece.

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Figure 1: a. *Austronucula perminima* (Monterosato, 1875), b. *Yoldia micrometrica* Seguenza G., 1877, c. *Brachidontes pharaonis* (P. Fischer, 1870), d. *Isognomon australica* (Reeve, 1858), muscle scars and prodisoconch, e-g. *Dendostrea folium* (Linnaeus, 1758). Barr = 1 mm, unless otherwise indicated.

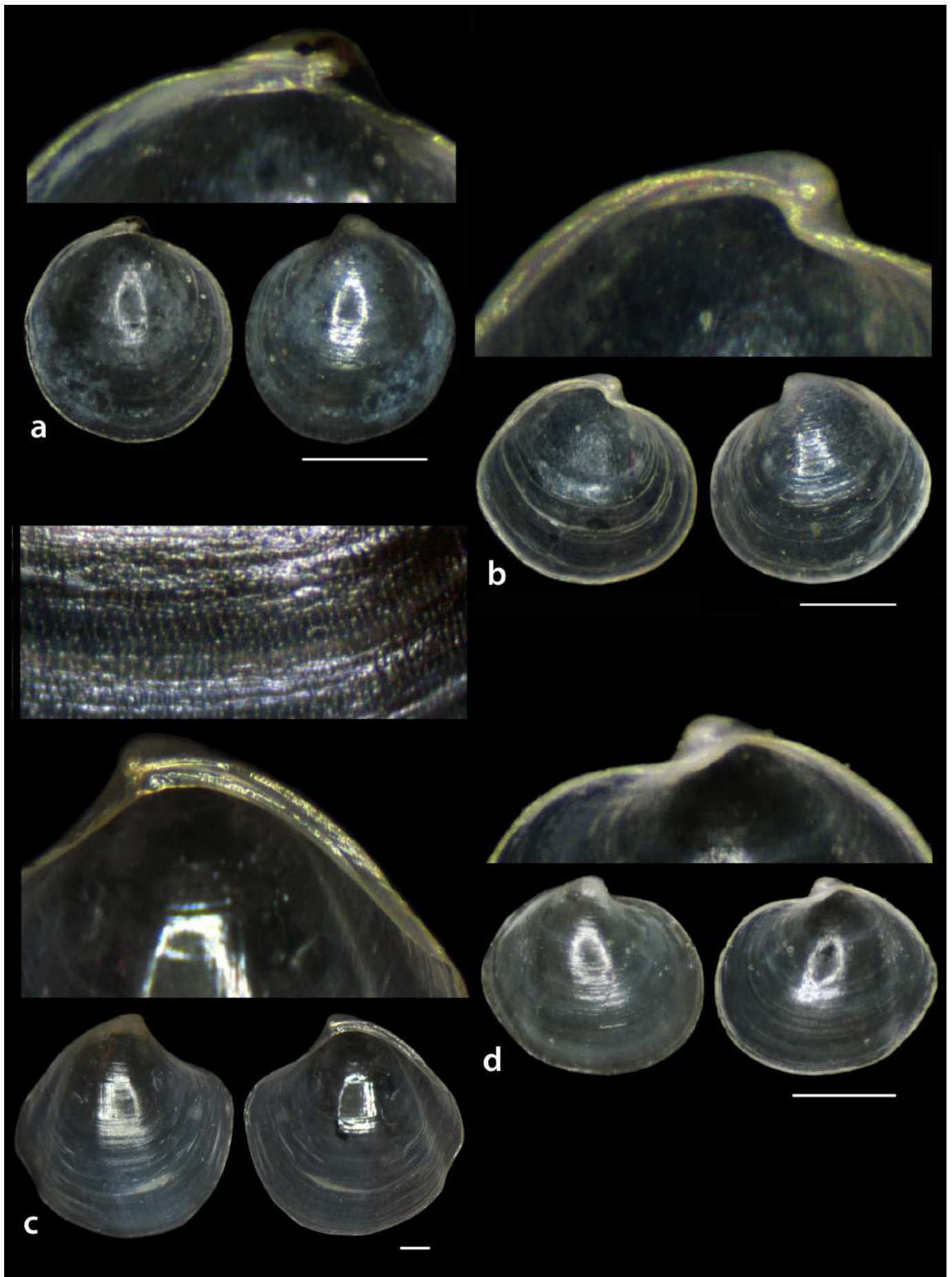


Figure 2: a. *Axinulus croulinensis* (Jeffreys, 1847), b. *Mendicula ferruginosa* (Forbes, 1844), c. *Thyasira granulosa* (Monterosato, 1874), d. *Thyasira subovata* (Jeffreys, 1881). Barr = 1 mm.

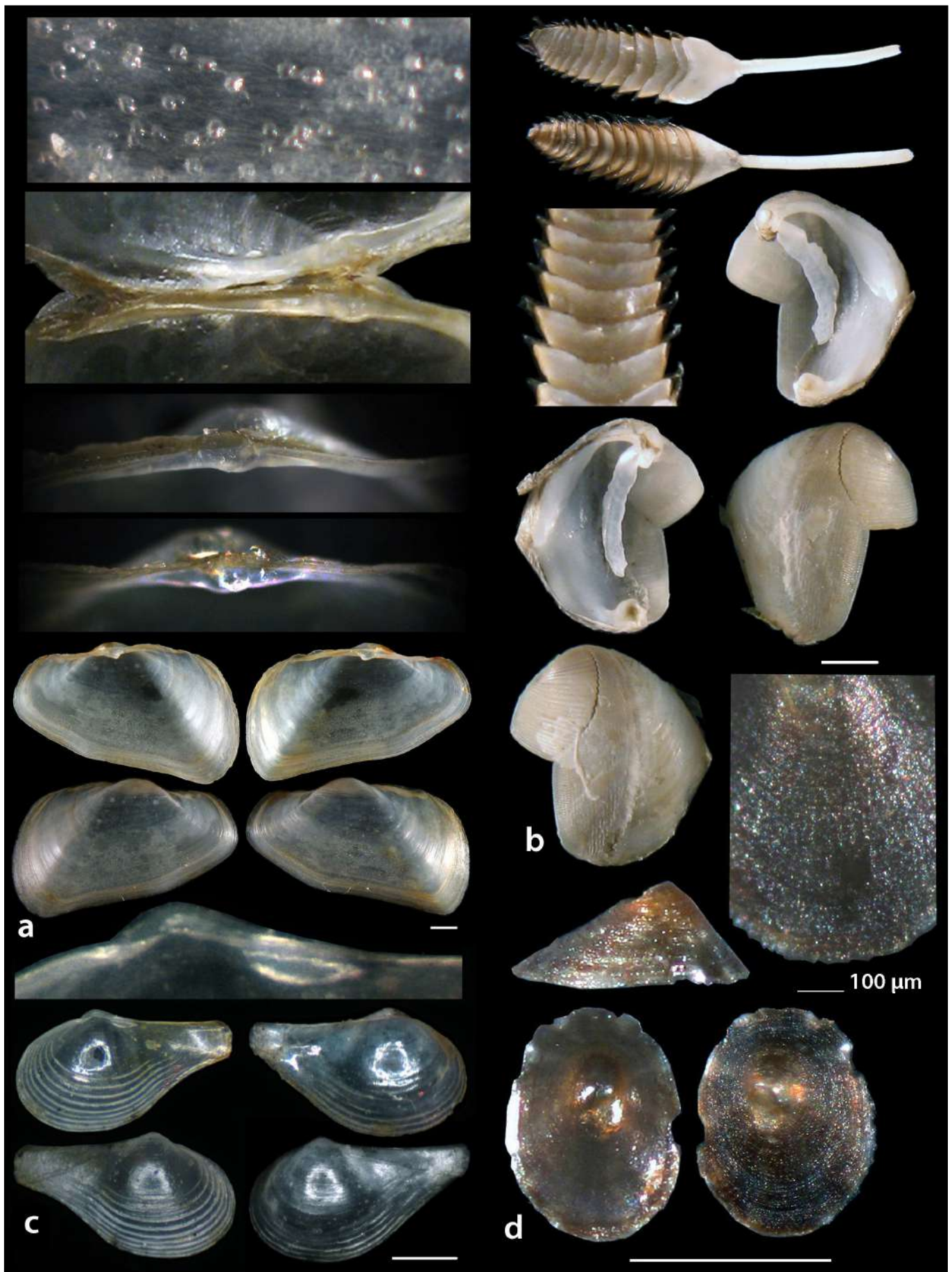


Figure 3: a. *Retusa* sp. 1, b. *Retusa truncatula* (Bruguière, 1792), c. *Retusa* sp. 2. Barr = 1 mm.



Figure 4: a. *Trochaclis versiliensis* Warén, Carrozza and Rocchini, 1992, b. *Dasyskenea suavis* Fasulo & Cretella, 2003, c. *Mikro giustii* (Bogi & Nofroni, 1989). Barr = 1 mm, unless otherwise indicated.

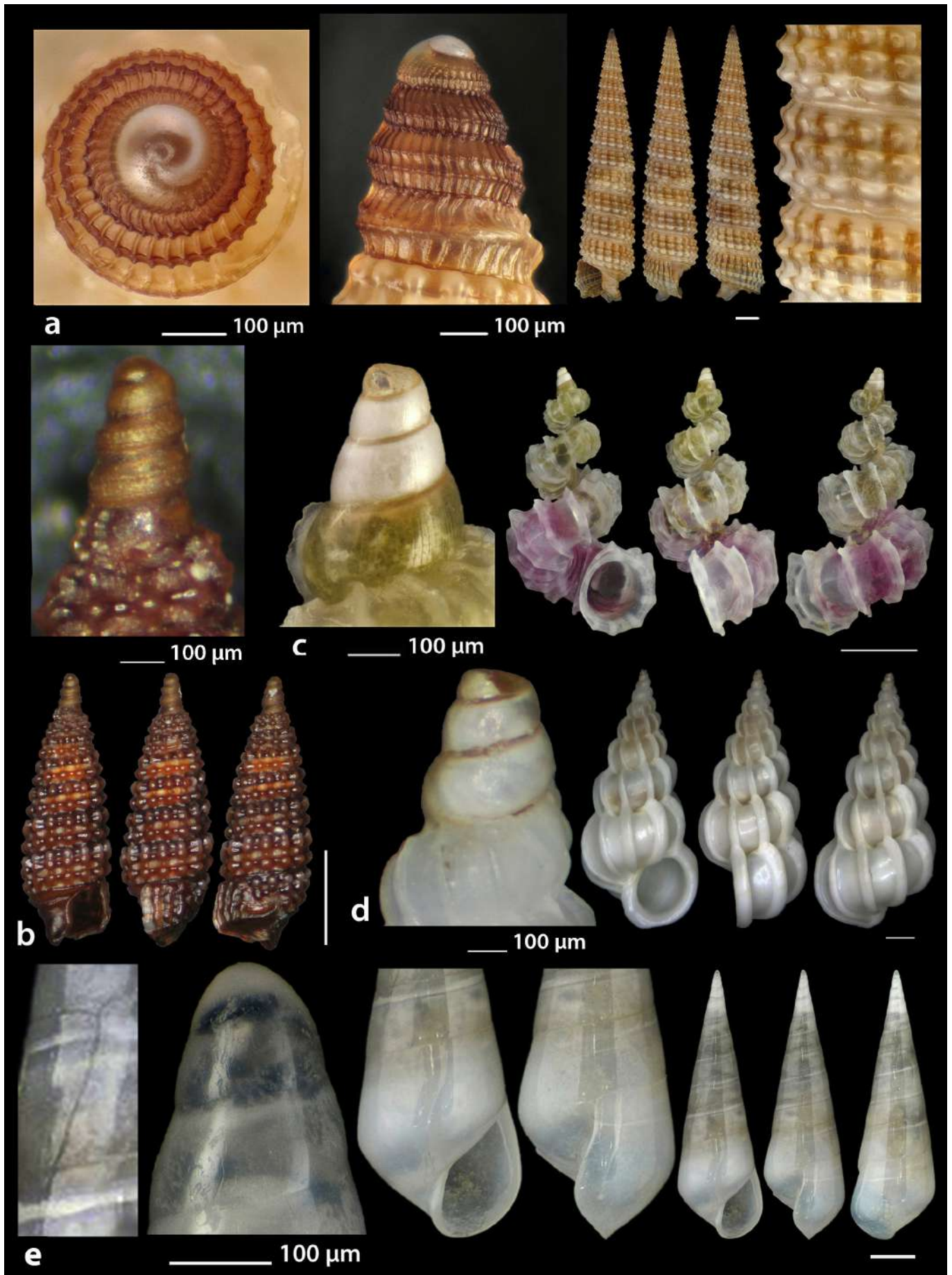


Figure 5: a. *Euthymella colzumensis* (Jousseaume, 1898), b. *Cerithiopsis pulchresculpta* Cachia, Mifsud & Sammut, 2004, c. *Cycloscala hyalina* (G. B. Sowerby II, 1844), d. *Epitonium jolyi* (Monterosato, 1878), e. *Melanella conoidea* (Kurtz & Stimpson, 1851). Barr = 1 mm, unless otherwise indicated.

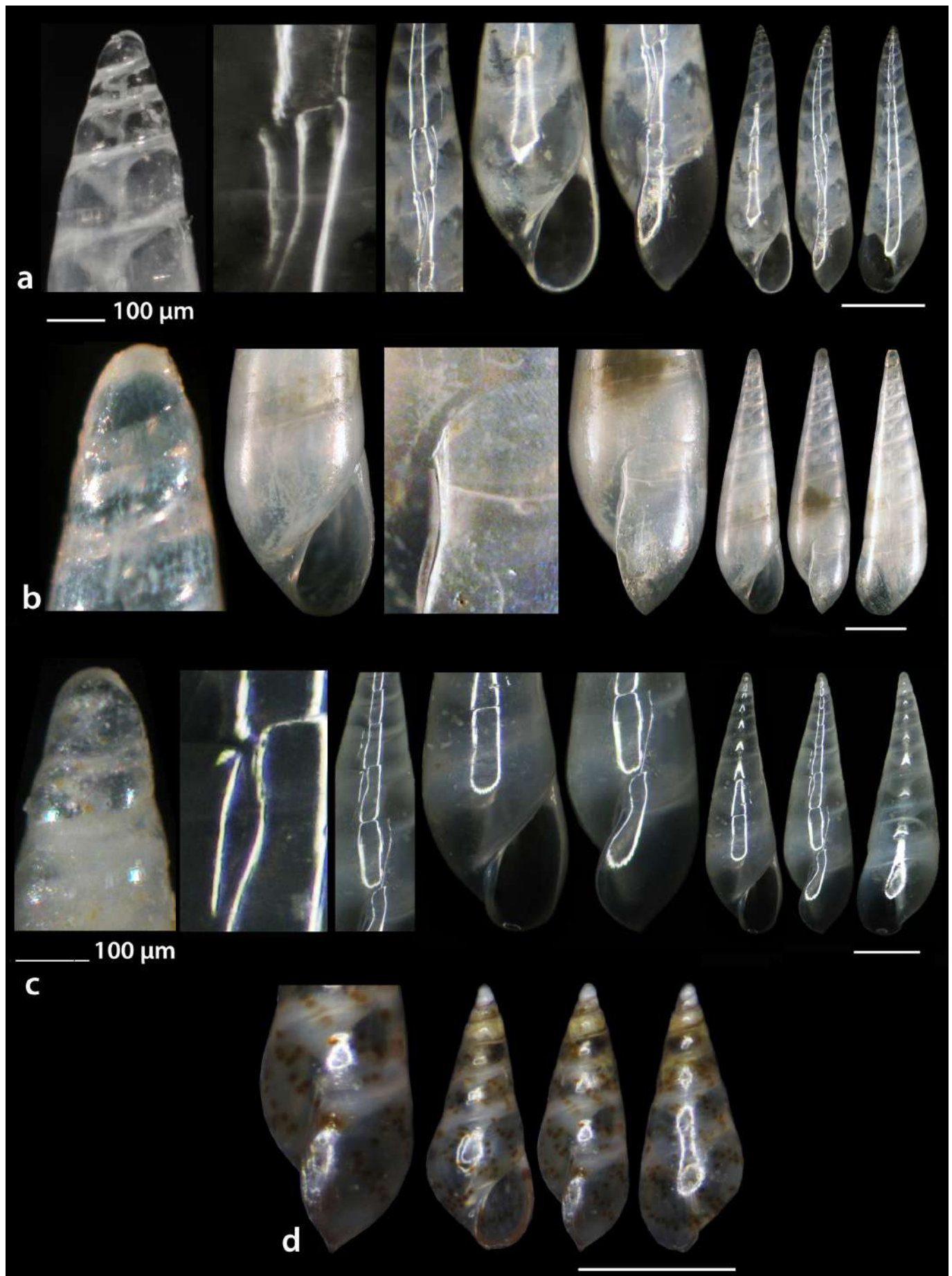


Figure 6: a. *Melanella* sp., b. *Melanella compactilis* (Locard, 1891), c. *Melanella polita* (Linnaeus, 1758), d. *Sticteulima lentiginosa* (A. Adams, 1861). Barr = 1 mm, unless otherwise indicated.

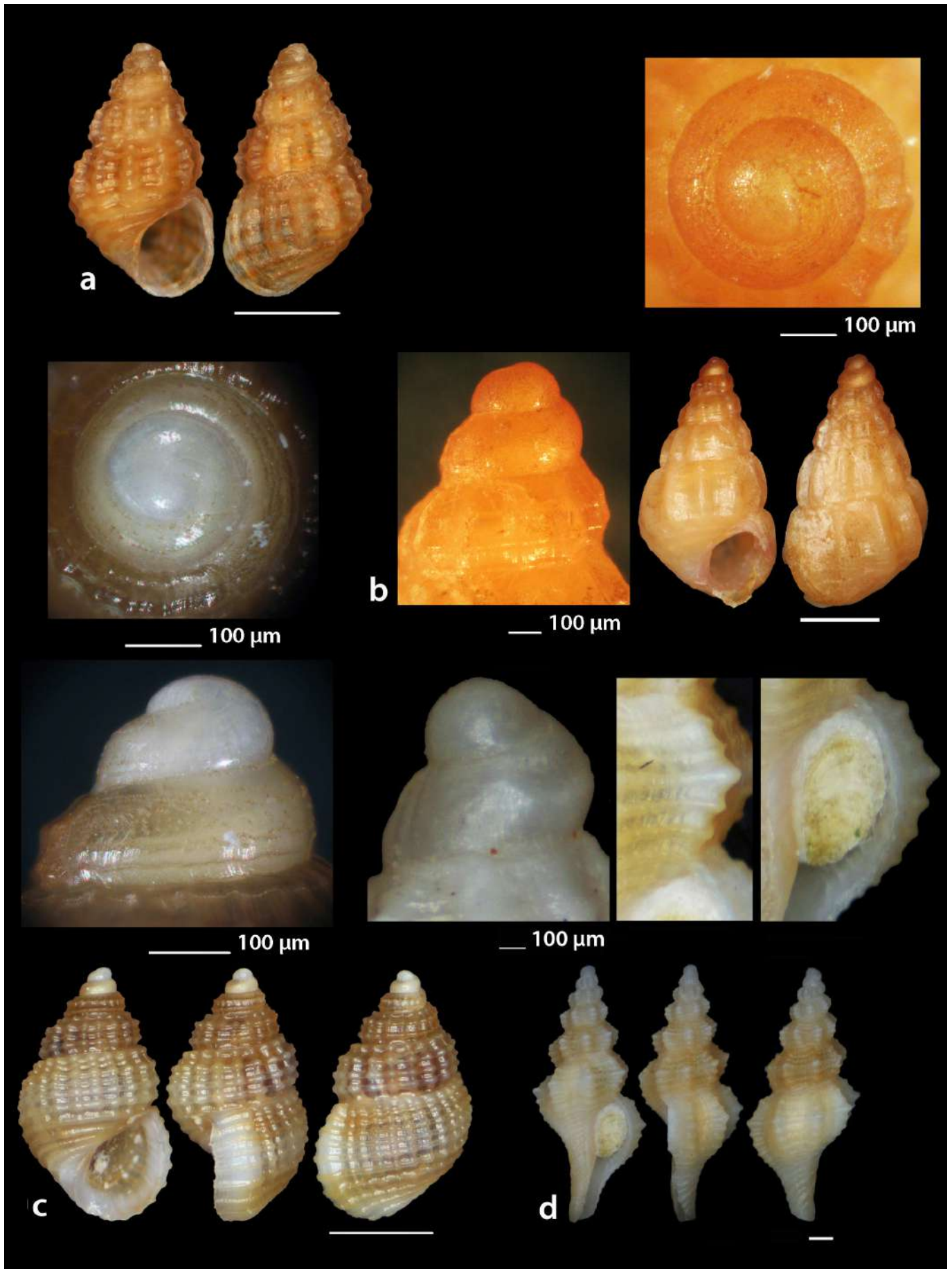


Figure 7: a. *Alvania fractospira* Oberling, 1970, b. *Alvania settepassii* Amati & Nofroni, 1985, c. *Alvania* sp., d. *Fusinus rusticus* (Monterosato, 1880). Barr = 1 mm, unless otherwise indicated.

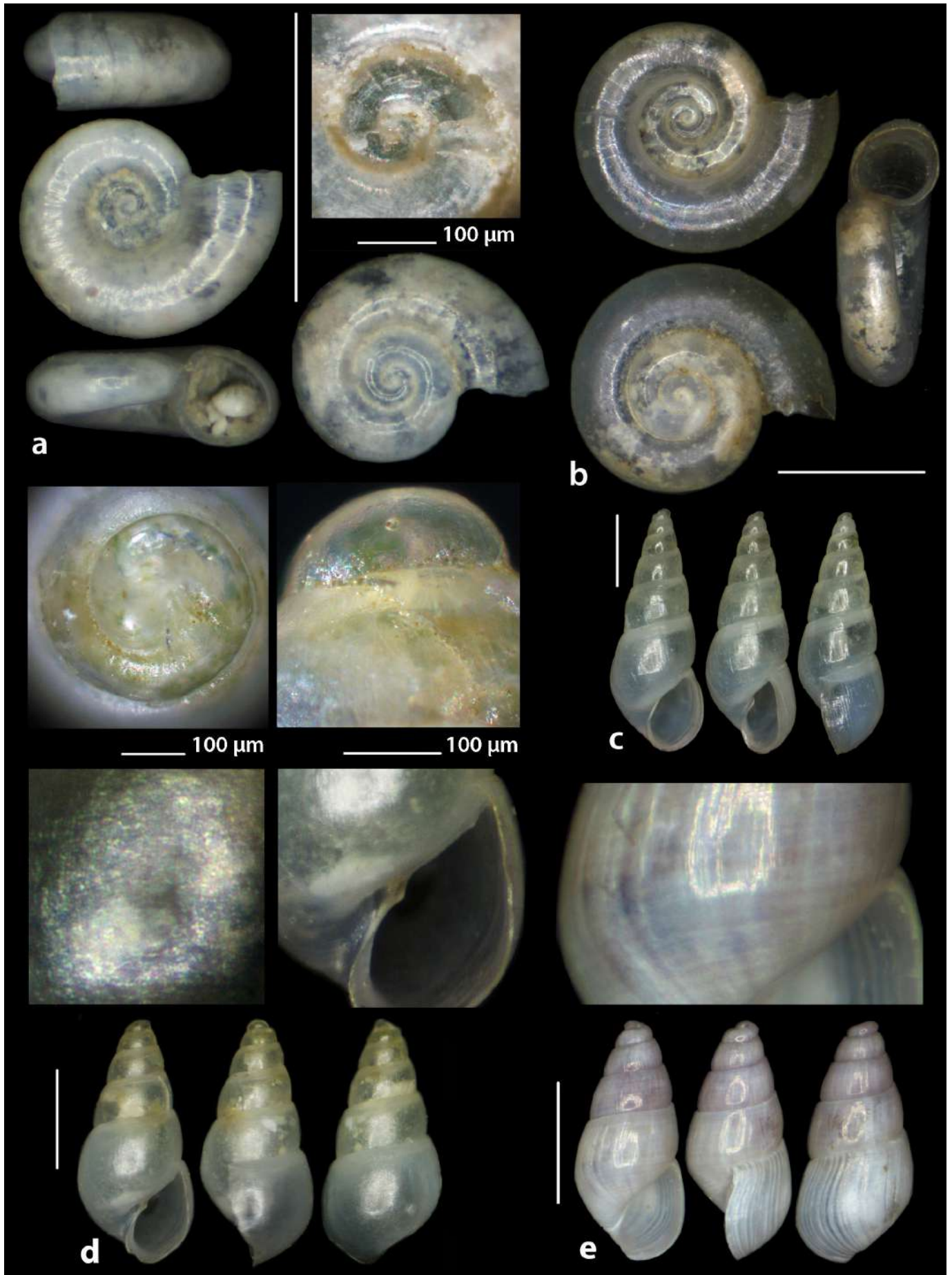


Figure 8: a. *Xylodiscula boucheti* Warén, Carrozza & Rocchini in Warén, 1992, b. *Xylodiscula lens* Warén, 1992, c. *Auristomia fusulus* (Monterosato, 1878), d. *Odostomia rissoiformis* Milaschewitsch, 1909, e. *Ondina divisa* (J. Adams, 1797). Barr = 1 mm, unless otherwise indicated.

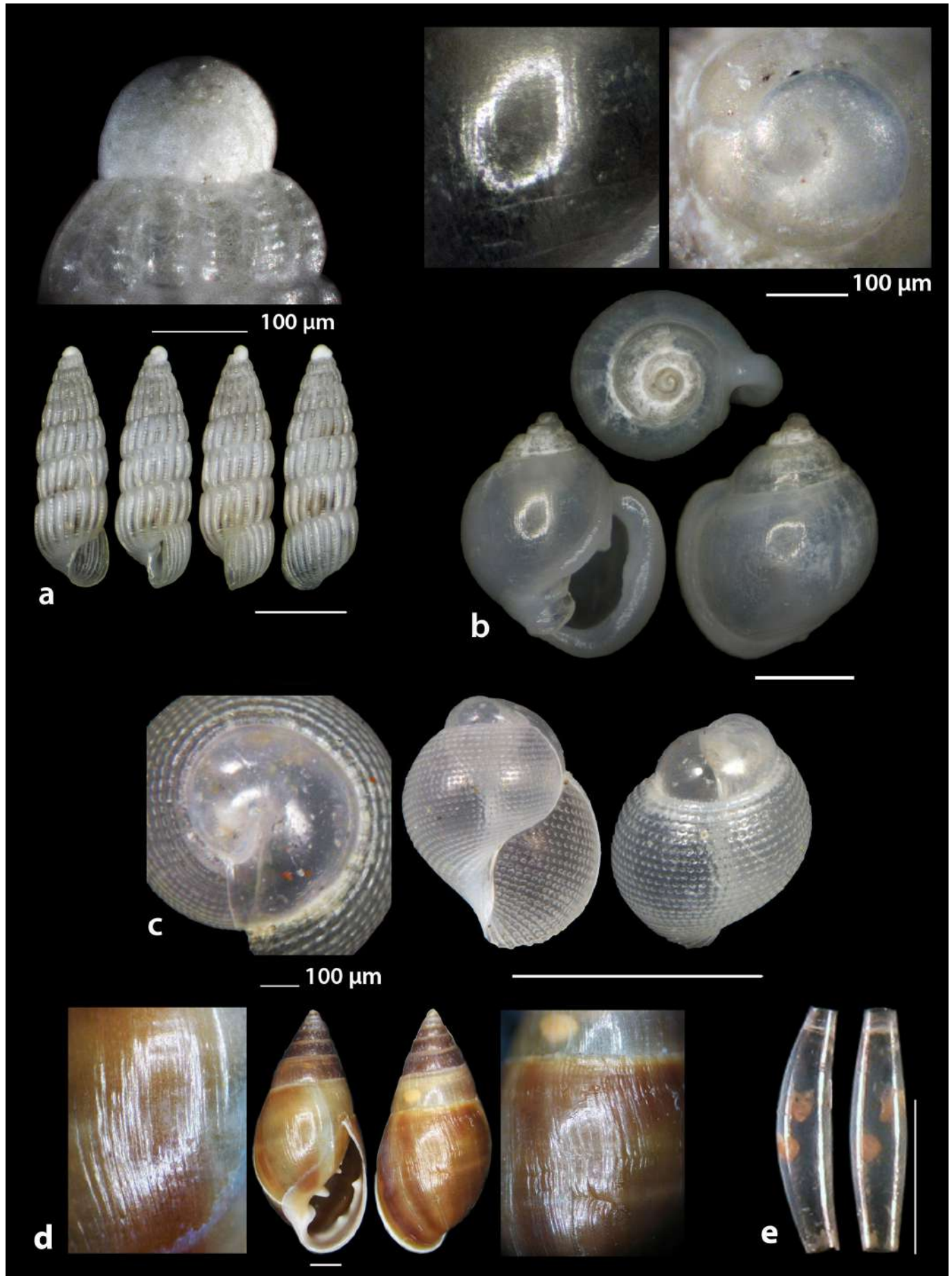


Figure 9: a. *Turbonilla edgarii* (Melvill, 1896), b. *Ringicula* sp., c. *Callostracon tyrrhenicum* (Smriglio & Mariottini, 1996), d. *Ovatella aequalis* (R. T. Lowe, 1832), e. *Cadulus subfusiformis* (M. Sars, 1865). Barr = 1 mm, unless otherwise indicated.

Table 1: List of recorded species with collection data and corresponding references.

[illegible]

Remarques taxonomiques et nomenclaturales sur les mollusques gastéropodes du Paléogène de France et description d'espèces nouvelles.

Partie 3. Conoidea

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Résumé : Des remarques taxonomiques et nomenclaturales sur les mollusques gastéropodes du Paléogène de France sont proposées. Des noms de remplacement sont introduits pour 3 espèces : *Pleurotomella irminonvilla* nom. nov., *Eopleurotoma atacica* nom. nov. et *Gemmula bearrizensis* nom. nov. 2 espèces nouvelles sont décrites : *Cordieria biouesensis* nov. sp. et *Gemmula osca* nov. sp.

Mots clés : Mollusca, Gastropoda, remarques taxonomiques et nomenclaturales, nouveaux noms, Paléogène, France.

Abstract : Taxonomic and nomenclatural changes on mollusc gastropods of the Paleogene of France are proposed. New names are introduced for 3 species: *Pleurotomella irminonvilla* nom. nov., *Eopleurotoma atacica* nom. nov. et *Gemmula bearrizensis* nom. nov. 2 new species are described: *Cordieria biouesensis* nov. sp. et *Gemmula osca* nov. sp.

Key words : Mollusca, Gastropoda, taxonomic and nomenclatural changes, new names, Paleogene, France.

Introduction

Les remarques taxonomiques et nomenclaturales qui suivent concernent les Gastéropodes du Paléogène français. Comme nous l'avons écrit précédemment (PACAUD, 2017, 2019), la *Révision des Mollusques paléogènes du bassin de Paris* publiées par LE RENARD & PACAUD (1995) et par PACAUD & RENARD (1995) s'appuyaient sur une systématique et une nomenclature « révisée », qui ne correspondent plus à ce qui est actuellement admis ou sont tout simplement erronées. En outre, ces travaux publiés en 1995 ne prenaient pas en compte ni les fossiles du Danien, ni ceux de l'Oligocène, ni les faunes hors du bassin de Paris, ce que nous faisons ici. Les gastéropodes du Paléogène de France ont été pour une grande part revu et nous proposons des remarques taxonomiques et nomenclatural pour ces derniers. Des noms de remplacement sont introduits pour 3 espèces pour lesquelles existent des homonymies primaires et secondaires, 2 espèces nouvelles, confondues avec d'autres, sont introduites.

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Abréviations

MNH.N.F : Muséum national d'Histoire naturelle de Paris, Collection de Paléontologie (France).

MNH.N.IM : Muséum national d'Histoire naturelle de Paris, Collection de Malacologie (France)

MNH.N.L : Muséum national d'Histoire naturelle de Luxembourg (Grand-Duché de Luxembourg).

UPS : Service commun Études & Conservations des Collections Patrimoniales de l'Université Paul Sabatier, Toulouse (France).
IRScNB : Institut royal des Sciences naturelles de Bruxelles (Belgique).

Systématique

Super-famille **Conoidea** Fleming, 1822

Famille **Borsoniidae** Bellardi, 1875

Genre **Cordieria** Rouault, 1848

Espèce type : *Cordieria iberica* Rouault, 1850 par désignation subse-
quente (COSSMANN, 1896). Origine : France, Éocène

***Cordieria biouesensis* nov. sp.**

Synonymie

Cordieria coemansi sensu Villatte, 1962 [non *Borsonia coemansi* Briart & Cornet, 1871] : 230, pl. 8, fig. 2-3.

Matériel type. UPST. L'exemplaire figuré par Villatte en est l'holotype.

Localité type. Biouès, Le Plan (Haute-Garonne), Thanétien (Paléocène supérieur).

Étymologie. De sa localité type.

Discussion. VILLATTE (1962 : 230, pl. 8, fig. 2-3) rapporte un spécimen du Thanétien (Paléocène supérieur) de Biouès, Le Plan (Haute-Garonne) à l'espèce *Cordieria coemansi* (Briart & Cornet, 1871) du Danien (Paléocène inférieur) de Mons (Belgique) (BRIART & CORNET, 1871 : 61, pl. 5, fig. 5a-d). Il s'agit pourtant d'une espèce différente. La coquille des Petites Pyrénées en diffère en effet par un galbe plus allongé et plus étroit, par l'absence d'une seconde rangée de tubercules suprasuturales ainsi que par une nette sculpture axiale. Nous proposons de désigner désormais cette espèce sous le nom de ***Cordieria biouesensis* nov. sp.**

***Cordieria briarti* (Cossmann, 1899)**

Borsonia briarti Cossmann, 1899 : 138.

Synonymie

Borsonia bellardii Briart & Cornet, 1877 [non Deshayes, 1865] : 32, pl. 15, fig. 5a-c

Borsonia chavani Glibert 1973 [non Villatte, 1962] : 85, pl. 10, fig. 8.

Matériel type. Syntypes IRScNB.

Localité type. Mons (Belgique), Danien (Paléocène inférieur).

Discussion. En 1973 (p. 85, pl. 10, fig. 8) GLIBERT introduit le nom *Borsonia chavani* pour corriger l'homonymie primaire *Borsonia bellardii* Briart & Cornet, 1877 non Deshayes, 1865. En renommant cette espèce, Glibert n'a pas remarqué que VILLATTE (1962 : 228, pl. 11, fig. 1-3) avait déjà décrit une espèce du Thanétien (Paléocène supérieur) de Biouès, Le Plan (Haute-Garonne) sous le nom de *Borsonia chavani*. Par ailleurs, Glibert

n'a pas remarqué non plus que Cossmann avait déjà proposé pour l'espèce du Danien de Belgique le nom de remplacement *Borsonia briarti* dès 1899 (p. 138), nous évitant ainsi de proposer un nom de substitution pour correction d'homonymie primaire.

Cordieria gracilis (Sandberger, 1862)

Borsonia gracilis Sandberger, 1862 : 246, n° 1 (cf. Sandberger, 1860 : pl. 16, fig. 11).

Synonymie

Pleurotoma delucii sensu Sandberger, 1860 [non Nyst, 1836] : pl. 16, fig. 11.

Discussion. En 1860, SANDBERGER (pl. 16, fig. 11) figure une espèce de l'Oligocène d'Allemagne qu'il assimile au *Pleurotoma delucii* Nyst, 1836 du Rupélien (Oligocène inférieur) de Hoesselt et de Kleyn-Spauwen (Belgique), puis en 1862 (p. 246, n° 1), sur les conseils de Bosquet, il la sépare comme espèce distincte sous le nom de *Borsonia gracilis*. BOUSSAC (1911b : 375, pl. 22, fig. 33 et 37) signale cette espèce dans les marnes du Priabonien (Éocène supérieur) du Vit-de-Castellane (Alpes-de-Haute-Provence) d'après des exemplaires dont les filets spiraux couvrent la surface des tours d'une suture à l'autre, contrairement aux spécimens oligocènes typiques.

Il faut noter toutefois que *Pleurotoma delucii* Nyst, 1836 est un homonyme primaire plus récent de *Pleurotoma delucii* DeFrance, 1826. D'ORBIGNY (1852 : 12, n° 195i) avait proposé le nom de remplacement *Pleurotoma nissus* pour corriger l'homonymie primaire *Pleurotoma delucii* Nyst « 1845 » [en fait 1836 : 173, pl. 4, fig. 85] non DeFrance, 1826. Cependant, TUCKER (2004 : 291) écrit que l'assertion de DES MOULINS (1842 : 127-128), qui attribue à DeFrance « Dict. p. 395 » le *Pleurotoma delucii*, et qui le réunit à titre de variété au *P. cataphracta* (Brocchi, 1814), est non fondée. Il ajoute même que « DeFrance n'a décrit aucun *Pleurotoma delucii* à la page 395 ni d'ailleurs à aucune autre page du genre *Pleurotoma* ». Or, nous trouvons à la page 391 [et non 395] du *Dictionnaire des Sciences Naturelles* le texte suivant de DeFrance : « [...] plus raccourcie [que *Pleurotoma cataphracta* (Brocchi, 1814)] et que les élévations de la carène sont plus tuberculeuses et moins nombreuses. [...] une espèce particulière que j'avois nommée *Pleurotoma delucii* ». Le taxon est bel et bien décrit et le nom est disponible, contrairement à ce qu'a écrit Tucker qui le considère comme un *nomen nudum*, donné comme un synonyme du *P. cataphracta* par Des Moulins. La correction en *P. nissus* d'Orbigny, 1852 est donc fondée. *Mitra biblicata* Philippi, 1847 (homonyme primaire plus récent de *M. biplicata* Risso, 1826) est un synonyme subjectif plus récent de *Cordieria nissus* (d'Orbigny, 1852). *Pleurotoma delucii* DeFrance, 1826 et *Pleurotoma cataphracta aquensis* Grateloup, 1845 (pl. 3 [21], fig. 20) sont des synonymes subjectifs plus récents de *Bathytoma cataphracta* (Brocchi, 1814). Nous rappelons que, conformément aux Art. 24.1 et 57.7 de l'ICZN (1999) relatif aux taxons homonymes établis à la même date [et ici dans le même travail], le nom établi au rang d'espèce a la préséance sur celui établi au rang de sous-espèce : *Pleurotoma cataphracta aquensis* Grateloup, 1845 (pl. 3 [21], fig. 20) est donc également un homonyme primaire de *Pleurotoma aquensis* Grateloup, 1845 (pl. 2 [20], fig. 14).

Cordieria mitraeformis (Deshayes, 1865)

Borsonia mitraeformis Deshayes, 1865 : 347, pl. 95, fig. 14-16.

Synonymie

Cordieria lapidaria sensu Le Renard & Pacaud, 1995 [non *Pleurotoma lapidaria* Dollfus, 1899] : 123.

Discussion. En 1899 (p. 179) DOLLFUS introduit le nom *Pleurotoma lapidaria* pour corriger l'homonymie secondaire *Pleurotoma mitraeformis* (de Boury, 1899) [en fait décrit comme *Oligotoma*] non *Pleurotoma mitraeformis* Wood, 1828 [émendation de KIENER (1840) ; l'espèce a été décrite sous le nom de *Pleurotoma mitriformis* Wood, 1828]. Dollfus provoque l'homonymie secondaire en rapportant l'espèce de De Boury au genre *Pleurotoma*. Or, LE RENARD & PACAUD (1995 : 123) se sont trompés en confondant deux taxons et nommèrent *Cordieria lapidaria* l'espèce *Borsonia mitraeformis* décrite et figurée par DESHAYES (1865 : 347, pl. 95, fig. 14-16). DOLLFUS (1899 : 179) a proposé le nom de remplacement *lapidaria* en renvoyant non pas à la figure originale de Deshayes mais à celle de De Boury qui est un *Asthenotoma* (Fig. 1). Il est donc clair que ce nouveau nom se rapporte au spécimen figuré par De Boury et non à la *Cordieria* figurée par Deshayes qui doit conserver le nom *mitraeformis*. *Oligotoma mitraeformis* de Boury, 1899 est un synonyme subjectif plus récent de *Asthenotoma pupa* (Edwards, 1861).

Genre ***Pleurotomoides*** Bronn, 1831

Espèce type : *Defrancia pagoda* Millet, 1827 par typification du nom remplacé. Origine : France, Miocène

Pleurotomoides sublaevigatus (Grateloup, 1845)

Pleurotoma sublaevigatus Grateloup, 1845 : pl. 2 [20], fig. 27.

Synonymie

Pleurotoma costellata minor Grateloup, 1845 [non *Pleurotoma dimidiatum minor* Philippi, 1844 nec *Pleurotoma minor* Adams, 1845 nec *Pleurotoma requienii minor* Grateloup, 1845 nec *Pleurotoma crenulata minor* Grateloup, 1845] : pl. 2 [20], fig. 27.
Pleurotoma costellata brevicauda Grateloup, 1845 [non *Pleurotoma brevicauda* Deshayes, 1834] : pl. 2 [20], fig. 27.
Pleurotoma subcostellata d'Orbigny, 1852 : 60, n° 1054.

Discussion. D'ORBIGNY (1852 : 60, n° 1054) considère *Pleurotoma costellata* sensu GRATELOUP, 1845 (pl. 2 [20], fig. 25, 27-29) comme une espèce différente de celle décrite par LAMARCK (1804) et propose le nouveau nom *Pleurotoma subcostellata* [Syntype : Bordeaux (Gironde), 1 ex., MNHN.F.A13185 (coll. d'Orbigny)]. En renommant cette espèce, d'Orbigny n'a pas remarqué que GRATELOUP (1845) avait donné aux spécimens des figures 27-29 les noms de *Pleurotoma costellata sublaevigata*, *P. costellata minor* et *P. costellata brevicauda* les distinguant ainsi de la forme nominative. Toutefois *Pleurotoma costellata minor* Grateloup, 1845 est un homonyme primaire plus récent de nombreux taxons (*Pleurotoma dimidiatum minor* Philippi, 1844, *Pleurotoma minor* Adams, 1845, *Pleurotoma requienii minor* Grateloup, 1845, *Pleurotoma crenulata minor* Grateloup, 1845) et *P. costellata brevicauda* Grateloup, 1845 est un homonyme primaire plus récent de *P. brevicauda* Deshayes, 1834. *Pleurotoma sublaevigata* d'Orbigny, 1850, homonyme primaire

plus récent de *P. costellata sublaevigata* Grateloup, 1845, a été renommé *Cryptoconus mellevillei* Tucker & Le Renard, 1993. Le nouveau nom *Pleurotoma subcostellata* d'Orbigny, 1852, synonyme subjectif plus récent de *P. costellata sublaevigata* Grateloup, 1845, est superflu. *P. turris sublaevigata* Grateloup, 1832d est un *nomen nudum*.

Famille Mangeliidae Fischer P., 1883
Genre **Amblyacrum** Cossmann, 1889b

Espèce type : *Pleurotoma rugosa* Deshayes, 1834 non Lea, 1833 par désignation originale. [= *Raphitoma gougeroti* Tucker & Le Renard, 1993] Origine : France, Éocène

Amblyacrum dameriacense (Deshayes, 1865)

Pleurotoma dameriacensis Deshayes, 1865 : 394-395, n° 75, pl. 99, fig. 7-9.

Synonymie

Pleurotoma carinata Deshayes, 1834 [non Link, 1808] : 489, pl. 66, fig. 26-29.

Raphitoma defrancei Tucker & Le Renard, 1993 : 2.

Discussion. En 1993 (p. 2) TUCKER & LE RENARD introduisent le nom *Raphitoma defrancei* pour corriger l'homonymie primaire *Pleurotoma carinata* Deshayes, 1834 (p. 489, pl. 66, fig. 26-29) non Link, 1808. Cependant, nous considérons l'espèce du Lutétien (Éocène moyen) *Pleurotoma dameriacensis*, décrite par DESHAYES (1865 : 394-395, n° 75, pl. 99, fig. 7-9), comme un synonyme de *Pleurotoma carinata* Deshayes, 1834 ; c'est ce nom que nous utiliserons ici. Le nom de substitution *Raphitoma defrancei* Tucker & Le Renard, 1993 est donc superflu.

Famille Raphitomidae Bellardi, 1875
Genre **Pleurotomella** Verrill, 1873

Espèce type : *Pleurotomella packardii* Verrill, 1873 par monotypie
Origine : USA, Récent

Pleurotomella irminonvilla nom. nov.

Synonymie

Raphitoma (Systemope) goniocolpa Cossmann, 1889 : 294 partim.

Pleurotomella goniocolpa Cossmann. – Cossmann & Pissarro, 1913 : pl. 53, fig. 227-3.

Pleurotomella goniocolpa Cossmann. – Cossmann, 1913 : 224.

Pleurotomella cossmanni Morellet & Morellet, 1946 [non Koperberg, 1931] : 353-354.

Pleurotomella (Systemope) goniocolpa Cossmann. – Le Renard & Pacaud, 1995 : 126.

Matériel type. Syntypes, 1 ex., MNHN.F.J05415 (coll. Cossmann), 15 ex., MNHN.F.A45999 (coll. Morlet).

Localité type. Bois-de-Perthes, Ermenonville (Oise), Auversien (Bartonien, Éocène moyen).

Étymologie. De sa localité type, attesté sous le nom Irminon villa au 10^e siècle. Composé du nom d'un homme d'origine germanique Irmin(o)n ou Ermin(o) + villa, qui désigne un domaine rural (NÈGRE, 1996). Nom donné en apposition.

Discussion. *Raphitoma (Systemope) goniocolpa* a été introduit par COSSMANN (1889 : 294) pour une espèce du Lutétien et du Bartonien (Éocène moyen) du Bassin parisien. COSSMANN

(1913 : 224), à la suite des commentaires de PEZANT (1909 : 22), a reconnu que le matériel type (coll. Boutillier et Chevallier) provenant du Lutétien de Thiverval-Grignon (Yvelines) et de Chaussy (Val d'Oise) n'était constitué que d'exemplaires juvéniles d'*Amblyacrum costellatum* (Lamarck, 1804). *Pleurotomella cossmanni* a été introduit par MORELLET & MORELLET (1946 : 353-354) pour les exemplaires bartoniens de *Raphitoma (Systemope) goniocolpa* (Cossmann, 1889). Ce nom est invalide et doit être remplacé du fait de l'existence de *Pleurotomella cossmanni* Koperberg, 1931. Nous proposons comme nom de substitution ***Pleurotomella irminonvilla*** nom. nov.

Famille Clavatulidae Gray, 1853
Genre **Turricula** Schumacher, 1817
Sous-genre **Crenaturricula** Vokes, 1939

Espèce type : *Surcula crenatospira* Cooper, 1894 par désignation originale. Origine : Californie, USA, Éocène

Turricula (Crenaturricula) barreti (de Boury, 1899) (Fig. 2)

Pleurotoma barreti de Boury, 1899 : 116, pl. 1, fig. 21.

Synonymie

Turricula (Crenaturricula) bouryi Glibert, 1960 : 33.

Discussion. Le nom *Pleurotoma barreti* de Boury, 1899 n'est pas un homonyme primaire plus récent de *Pleurotoma barretti* Guppy, 1866 comme l'écrit GLIBERT (1960 : 33) en proposant le nom de remplacement *Turricula (Crenaturricula) bouryi*. En effet, conformément à l'Art. 57.6 de l'ICZN (1999), la différence d'une lettre entre ces deux épithètes suffit pour qu'il n'y ait pas homonymie. Par ailleurs, l'espèce décrite par DE BOURY (1899 : 116, pl. 1, fig. 21) est dédiée à l'Abbé Barret, alors curé d'Amblainville (Oise), qui a découvert un grand nombre de gisements bartoniens dans le bassin de Paris (MORLET, 1888) alors que l'espèce introduite par Guppy en 1866 est, quant à elle, dédiée à Lucas Barrett, ancien Directeur du Geological Survey of West Indies. L'espèce décrite par Guppy appartient au genre *Polystira* Woodring, 1928 (POWELL, 1966). Le nom proposé par de Boury est donc tout à fait valide.

Famille Turridae Adams, H. & A., 1853
Genre **Eopleurotoma** Cossmann, 1889

Espèce type : *Pleurotoma multicostata* Deshayes, 1834 par désignation originale. Origine : France, Éocène

Eopleurotoma atacica nom. nov.

Synonymie

Pleurotoma (Eopleurotoma) romani Doncieux, 1908 [non *Pleurotoma (Clavula) romani* Libassi, 1859] : 41-42, pl. 2, fig. 16.

Matériel type. Syntypes : 6 ex., MNHN.F.R64115 (coll. Bories) ; 1 ex., UPS.BO-113 (coll. Bories, figuré par DONCIEUX, 1908).

Localités types. Métairie Coustalet, Fabrezan, (Aude), Bergerie des Palais, Fabrezan, (Aude), Albas (Aude), Ilerdien (Yprésien, Éocène inférieur).

Étymologie. De sa région type l'Aude où le matériel type a été récolté. Nom empreinté au fleuve éponyme, l'ancien Atax, déformation progressive de « Atacos » terme gaulois signifiant fougueux ou très rapide.

Discussion. Le nom *Pleurotoma (Eopleurotoma) romani* a été introduit par DONCIEUX (1908) pour une espèce de l'Ilerdien (Yprésien, Éocène inférieur) des Corbières. Ce nom est invalide et doit être remplacé du fait de l'existence de *Pleurotoma (Clavatula) romani* Libassi, 1859 du Néogène d'Altavilla (Italie) (LIBASSI, 1859 : 30-31, n° 62, fig. 30). Nous proposons comme nom de substitution pour l'espèce des Corbières *Eopleurotoma atacica* nom. nov.

***Eopleurotoma flexicosta* (de Boury, 1899) (Fig. 3)**

Pleurotoma flexicosta de Boury, 1899 : 44, pl. 1, fig. 8.

Synonymie

Eopleurotoma brebionis Tucker & Le Renard, 1993 : 2.

Discussion. Le nom *Pleurotoma flexicosta* de Boury, 1899 n'est pas un homonyme primaire plus récent de *Pleurotoma flexicostatum* Giebel, 1864 comme l'ont écrit TUCKER & LE RENARD (1993 : 2). Ces auteurs proposent inutilement le nom de remplacement *Eopleurotoma brebionis*. En effet, et conformément à l'Art. 57.6 de l'ICZN (1999), la différence de trois lettres entre ces deux épithètes suffit pour qu'il n'y ait pas homonymie ; le nom proposé par de Boury est donc tout à fait valide.

***Eopleurotoma multinoda* (Lamarck, 1804) (Fig. 4)**

Pleurotoma multinoda Lamarck, 1804 : 167-168, n° 10 (cf. Vélín 7, fig. 14a-b).

Synonymie

Pleurotoma dameriacensis de Boury, 1899 (émendé dans la table alphabétique) [non Deshayes, 1865] : 62, pl. 1, fig. 12.

Eopleurotoma morelleti Tucker & Le Renard, 1993 : 2.

Discussion. TUCKER & LE RENARD (1993 : 2) relèvent l'homonymie primaire plus récente *Pleurotoma dameriacense* de Boury, 1899 (corrigé en *dameriacensis* par de Boury dans la table alphabétique de son travail) non Deshayes, 1865 et proposent le nouveau nom *Eopleurotoma morelleti*. Nous adoptons cependant l'opinion de BRÉBION (1992 : 12) sur le morcellement de l'espèce *Pleurotoma multinoda* par de Boury et considérons le taxon *Pleurotoma dameriacensis* de Boury, 1899 basé sur un unique échantillon en mauvais état comme un synonyme subjectif plus récent de *Pleurotoma multinoda* Lamarck, 1804 ; de fait le nom de substitution *Eopleurotoma morelleti* est superflu.

***Eopleurotoma sarta* (Dollfus, 1899) (Fig. 5)**

Pleurotoma sarta Dollfus, 1899 : 179 nomen novum.

Synonymie

Pleurotoma asperrima de Boury, 1899 [non *Fusus asperrimus* Brown, 1827] : 41, pl. 1, fig. 2.

Discussion. En 1899 (p. 179) DOLLFUS introduit le nom *Pleurotoma sarta* pour corriger l'homonymie secondaire *Pleurotoma asperrima* de Boury, 1899 non *Fusus asperrimus* Brown « 1829 » [en fait 1827]. Dollfus provoque l'homonymie secondaire en rapportant l'espèce de Brown au genre *Pleurotoma* alors qu'il s'agit en fait d'une espèce appartenant au genre *Amblyacrum* ou *Mangelia*. Cependant, l'emploi du nom de remplacement *sarta* par COSSMANN & PISSARRO (1913 : pl. 51, fig. 224-26') et par LE RENARD & PACAUD (1995 : 124) rend l'homonymie

secondaire plus récent remplacé définitivement invalide (ICZN, 1999 : Art. 59.3).

“ *Pleurotoma pseudocolon* d'Orbigny, 1850 “

Synonymie

Pleurotoma colon sensu Deshayes, 1834 [non Sowerby J., 1816] : 492-493, pl. 66, fig. 4-7.

Epalxis (Bathytoma) turbida sensu Pacaud, 2007 [non *Murex turbida* Solander in Brander, 1766] : 49.

Discussion. *Pleurotoma pseudocolon* a été introduit par D'ORBIGNY (1850 : 316, n° 342) pour le *Pleurotoma colon* sensu Deshayes, 1834 non Sowerby J., 1816. DESHAYES (1834 : 492-493, pl. 66, figs 4-7) mentionne *Pleurotoma colon* Sowerby J., 1816 d'après un unique exemplaire provenant de la région de Soissons (Aisne). Cette espèce est signalée à l'origine du Bartonien (Éocène moyen) d'Angleterre et n'a en fait jamais été récoltée dans le bassin de Paris. La mention de cette espèce dans le Cuisien constitue certainement une erreur d'étiquetage. Nous nous sommes donc trompés (PACAUD, 2007 : 49) lorsque nous avons écrit que *Pleurotoma pseudocolon* d'Orbigny, 1850 était un synonyme d'*Epalxis (Bathytoma) turbida* (Solander in Brander, 1766). C'est l'espèce de James Sowerby, décrite du Bartonien, qui est un synonyme du *Pleurotoma turbida* Solander in Brander, 1766 et non le « spécimen du Cuisien » du bassin de Paris attribué à tort par Deshayes à *P. colon*. Le nouveau nom proposé par d'Orbigny est donc inutile.

Genre *Gemmula* Weinkauff, 1875

Espèce type : *Pleurotoma gemmata* Hinds, 1843 par désignation subséquente (COSSMANN, 1896). Origine : Recent

***Gemmula bearrizensis* nom. nov.**

Synonymie

Pleurotoma acutangularis sensu Tournouër, 1873 [non Deshayes, 1834] : 37, pl. 5, fig. 8.

Drillia pellati Boussac, 1911a [non *Drillia (Crassispira) pellati* Cossmann & Pissarro, 1904] : 59-60, pl. 13, fig. 8, 8a.

Matériel type. Holotype (coll. Pellat) MNHNL.

Localité type. Biarritz (Pyrénées-Atlantiques), Priabonien (Éocène supérieur).

Étymologie. De sa localité type Biarritz. En occitan gascon, Bearriz ou Bearidz, viendrait du latin « videre » qui signifie : voir (LEMOINE, 1977).

Discussion. Le nom *Drillia pellati* a été introduit par BOUSSAC (1911a : pl. 13, fig. 8, 8a) pour une espèce du Priabonien (Éocène supérieur) de Biarritz (Pyrénées-Atlantiques). Ce nom est invalide et doit être remplacé du fait de l'existence d'un *Drillia (Crassispira) pellati* Cossmann & Pissarro, 1900 du Lutétien du Cotentin (COSSMANN & PISSARRO, 1900 : 55-56, pl. 4, fig. 29). Le spécimen illustré par BOUSSAC (pl. 13, fig. 8a) a déjà été figuré par TOURNOUËR (1873 : pl. 5, fig. 8) sous le nom de *Pleurotoma acutangularis* Deshayes, 1834. L'exemplaire de l'Éocène basque en diffère toutefois par sa taille plus importante, son galbe moins élancé, plus trapu, la carène des tours beaucoup plus aiguë. Les tours sont lisses sur les derniers tours et crénelés sur les premiers. Nous proposons de désigner cette espèce *Gemmula bearrizensis* nom. nov.

Gemmula osca* nov. sp.*Synonymie**

Drillia biarritzensis sensu Villalta Comella, 1956 [non Boussac, 1911] : 221-222, pl. 11, fig. 5a-b.

Matériel type. Holotype, exemplaire figuré par VILLATA COMELLA.
Localité type. San Román de Basa (Aragon, Espagne), Bartonien (Éocène moyen).

Étymologie. De Huesca, province espagnole de la communauté autonome d'Aragon ; nommée Osca par le préteur romain Terentius Varron qui l'a conquise en 179 avant JC. Nom donné en apposition.

Remarques. Dans les collections du Museu de Ciències Naturals de Barcelona, sous le n° MGB V15098, se trouve catalogués trois spécimens provenant de San Román de Basa et identifiés comme *Drillia biarritzensis* Boussac, 1911. Ce sont les seuls spécimens dans la collection Villalta Comella qui présentent cette détermination taxonomique. Villalta Comella précise lui-même dans son travail que 3 spécimens ont été recueillis, cependant aucun d'entre eux ne semble correspondre au spécimen figuré (comm. pers. Luis Troya García).

Discussion. VILLALTA COMELLA (1956 : 221-222, pl. 11, fig. 5a-b) rapporte trois spécimens du Bartonien (Éocène moyen) de San Román de Basa (Aragon, Espagne) à l'espèce *Drillia biarritzensis* Boussac, 1911 du Priabonien (Éocène supérieur) de Biarritz (Pyrénées-Atlantiques). La coquille de la province de Huesca présente tous les caractères du genre *Gemmula* Weinkauff, 1875 (Espèce type : *Pleurotoma gemmata* Hinds, 1843 par designation subséquente – COSSMANN, 1896c). Elle diffère radicalement de *Crassispira* (*s.str.*) *biarritzensis* (Boussac, 1911) par une coquille étroite, turriculée, composée d'une dizaine de tours anguleux à large rampe déclive adapicale, séparée par une suture bien distincte. Les tours sont divisés en deux régions par un angle médian et noduleux. La région antérieure est ornée de nombreux plis obliques et serrés, crénelés par 3 ou 4 cordons spiraux que séparent des sillons profonds ; l'ensemble présente un aspect grossièrement granuleux. L'espèce *Crassispira* (*s.str.*) *biarritzensis* (Boussac, 1911) présente quant à elle une coquille plus large, moins étroitement turriculée, composée de 7 à 8 tours à peine anguleux, ornés de quelques sillons spiraux obsolètes, écartés et portant de grosses nodosités obliques (BOUSSAC, 1911a : 60-61, pl. 13, fig. 3, 3a, 12-13). Nous proposons de désigner désormais l'espèce bartonienne d'Espagne sous le nom de ***Gemmula osca* nov. sp.**

Famille Terebridae Mörch, 1852

Sous-famille Terebrinae Mörch, 1852

Genre ***Hastula*** Adams, H. & A., 1853f

Espèce type : *Buccinum strigillatum* Linnaeus, 1758 par designation subséquente (COSSMANN, 1896). Origine : Recent

Hastula sublaevigata (Grateloup, 1845)

Terebra cinerea sublaevigata Grateloup, 1845 : pl. 1 [35], fig. 25c, 25e [non *Terebra plicaria sublaevigata* Grateloup, 1845 : pl. 1 [35], fig. 28c].

Synonymie

Terebra cinerea sensu de Basterot, 1825 [non *Buccinum cinereum* Born, 1778] : 52, pl. 3, fig. 14.

Terebra cinerea undulata Grateloup, 1845 [non *Terebra undulata* Gray, 1834] : pl. 1 [35], fig. 25a-b, d.

Terebra cinerea crenulata Grateloup, 1845 : pl. 1 [35], fig. 25f.

Terebra subcinerea d'Orbigny, 1852 : 87, n° 1626.

Discussion. *Terebra subcinerea* a été introduit par D'ORBIGNY (1852 : 87, n° 1626) pour le *Terebra cinerea* sensu « Grateloup, 1845 » (pl. 1 [35] fig. 25) [en fait de Basterot, 1825 (p. 52, pl. 3, fig. 14)] non *Terebra cinerea* « Lamarck » [en fait *Buccinum cinereum* Born, 1778 non *Terebra cinerea* Bosc, 1801] [Syntypes : Bordeaux (Gironde), 17 ex., MNHN.F.B27640 (coll. d'Orbigny) ; Saucats (Gironde) : 10 ex., MNHN.F.A70975 (coll. Brongniart/de Basterot)]. En renommant cette espèce, d'Orbigny n'a pas remarqué que GRATELOUP (1845) avait donné aux spécimens figurés les noms de *Terebra cinerea undulata*, de *T. cinerea sublaevigata* et de *T. cinerea crenulata* les distinguant ainsi de la forme nominative. Cependant, le nom *Terebra cinerea undulata* Grateloup, 1845 est un homonyme primaire plus récent de *T. undulata* Gray, 1834 et *T. cinerea crenulata* montre des caractères individuels au spécimen figuré. Conformément à l'Art. 24.2.2 de l'ICZN (Principe du Premier Réviseur) nous donnons ici préséance au nom *T. cinerea sublaevigata* publié à la même date et dans le même travail et considérons *T. cinerea crenulata* comme un synonyme subjectif. Le nom de substitution *Terebra subcinerea* d'Orbigny, 1852, synonyme subjectif plus récent de *T. cinerea sublaevigata*, est superflu.

Par ailleurs, GRATELOUP (1845 : pl. 1 [35] fig. 28c) introduit également comme variété du *Terebra plicaria* de Basterot, 1825 le nom *Terebra plicaria sublaevigata*, le distinguant ainsi de la forme nominative. Cependant, ce nom est nomenclaturalement invalide ; c'est un homonyme primaire de *Terebra cinerea sublaevigata* discuté ci-avant. Nous considérons de plus ce taxon comme un synonyme subjectif plus récent de *Terebra plicaria* de Basterot, 1825, au même titre que les sous-espèces *Terebra plicaria italica* Grateloup, 1845 [non Hoeninghaus, 1831 *nomen nudum*], *T. plicaria fuscata* (Brocchi, 1814) [homonyme secondaire plus récent de *Terebra fuscata* (Linnaeus, 1758)] et *T. plicaria burdigalensis* Grateloup, 1845. Pour DAVOLI (1977 : 147) *Terebra* (*Hastula*) *cinereides* Hoernes & Auinger, 1880 est un synonyme subjectif plus récent de *T. cinerea sublaevigata* Grateloup, 1845.

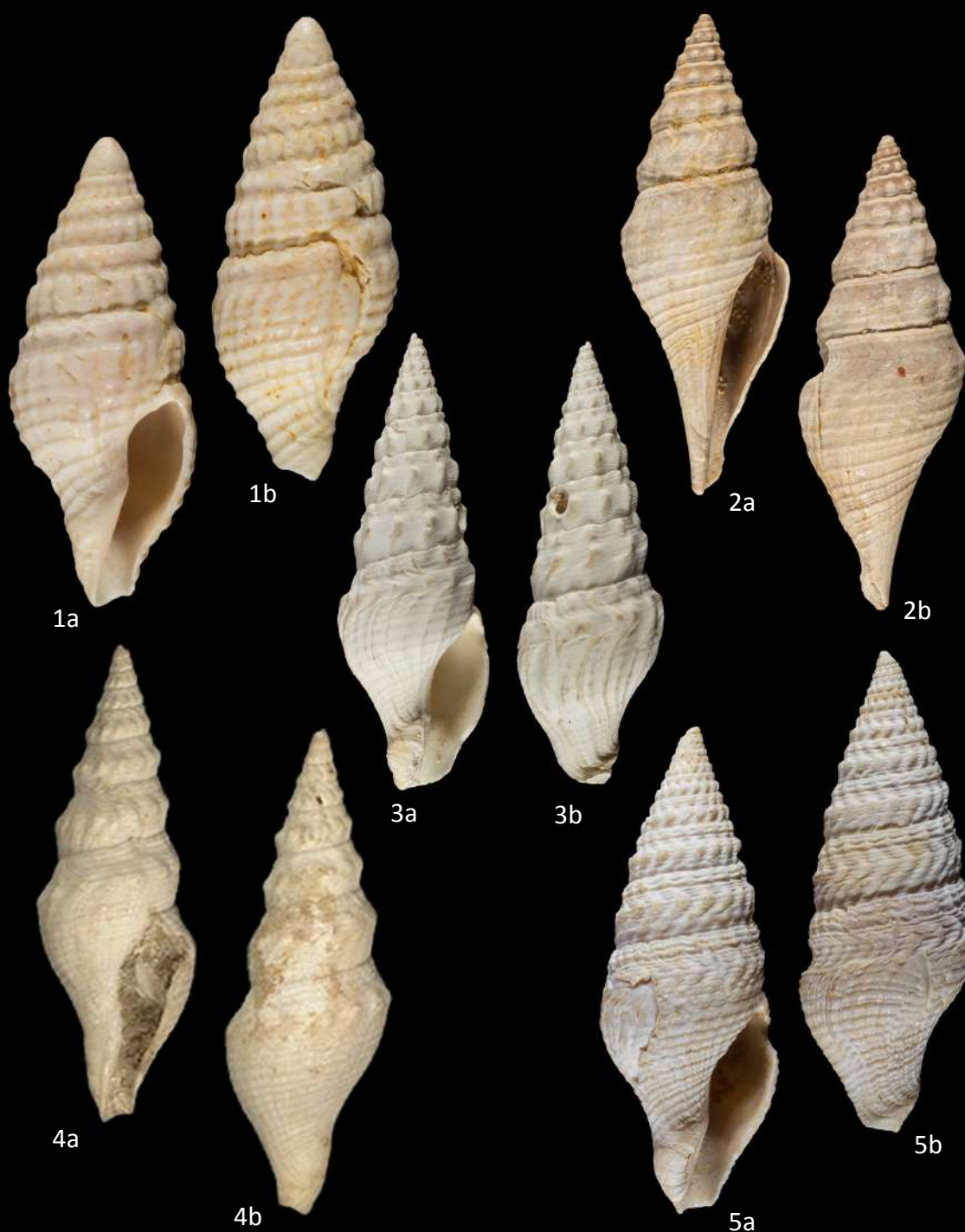
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1. *Asthenotoma mitraeformis* (de Boury, 1899), holotype MNHN-IM-2000-3396 (coll. de Boury), Marinésien (Bartonien, Éocène moyen) du Ruel, Haravilliers (Val d'Oise). h = 6,8 mm.
2. *Turricula (Crenaturricula) barreti* (de Boury, 1899) holotype MNHN-IM-2000-3337 (coll. de Boury), Marinésien (Bartonien, Éocène moyen) du Ruel, Haravilliers (Val d'Oise). h = 26,0 mm.
3. *Eopleurotoma flexicosta* (de Boury, 1899), holotype MNHN-IM-2000-2951 (coll. de Boury), Lutétien (Éocène moyen) de Chambors (Oise). h = 19,0 mm.
4. *Eopleurotoma multinoda* (Lamarck, 1804), holotype de *Pleurotoma dameriacensis* de Boury, 1899 MNHN-IM-2000-3346 (coll. de Boury), Lutétien (Éocène moyen) de Damery (Marne). h = 17,0 mm.
5. *Eopleurotoma sarta* (Dollfus, 1899), holotype de *Pleurotoma asperrima* de Boury, 1899 MNHN-IM-2000-3325 (coll. de Boury), Lutétien (Éocène moyen) de Damery (Marne). h = 18,0 mm.

Conus (Sciteconus) punctomaculatus Bozzetti, 2020 est un synonyme de *Dendroconus medoci* (Lorenz, 2004)

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Mots clés :

Dans la dernière publication de *Malacologia Mostra Mondiale* (n° 109, novembre 2020), Luigi Bozzetti décrit une nouvelle espèce originaire de Lavanono, à l'extrême sud de Madagascar. Il la nomme *Conus (Sciteconus) punctomaculatus*.

Introduction :

La description se base sur l'observation de quatre exemplaires qui forment le matériel type de l'espèce. Les spécimens sont tous les quatre issus de débris coquilliers et ont donc été récoltés morts. Ils sont caractérisés par la présence d'une bande spirale centrale sur le dernier tour qui porte des taches rectangulaires orange. La nouvelle espèce est classée dans le genre *Sciteconus* et donc comparée avec deux espèces sud-africaines attribuées à *Sciteconus*.

Discussion :

L'auteur ne cite pas « A Taxonomic Iconography of Living Conidae ». S'il avait consulté cet ouvrage et plus particulièrement les pages consacrées aux espèces présentes dans le sud de Madagascar, il aurait sans doute vu sur la page

847, les photographies (fig. 2) de deux coquilles de *Dendroconus medoci* (Lorenz, 2004) mesurant respectivement 24,3 mm et 16,8 mm avec une protoconque paucispirale. La plus petite est rigoureusement identique aux coquilles illustrant la description de *C. punctomaculatus*. La plus grande montre des maculations rectangulaires orange qui s'étendent à l'ensemble du dernier tour. Une autre coquille illustrée par Monnier *et al.* (fig. 3) montre comment les taches deviennent plus sombres et

Key Words:

In the last issue of *Malacologia Mostra Mondiale* (N° 109, November, 2020), Luigi Bozzetti describes a new species from Lavanono, in the far south of Madagascar. He names it *Conus (Sciteconus) punctomaculatus*.

Introduction:

The description is based on the observation of four specimens which form the type material of the species. The specimens are all four from shell debris and were therefore collected dead. They are characterized by the presence of a central spiral band on the whorl which exhibits orange and rectangular blotches. The new species is classified in the genus *Sciteconus* and therefore compared with two South African species attributed to *Sciteconus*.

Discussion:

The author does not mention "A Taxonomic Iconography of Living Conidae". If he looked at it, and more particularly the pages devoted to the species present in the south of Madagascar, he would undoubtedly have seen on page

847, the photographs (fig. 2) of two *Dendroconus medoci* (Lorenz, 2004) measuring 24.3 mm and 16.8 mm respectively, with a paucispiral protoconch. The smaller shell is strictly identical to the shells illustrating the description of *C. punctomaculatus*. The larger one shows orange rectangular blotches that extend throughout the last whorl. Another shell illustrated by Monnier *et al.* (fig. 3) shows how the blotches become darker and orange spiral bands begin to appear which will give the adult



Figure 1: Holotype & paratype 3 du *Conus (Sciteconus) punctomaculatus* (coll. Luigi Bozzetti) 17,7 et 17,8 mm, Lavanono, S. Madagascar. (Photos: Bozzetti, 2020)

des bandes spirales orangées commencent à apparaître. Elles donneront le dessin adulte connu sur la plupart des spécimens de l'espèce.

Le second auteur a pu réunir au cours de ses voyages dans le grand sud malgache un certain nombre d'exemplaires formant une série de croissance qui démontre clairement que *Conus (Sciteconus) punctomaculatus* est un synonyme junior subjectif de *Dendroconus medoci*, espèce de grande taille pouvant atteindre 85 mm.

Il est à noter que l'apex des types de *Conus (Sciteconus) punctomaculatus* Bozzetti, 2020 n'est que très peu érodés et que la protoconque en forme de mamelon "mamilliate" que possède cette espèce (*Dendroconus medoci*) est particulièrement volumineuse en raison de la grande taille atteinte par les adultes de cette espèce.

Luigi Bozzetti ne cite pas non plus dans sa bibliographie l'étude de Monnier *et al.* sur les cônes du grand sud malgache. Il ne semble pas avoir procédé à des comparaisons avec d'autres espèces trouvées dans la région où sa nouvelle espèce a été récoltée. Il procède à des comparaisons avec des espèces sud-africaines qui vivent dans

une autre zone biogéographique dont la faune de Conidae n'a que très peu de points communs avec la région du grand sud Malgache, dont les affinités sont très clairement Indo-Pacifiques. L'auteur ne semble pas non plus avoir contacté les auteurs des travaux publiés précédemment sur les cônes de Madagascar. L'eût-il fait qu'il aurait évité d'ajouter un nouveau synonyme à une littérature qui en comprend déjà beaucoup.

Références :

BOZZETTI, L., 2020. *Conus (Sciteconus) punctomaculatus* (Gastropoda : Prosobranchia : Conidae) from Southern Madagascar. *Malacologia Mostra Mondiale* 109 Vol. XXXII (Cupra Marittima, Italy), p. 12, 13.

LORENZ, F., 2004. Two new species of Conidae from Southern Madagascar. *Visaya* 1(2), Conchology Inc. (Cebu, Philippines), p. 19-23.

pattern known on most of the specimens of the species.

The second author was able to collect, during travels in the great south of Madagascar, a certain number of specimens forming a growth series which clearly demonstrates that *Conus (Sciteconus) punctomaculatus* is a subjective junior synonym of *Dendroconus medoci*, a large species that can reach 85 mm.

It should be noted that the apex of the types of *Conus (Sciteconus) punctomaculatus*, Bozzetti, 2020 is only slightly eroded and that the mamilliated protoconch of this species, *Dendroconus medoci* (Lorenz, 2004), is particularly large due to the size reached by adults.

Nor does Luigi Bozzetti cite, in his bibliography, the study by Monnier & al. on the cones of the great south of Madagascar. He does not seem to have made any comparisons with other species found

in the area where his new species was collected. He prefers to make comparisons with South African species that live in another biogeographical area whose Conidae fauna has very little in common with the region of the great south of Madagascar,

whose affinities are clearly Indo-Pacific. The author also does not seem to have contacted the authors of the previously published works on the cones of Madagascar. Had he done so, he would have avoided adding a new synonym to a literature that already includes so many.



Figure 2 : juvéniles de *Dendroconus medoci* 16.8 & 23.4 mm, Lavanono, S. Madagascar Coll. E. Monnier (photos : Monnier & co. (2018), page 847)

Rissoella angeli n. sp. (Gastropoda: Heterobranchia: Rissoellidae) and additional new records of molluscs for the Mediterranean and the Hellenic Seas

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Abstract

With this study we continue contributing to the knowledge of the Hellenic marine malacofauna from the entire Greek territory during the period from February 2020 to August 2020. It includes 25 fully identified species out of which 1 are new for the Mediterranean Sea, 15 are new for the Eastern Mediterranean Sea, 20 are new for the Hellenic malacofauna, while *Rissoella angeli* n. sp. is described from Thermaikos, Toroneos and Siggitikos Gulfs (North Aegean Sea) based on twenty one specimens found in three locations at depths of 0.2 m, 40 m and 60 m. Main taxonomic characteristics and ecological information such as habitat, distribution and origin, are given and discussed.

Introduction

The molluscan biodiversity of the Hellenic Seas has been influenced by environmental and anthropogenic changes described and discussed by a number of investigators (e.g. Galil, 2000; Galil & Zenetos, 2002; Zenetos *et al.*, 2005; Abdulla & Linden, 2008; Galil *et al.*, 2008; Zenetos *et al.*, 2009; Skliris *et al.*, 2011; Tsiaras *et al.*, 2012). Recent faunistic works revealed some 200 new species (Streftaris & Zenetos, 2007; Manousis *et al.*, 2012; Tzomos *et al.*, 2012; Manousis & Galinou-Mitsoudi, 2014; Crocetta *et al.*, 2013; Manousis *et al.*, 2017; Micali *et al.*, 2017; Romani *et al.*, 2017; Manousis *et al.*, 2018a, b; Manousis *et al.*, 2019; Mbazios *et al.*, 2020; Manousis *et al.*, 2020a, b; Manousis *et al.*, 2020c). This work continues with the publication of the new findings for the Hellenic malacofauna.

Methods

Sampling, handling and species recognition were conducted according to Manousis and Galinou Mitsoudi (2014) and Mbazios *et al.* (2020) from February 2020 to July 2020 in certain locations throughout the Hellenic Seas. All 1st and 2nd documented records from the Hellenic Seas are listed in Table 1 with collection data while comparison of *Rissoella angeli*, n. sp. with other congeners is listed in Table 2. A brief description

of certain findings is given in the text below and in some cases additional information supportive to their identification. They are all presented in Figures 1 to 9, and Tables 1 and 2 including species for comparison with the demonstrated species. For the nomenclature of the presented species MarBEF and/or WoRMS were used (access up to 31 July 2020). The specimens are deposited in the premises of Dr. T. Manousis, G. Mbazios, E. Samara and G. Zaminos. Scientists are welcome to have access to the biological material for inspection by appointment.

Results

The records

This work includes 25 fully identified species out of which 15 are new for the Eastern Mediterranean Sea, 20 are new for the Hellenic malacofauna and *Rissoella angeli* is a new species.

Abbreviations:

Aa - Average height of the aperture/shell length, **Al** - Average height of the body whorl/shell length, **Be** - Beached, **BS** - Black Sea, **CMS** - Central Mediterranean Sea, **Co** - Common, **CB** - Coralligenous Bottom, **CEMS** - Central and East Mediterranean Sea, **CMS** - Central Mediterranean Sea, **Cos** - Cosmopolitan, **E** - Eyes, **EMS** - East Mediterranean Sea, **EMS1** - First record for the East Mediterranean Sea, **G1** - First record for Greece, **G2** - Second record for Greece, **H** - Habitat, **HG** - Hypobranchial gland, **IP** - Indo-Pacific, **KLM** - Known Lessepsian Migrant, **Ktl** - Known from type locality, **LW** - Shell h/w ratio, **Mad** - Madeira, **Mat** - matte, **MB** - Mixed Bottom, **MS** - Mediterranean Sea, **MS1** - First record for the Mediterranean Sea, **Mu** - Muddy Bottom, **NEA** - North East Atlantic, **NEP** - North East Pacific, **n. sp.** - new species, **NLM** - New Lessepsian Migrant, **NW** - North-West, **OD** - Octopus Den, **Pf** - Pigmentation of the animal in the first whorls, **Pr I** - Protoconch I maximum diameter, **Pr II** - Protoconch II maximum diameter, **Ra** - Rare, **Sa** - Spiral angle, **Sh** - Shipwreck, **TSP** - Tasmanian Sea Pacific, **U** - Umbilicus, **Ua** - Umbilical angle, **Un** - Uncommon, **Unk** - Unknown, **VRa** - Very Rare, **WA** - West Atlantic, **W1** - First record for the World, **WCMS** - West and Central Mediterranean Sea, **WMS** - West Mediterranean Sea, **ZB** - Zostera bed.

BIVALVIA

Kurtiella ovata (Jeffreys, 1881) (Fig. 1a)

The left valve is 1.8 mm long, 1.3 mm high ($l/h = 1.4$), fragile, translucent, with the beak situated towards the posterior $\frac{1}{4}$ and markedly opisthoclinal. Prodissoconch distinct and elongate. Dissoconch with fine and dense commarginal lines. Anterior part of cardinal platform straight, sloping down smoothly; posterior part conspicuously bent inwards, sloping more abruptly in the vicinity of a distinct escutcheon. Lateral teeth marked. Shell colour whitish. *K. ovata* is known from Porcupine, Galicia bank, Lusitanian seamounts, and Meteor group seamounts, all in N Atlantic, and W and C Mediterranean (Gofas & Salas, 2008; Cossignani & Ardevini, 2011). It inhabits deep bioclastic gravels (Gofas & Salas, 2007). Our specimen is clearly distinguished from *K. bidentata* (Montagu, 1803) (Fig. 1b, c) by more markedly opisthoclinal and more posteriorly situated beak along with the clearly inward curvature of the posterior cardinal platform. The beak shape is reminiscent of that of *K. tumidula* (Jeffreys, 1866) but the latter has a more inflated shell, with beaks even closer to the posterior end and has proportionally more elongated outlook.

Kurtiella triangularis (R. B. Watson, 1897) (Fig. 1d)

The left valve is 2.1 mm long, 1.5 mm high ($l/h = 1.4$), rather solid for its size, translucent, with the beak slightly opisthoclinal situated by the posterior $\frac{1}{3}$. Prodissoconch I ovate and smooth. Dissoconch with dense commarginal lines. Anterior and posterior sections of cardinal platform straight and at 90° from each other. Conspicuous and elongated lateral teeth. Colour snow-white. The species has been reported and studied from Madeira, Selvagens, Canary Islands, Atlantic coast of Morocco, the Strait of Gibraltar and the Alboran Sea, and inhabits intertidal algal turf and rocks (Gofas & Salas, 2008). Our specimen is different from *K. bidentata* (Montagu, 1803) (Fig. 1b) by the layout of the hinge in which the posterior segment is rather straight and not curved inwards, and by the generally more robust shell.

GASTROPODA

Campylorhaphion sp. (Fig. 2b-g)

Shell 4.0 mm high and 1.2 mm wide ($h/w = 3.3$) with tall, slightly bent spire, comprising in total 10 whorls, transparent turning opaque towards the base. Body whorl (measured along the axis on Fig. 2g) 1.8 mm (45% of total length), height of aperture 1.0 mm (25% of total length), spire angle 24°. Larval shell (Fig. 2b) distinctly delimited from the teleoconch by a conspicuous sinuous incremental scar, 515 μ m high and 230 μ m wide, transparent, smooth, comprising 3.5 slightly convex whorls with a distinct suture. Teleoconch (Fig. 2g) of 7 slightly convex whorls, the last of which has its maximum convexity by the periphery and smoothly convex base. Suture of teleoconch whorls evident, false suture of the “*Melanella*” type, conspicuous (Fig. 2e). Axis slightly bent, aperture drop-shape, rounded in its apical part. Columella and parietal edge bordered by a callus and form an angle. Outer lip simple, in lateral view forming a small sinus just below the suture, then forming a regular curve with the most protruding part situated at the $\frac{1}{3}$ of its height (Fig. 2f). Surface of teleoconch whorls superficially smooth, exhibiting an internal dense axial refraction pattern of the aragonite (Fig. 2d) and an external axial sculpture of very finely incised, slightly

opisthoclinal lines visible only under high magnification and in not worn out areas, regularly spaced about 40 μ m (Fig. 2c). Similar, though more conspicuous, axial sculpture is observed in the Atlantic *M. costellata* (Dautzenberg & Fischer, 1897) and *M. turbonilloides* Bouchet & Warén, 1986 but the incisions are more pronounced and they are profoundly different in the larval shell (paucispiral) and the shape of the teleoconch (Bouchet & Warén, 1986). Other Eulimid species with a shell microsculpture include: *M. alba* (da Costa, 1778), a five times larger species with much thicker and densely crowded axial sculpture; *M. lubrica* (Monterosato, 1890) with spiral dense sculpture (Warén, 1984; Gofas *et al.*, 2011) and *M. scarifata* Gofas & Rueda, 2014 with numerous axial lines (Gofas *et al.*, 2014). The latter species also has a multispiral larval shell of similar size (530 μ m x 350 μ m) and the same number of whorls, while its teleoconch is of similar size also (5 mm); has nearly same number of whorls, same body whorl/total height ratio, nearly same spire angle (25.5°) and a regularly spaced of about 50 μ m axial sculpture (Gofas *et al.*, 2014). The rather evident difference between *C. sp.* and *M. scarifata* is the highly angled periphery of the body whorl of the latter, a character that may vary due to possible gender dimorphism (Bouchet & Warén, 1986). Although Gofas *et al.* (2014) have pointed out that “The larval shell of *Melanella scarifata* n. sp. is unusually large and denotes a planktotrophic larval development, so the species is probably not endemic to the Algarrobo Bank and may be found again in relatively remote places of the Atlantic and Mediterranean Sea”, if *C. sp.* is the fulfillment of that prediction remains to be seen, if availability of additional specimens permits. Compared with *C. famelicum* (R. B. Watson, 1883), *C. sp.* bears a proportionally higher body whorl, different shape of outer lip and not aligned incremental scars (Bouchet & Warren, 1986).

Vitreolina cf. ***knudseni*** Bouchet & Warren, 1986 (Fig. 2i-o)

Shell small, transparent, slender, 2.45 mm high and 0.80 mm wide ($h/w = 3.1$), spire tall comprising in total of 9 whorls. Larval shell distinctly delimited from the teleoconch by a conspicuous sinuous incremental scar, 415 μ m high and 245 μ m wide, transparent, smooth, of some 4.5 slightly convex whorls with an indistinct suture and a pointed apex (Fig. 2i). Teleoconch of 5 whorls, slightly convex in apertural view and straight in side view (Fig. 2n, o). The incremental scars are aligned forming a curve in the right side of the shell (Fig. 2o), while the suture dips at the scars and the false suture is of the “*Curveulima*” type (Fig. 2j). In apertural view the shell diameter is 0.75 mm while in side view 0.65 mm; the relation of the diameters is 0.87. Body whorl (measured along the axis on Fig. 2n) 1.20 mm (nearly 50% of total length), spire angle 23°. Aperture drop-shape, nearly 28% of total length, outer lip straight (in apertural view) with evenly rounded lower edge (Fig. 2l). Columella forms a smooth arch (Fig. 2l) with the continuous parietal callus (Fig. 2k). Outer lip orthoclinal, draws in at the suture, with its more projecting part at the middle of its height (Fig. 2m). Compared with its sympatric congeners of similar contour and size (also based on images), our specimen differs from *V. antiflexa* (Monterosato, 1884) (Appoloni *et al.*, 2018), *V. incurva* (Bucquoy, Dautzenberg & Dollfus, 1883), *V. perminima* (Jeffreys, 1883) and *V. philippi* (de Rayneval & Ponzi, 1854) (Gofas *et al.*, 2011), in the shell morphometrical characters and outlook. In contrast to the aforementioned species, it is essentially identical to *V. knudseni* Bouchet & Warren, 1986 (drawings in, Bouchet & Warren, 1986, p. 435, Figs 1032, 1033).

More particularly, it has (in comparison with the *V. knudseni* description and drawings) same protoconch, shell curvature, aligned incremental scars and slightly bent alignment, same diameter relation (0.88) in apertural and side views, and same in proportions and characters body whorl, aperture and outer lip. The reasons for our uncertainty - and thus the “cf” - are that *V. knudseni* holotype is larger by nearly 1.5 mm and 0.6 whorls, is only shown as a drawing and no other specimen is available in the literature so that we have a realistic impression of an authentic shell.

Eatonina sp. (Fig. 3c, d)

Shell minute, oval-cylindrical, fragile, translucent, smooth and brilliant. Protoconch I slightly protruding, of 0.75 whorls, 145 µm maximum diameter, smooth, with an evident limit. Protoconch II of one additional whorl and 240 µm maximum diameter. Teleoconch of 2 ½ inflated and almost smooth whorls, weak and dense incremental lines and a deep suture. Aperture sub-circular, outer lip simple, fragile and prosocline, columella oblique, inner lip thin, slightly flaring over a narrow umbilicus. Body whorl some 70% of the total length. Overall colour cream-yellow and the protoconch, suture and umbilicus a light honey-yellow. The two shells are 836 µm and 809 µm long, 573 µm and 545 µm wide, respectively, h/w = 1.45. Compared with its Mediterranean similar species *Eatonina* sp. differs from *E. cossurae* (Calcar, 1841), *E. pumila* (Monterosato, 1884) and *E. fulgida* (J. Adams, 1797) in the lack of spiral colour decoration, its smaller protoconch, the different shell contour and the h/w ratio (1.3 in *E. fulgida* and *E. pumila*) (Rubio & Rodriguez Babio, 1995; Scaperrotta et al., 2014). Though similar in size and colouration to *E. matildae* Rubio & Rodriguez Babio, 1996, our specimens have a different shell and aperture shape and colour pattern, and by far different h/w ratio (1.1 in *E. matildae*) (Rubio & Rodriguez Babio, 1995; Gofas et al., 2011). They are also different from *Tubbreva micrometrica* (Aradas & Benoit, 1876) as the latter is oval-conical, has flatter whorls, proportionally larger aperture, lacks an umbilicus and bears three spiral light brown bands on the body whorl (Scaperrotta et al., 2014). Compared with more exotic Rissoiforms, *Eatonina* sp. exhibits superficial similarities with *Eatoniella ainsworthi* (Hedley, 1916), *Eatoniella galbinia* (Laseron, 1950), *Eatonina fulvicolumella* Ponder & Yoo, 1981 and *Eatoniella occulta* Ponder, 1983 (*Eatoniellidae* Ponder, 1965) from all of which it differs in the relative morphometric proportions and/or the relative size of the aperture (Ponder & Yoo, 1981; Ponder, 1983).

Tritia elongata (Bucquoy, Dautzenberg & Dollfus, 1882) (Fig. 5e)

The bucciniform shell is elongated-ovate and glossy. Protoconch paucispiral of 1.5 whorls. Teleoconch of 5 slightly convex whorls, suture shallow and slightly edged. First 2 whorls with axial ribs, subsequent whorls smooth, except some 5 spiral grooves at the base of the body whorl. Aperture ovate, outer lip weakly thickened and expanded without a varix, bearing 10–11 inner teeth. Columella convex, smooth, columellar callus smooth, margined and narrow, bearing one indistinct anterior swelling and a parietal denticle. Siphonal canal short and wide. Siphonal fasciole short and rounded. Background colour violet with a light grayish band on the periphery of the body whorl, and some 15 spiral lines of alternating violet and grayish spots, one of which subdivides the lighter band of the periphery. Suture fringed abapically with spirally elongated white blotches. Aperture orange–grey inside, with a lighter

band on the periphery showing through and apertural edge lighter. *T. elongata* had until recently been treated as a variant of *T. corniculum* (Olivi, 1792) (Fig. 5f) when Aissaoui et al. (2017) accepted it as a separate species.

Rissoella angeli n. sp. (Figs. 6a–h, 7a–s, 8a–h).

Systematics:

Superfamily **Rissoelloidea** Gray, 1850

Family **Rissoellidae** Gray, 1850

Genus **Rissoella** Gray, 1847

Type species: *Rissoa? glaber* Alder (= *Rissoella glaber* (err. pro glabra) J. E. Gray, 1847; = *Rissoa? diaphana* Alder, 1848; = *Rissoa albella* Alder, 1844), by monotypy.

Etymology: The species is named after Dr. Thanasis Manousis' son Angelos.

Abbreviations: **CTM** - Collection Thanasis Manousis, **MB** - Mixed Bottom, **MNHN** - Muséum National d'Histoire Naturelle, **OD** - Octopus Den.

Description of holotype: Shell minute, hyaline, transparent, bright, oval-globose (Fig. 6a–h), 1.15 × 0.86 mm (h/w = 1.33) (h/w = nearly 1.30, mean of 21 shells). Protoconch paucispiral, of some 0.60 whorls (according to Verduin, 1976), maximum diameter 290 µm, smooth and globose, separated from the teleoconch by a clearly visible line (Fig. 6d). Teleoconch with 2.50 inflated, strongly convex whorls (Fig. 6f) sculptured by faint axial incremental marks (Fig. 6g and h). Whorls with regular contour and conspicuous increase in width (Fig. 6c). Spire short, suture deep, constricted. Body whorl large, globose, 80% of shell length. Base large, rounded. Aperture 57%, oval and oblique with faint posterior angulation, extended anteriorly. Parietal region slightly arched in its proximity to the umbilicus. Outer lip slightly prosocline, thin, with smooth inner surface. Inner lip thin. Umbilicus well developed (according to Ponder & Yoo, 1977) delimited by a conspicuous rim (Fig. 6e). Area between the umbilicus rim and the inner lip exhibits dense and vertical incremental plicae (Fig. 6e). The umbilical rim and the same umbilicus morphology are also present in shells of smaller size. Periumbilical area radially pleated (Fig. 6e). Animal light chestnut-brown at the top, turning yellowish-beige in the body whorl with scattered blurred chestnut-brown spots and hypobranchial gland beige with scattered chestnut-brown blotches (Fig. 6a and b). In paratype 1, the hypobranchial gland exhibits also a diffused lemon-yellow spot, observable by transparency (Fig. 7c and d) that fades away quickly in wet storage (ethanol 95%). It bears two pairs of head tentacles over the yellowish-beige foot and black eyes over a yellow-beige background (Fig. 7a and b). Operculum straw-yellow and transparent (Fig. 7a and b).

Type Material: Holotype (Fig. 6a–h), live, CTM, Greece, Marathia, South Toroneos Gulf, MB, - 50 m, 39°56'N 23°53'E, deposited at MNHN-IM-2000-35849.

Other material examined: Paratype 1 (Fig. 7a-d and 8g), live, CTM, Greece, Porto Koufo, South Toroneos Gulf, MB, - 40 m, 39°56'N – 23°53'E, stored in 95% EtOH; Paratypes 2 and 3 (Fig. 7e-i and 7j-n, respectively), CTM, Greece, Cape, Epanomi, East Thermaikos Gulf, Zostera bed, - 0.2 m, 40°23'N – 22°53'E; Paratypes 4 to 8 (Fig. 7o-s), CTM, Greece, Central Siggitikos Gulf, OD, - 60 m, 40°11'N 24°02'E; Paratype 9 (Fig. 8a-f), CTM, Greece, Central Siggitikos Gulf, OD, - 60 m, 40°11'N 24°02'E, used for SEM images, deposited at MNHN-IM-2000-35850. An additional voucher specimen was deposited at MNHN-IM-2008-2005.

Type Locality: Marathia, South Toroneos Gulf, 39°56'N 23°53'E.

Distribution: Known only from Thermaikos, Toroneos and Siggitikos Gulfs, North Aegean Sea.

Habitat: The shells were collected from mixed bottom and Zostera bed material from 0.2 - 60 m depth.

Remarks: *Rissoella angeli* Manousis n. sp. shells exhibit features diagnostic for the Rissoellidae family, which, apart from the very few diagnostic shell characters e.g. the transparent and simple shell, include the colourful animal, the pigmented hypobranchial gland and the two pairs of head tentacles. A brief comparison with its Mediterranean cogenes shows that it differs from *R. globularis* (Forbes & Hanley, 1853) (Fig. 8i) and *R. opalina* (Jeffreys, 1848) (Fig. 8k) in the shell morphometry and the preumbilical rim (cord) while it also differs from *R. inflata* (Monterosato, 1880) (Fig. 8j) (see also, Appolloni *et al.*, 2018, p. 118, fig. 28K) in the shell morphometry and the animal colour. In table 2, *R. angeli* n. sp. morphometric and animal characters are compared with those of several species of *Rissoella* Gray, 1847 with preumbilical cord, based on the available literature. As the animal colouration may be affected by parameters such as starvation (Caballer *et al.*, 2014), while shell characters appear more stable and can be more objectively measured, priority for the comparison was given to morphometry e.g. shell size, average height of the aperture/shell length, average height of the body whorl/shell length, shell h/w ratio, spiral angle and umbilical angle.

Based on the above, *R. angeli* n. sp. is close to:

R. belkisiae Ortea & Espinosa, 2005, but the animal of the later is grey with dark grey or black head (Caballer *et al.*, 2011);

R. contrerasi Rolán & Hernández, 2004, which bears a more massive body whorl, a wider teleoconch angle (73°), a more narrow umbilicus and a black animal with a hypobranchial gland in the form of a sock-shaped and intense yellow line (Rolán & Hernández, 2004);

R. ermelindoi (Ávila & Cordeiro, 2015) which has a uniformly black animal (Cordeiro & Ávila, 2015);

R. floriae Ortea & Espinosa, 2005, but the animal of the later has the hypobranchial gland of intense yellow, not surrounded by a ribbon (Caballer *et al.*, 2011);

R. inflata (Monterosato, 1880) due to the resemblance of the later with *R. contrerasi*. Of the species referred for the Canary Islands by Nordsieck and Garcia-Talavera (1979), *R. inflata* (Monterosato, 1878) (image of Monterosato's *Hela inflata*, in Appolloni *et al.*, 2018, p. 118, fig. 28K) is, according to Robertson (1961), a nomen nudum, and the species that

has been designated by them as such could be the one described later as *R. contrerasi* by Rolán and Hernández (2004). Apparently, the shell of Monterosato's *H. inflata* exhibits a conical spire, not oval such as *R. angeli* n. sp. or that of *R. contrerasi*. Carrozza (1976, p. 167, fig. 8) depicts a shell of *R. inflata* which is accepted by Aartsen *et al.* (1984) as such but the shell is much wider than ours exhibiting a teleoconch angle wider by 11°. In WoRMS, the two species, *R. contrerasi* Rolán & Hernández, 2004 and *R. inflata* (Monterosato, 1880), though accepted as separate species, are represented by the same specimen the morphometric characters of which are added to Table 2. It seems that the WoRMS specimen bears the characters of *R. angeli* n. sp. and not those of *R. inflata* of similar size depicted by Appolloni *et al.* (2018) or Scaperrotta *et al.* (2012) (also in Table 2) and therefore the WoRMS specimen could in fact belong to *R. angeli* n. sp. and not to *R. contrerasi*, a species with a different animal colour than *R. angeli* n.sp. (Rolán & Hernández, 2003). According to Cachia *et al.* (2001) the animal of *R. inflata* is colourless and "seen through the shell the visceral mass has a mixture of colours, black and red at the top of the shell and yellow or orange with black spots in the body whorl". The above description, though contradictory, is reminiscent of the image of *R. salasae* (in Ortea, 2019, p. 75, fig. 3) from the Canary Islands, a species again with a different animal colour than *R. angeli*. Also, according to Scaperrotta *et al.* (2012) the animal of *R. inflata* is colourless and according to Gofas *et al.* (2011) is vivid pink. Giannuzzi *et al.* (2014) present a shell of *R. inflata* which is larger than *R. angeli* by nearly 40%, has a wider umbilicus and a clearly opisthocline outer lip. Finally, Conchology Inc. (<https://www.conchology.be/?t=1>) depicts as *R. inflata* a live specimen with a cream-yellow animal. In conclusion, whichever is the observable colour of the true *R. inflata* (a case in need of images along with the descriptions) our live specimens are of different colour than those described, the shell is smaller in size for the same number of whorls, with a slender spire and bear a straw yellow operculum [in *R. inflata* brown (Cachia *et al.*, 2001) or light brown (Scaperrotta *et al.*, 2012)].

R. trigoi Rolán & Hernández, 2004, but its animal is black with the hypobranchial gland also black, ovoid and with a prolongation (Rolán & Hernández, 2004).

Haloo japonica (Pilsbry, 1895) (Fig. 9a, b)

Shell subglobose, fragile, semi-transparent, yellowish with lilac tinges. Surface with prosocline incremental lines and very fine spiral ones. Cephalic disc with two developed and overlapping posterior lobules. Short parapodia that do not contact dorsally. Long and rounded paleal lobe that subsequently extends beyond the shell posteriorly. Animal translucent, whitish, with scattered white dots and more densely grouped spots in the center of the cephalic disc and in the parapodia. Conspicuous orange spots on the surface of the mantle and unpigmented periocular area. An Indopacific species (Hanson *et al.*, 2013) that perhaps entered the Mediterranean Sea via the Atlantic on live stock of *Crassostrea gigas* and *Ruditapes philipinarum* for aquaculture purposes (Cervera *et al.*, 2004; Zenetos *et al.*, 2010; Occhipinti-Ambrogi *et al.*, 2011; Crocetta, 2012). It is referred as a highly invasive species that could replace native *Haloo* and *Haminoea* species (Macali *et al.*, 2013; Oskars, 2019; Oskars & Malaquias, 2019).

***Trinchesia caerulea* (Montagu, 1804) (Fig. 9e)**

Body nearly 2 mm with a white and diffused dorsal band. The foot is narrow and rounded anteriorly. The rhinophores are light-yellowish and 1.5 times longer than the oral tentacles. The cerata are relatively short and spindle-shaped with distinct colour zones, digestive gland basally greenish with a narrow dotted lemon-yellow band at the surface, an upper blue dotted broad band, and towards the top of the cerata a dotted yellow band. The tips of the cerata are clear. The rhinophores and oral tentacles exhibit diffuse light yellowish pigment. Morphologically, though similar, *T. caerulea*, can be distinguished from *T. cuanensis* Korshunova *et al.*, 2019 by the greenish to light grayish basis of the cerata (blackish to dark grayish in *T. cuanensis*) and the absence on the cerata of a narrow blackish band above the broad blue band (present in *T. cuanensis*). *T. caerulea* can also be distinguished from *T. morrowae* Korshunova *et al.*, 2019 by the greenish basis of the cerata (light grayish to yellowish in *T. morrowae*), the presence of a diffused dorsal band (distinct white dorsal line and thin white lateral lines present in *T. morrowae*), the light yellowish tips of the rhinophores and oral tentacles (orange ones in *T. morrowae*) (Korshunova *et al.*, 2019). *T. caerulea* can be distinguished from *T. diljuvia* Korshunova *et al.*, 2019 by the presence of distinct colour zones on the cerata, (absent in *T. diljuvia*) and the absence of a distinct white dorsal line (Korshunova *et al.*, 2019). *T. caerulea* is found in stony, shallow areas covered with various algae, and feeds on hydrozoans (Korshunova *et al.*, 2019). We present the species here as, though referred for Greece by Koukouras (2010), its presence is not documented by any means (Korshunova *et al.*, 2019).

Discussion

The findings of *Kurtiella ovata* (Fig. 1a) and *K. triangularis* (Fig. 1d), though poor in specimens, came as a pleasant event yet not as a surprise, as both species have already been reported from the W and C Mediterranean. The North Aegean Sea is a navigational crossroad of the Mediterranean Sea while Thermaikos and Thessaloniki Gulfs are successive marine basins on the navigation line to the second largest port of Greece and therefore a stage of continuous species occurrence (Manousis *et al.*, 2010). Also the area harbours their cogenerates *K. pellucida* (Jeffreys, 1881), *K. tumidula* (Jeffreys, 1866) (Manousis *et al.*, 2020b) and is especially rich in the also brooding *K. bidentata* (Fig. 1b, c). Although their large prodissoconch 1 without any limit indicating the beginning of a prodissoconch 2 is indicative to a non-planktotrophic development and, perhaps, a limited ability for dispersal (Gofas & Salas, 2008), given a suitable dispersal factor their brooding capability may facilitate the dispersal of the offspring as it is protected from harsh and variable environmental conditions outside the shell.

The present 3 records of *Acrochalix callosa* (Fig. 2a) together with those 2 previously reported as *A. cf. callosa* (Manousis *et al.*, 2014) give us a more thorough idea of the species characters, especially the fact that all shells are flattened, i.e. the observed diameter from the outer lip to the opposite edge of the shell is much larger than that measured at a right angle (apertural view) to this. The above, together with the direct correlation of size/number of whorls between our specimens and the drawing of the holotype (Bouchet & Warén, 1986) make us certain that we are dealing in all cases with the

authentic North Atlantic species described some 3 decades ago by Bouchet and Warén (1986). At the same time, our findings point out to a rather stable presence of the species in the North Aegean Sea, as they have been collected at distant time lapses and from four different and distant locations. Nevertheless, the distribution of the species remains unclear as the present locations are extremely far from the type locality. Perhaps additional records from the Central and West Mediterranean will shed light on the case.

Similar to the above case is that of *Vitreolina cf. knudseni* as *V. knudseni* is only known from a single specimen from the North Atlantic. We are looking forward to more specimens of ours and of fellow colleagues so that more light is shed on these rather unexpected distant findings.

The Mediterranean Sea has been the birth place of molluscan systematics with the work of Bucquoy *et al.* (1882-1886, 1887-1898) being the basic identification guide of its molluscs for nearly a century and the core of the perception of a unified Mediterranean as far as its molluscan inhabitants are concerned. Apart from the major impact of the Lessepsian migration, the discovery of endemic species in the Eastern Basin (e.g. Oberling, 1970; Amati & Oliverio, 1987) or of narrow range in the Western Basin (e.g. Curini *et al.*, 1982; Gofas, 1998) gave evidence of a divided and more complex biogeographical pattern. The application of molecular techniques (e.g. Hebert & Gregory, 2005; Will *et al.*, 2005) revealed an even more composite biogeography (e.g. Barco *et al.* 2013; Calvo *et al.* 2015), which can be correlated to the changes in its configuration and climate over the last 10 millennia. The Nassariidae family in the Mediterranean is representative of such an advance in the Mediterranean mollusc systematics with a recent molecular phylogeny demonstrating that the genus *Nassarius* is polyphyletic. The generic name adopted for the Mediterranean and Northern Atlantic clade is *Tritia* Risso, 1826 (Galindo *et al.* 2016). By revisiting the status of Nassariids in the Gulf of Gabès, Aissaoui *et al.* (2017) not only gave an answer to the genetic differentiation of the local populations but also the opportunity to researchers like us to find a way out of the identification dilemmas related to the local "*Tritia corniculum*" phenotypic variation.

The species of the Rissoellidae family are difficult to study due to their minute size and to identify due to their transparency, hence the reduction in the number of available discriminating morphological characters. Thus, identification is aided by the colour patterns of the animals (Sasaki, 2008). In addition, the absence of unanimity on the key discriminating characters explains why it is among the least studied families of micromolluscs (Okutani, 2000). We would add that the identification procedure is hindered by the lack of uniformity in the presentation of the characters as, in spite the limited availability of handy characters, not all of the available ones, such as the protoconch dimensions, are presented in some publications. Furthermore, the mean values of the morphometrical characters observed in shells of different developmental stages give rise to an uncertainty as to the expected value of the character in a given mature specimen. It has been proposed that *Rissoella* species exhibit a low dispersal capacity because of the absence of a pelagic larval stage and, presumably because of that, they are usually found in very specific habitats (Ortea & Espinosa 2004) and therefore they tend to be microendemic (Caballer *et al.*, 2011). Immediately afterwards, the latter authors added that the small size could

by itself facilitate their passive transport in floating elements carrying algae (Caballer *et al.*, 2011) a factor which, in our view, cancels the impact of the proposed low dispersal capacity due to lecythotrophy – a possibility that perhaps was also discreetly implied by the authors. As observed in *R. contrerasi* and *R. trigoi* (Table 2), the development of protoconch II (larval shell) adds more than 60% to the maximum diameter of protoconch I (embryonic shell). If it is accepted that the gastropod larvae are approximately spherical, this by some 400% substantial increase in the corresponding volume and, presumably, in biological mass during metamorphosis is indicative of a prolonged and feeding larval stage that could take place in the water column. If some *Rissoella* species larvae are, in fact, planktotrophic, then their alleged microendemism could not be the result of low dispersal capacity but rather that of intense selection pressure driven perhaps by stenotrophy and limited appropriate habitat availability. Finally, the lighter animal colour of the holotype, in comparison with that of paratype 1, might be attributed to starvation, as the holotype was collected less fresh while paratype 1 was found crawling in recently brought to surface bottom material. We should add that the contradictory descriptions of the colour of *R. inflata* animal may indicate descriptions of specimens belonging to different species but perceived as belonging to the same one, namely *R. inflata*, due to their similarities in the shell morphological characters and the lack of fresh live individuals. In accordance to the above is the fact that in literature are depicted as *R. inflata* shells of different contour and size for the same number of whorls. The almost simultaneous collection of shells and live individuals of *Halio japonica* in Cretan Sea and North Aegean Sea is indicative of its establishment in the Hellenic marine environments.

Korshunova *et al.* (2019) demonstrated that the common throughout European waters *Trinchesia caerulea* (Montagu, 1804) is a complex of four species. More specifically and importantly from the identification point of view, they have correlated stable morphological characters with molecular data. Thus, the previously ‘cryptic’ species can be distinguished morphologically by using multilevel morphological information as a primary source, including the distinct colour zones of the cerata. This information enabled us to identify our specimen. With the new findings, the Hellenic bivalve fauna is raised from 356 (Manousis *et al.*, 2020b) to 359 while that of the gastropods from 729 (Manousis *et al.*, 2020c) to 749.

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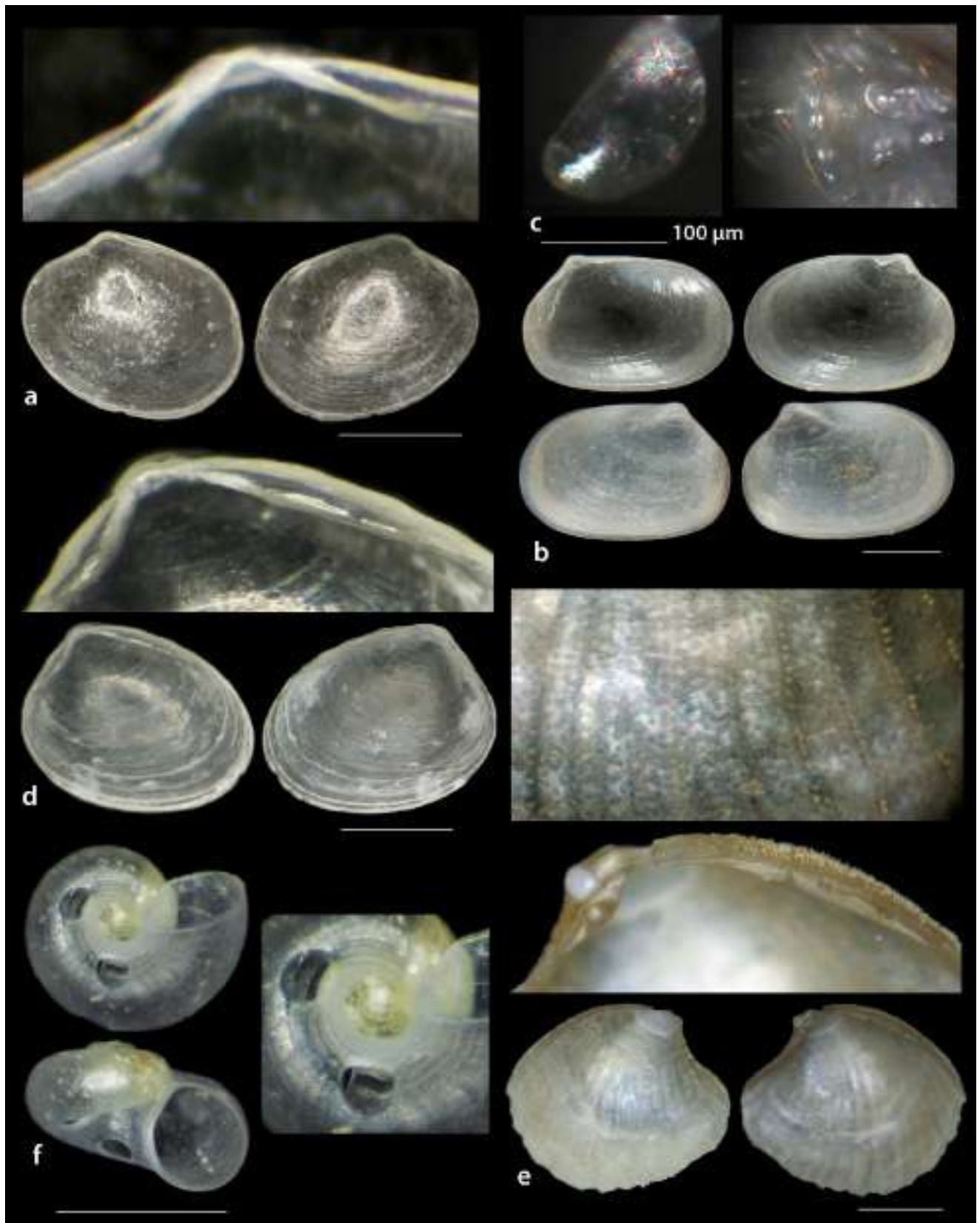


Figure 1: a. *Kurtiella ovata* (Jeffreys, 1881), b. *Kurtiella bidentata* (Montagu, 1803), c. *K. bidentata* (Montagu, 1803) D-shape Veligers in pallial cavity, d. *Kurtiella triangularis* (R. B. Watson, 1897), e. *Haliris trapezoidea* (Seguenza, 1876), f. *Dikoleps umbilicostriata* (Gaglioli, 1987). Barr = 1 mm, unless otherwise indicated.

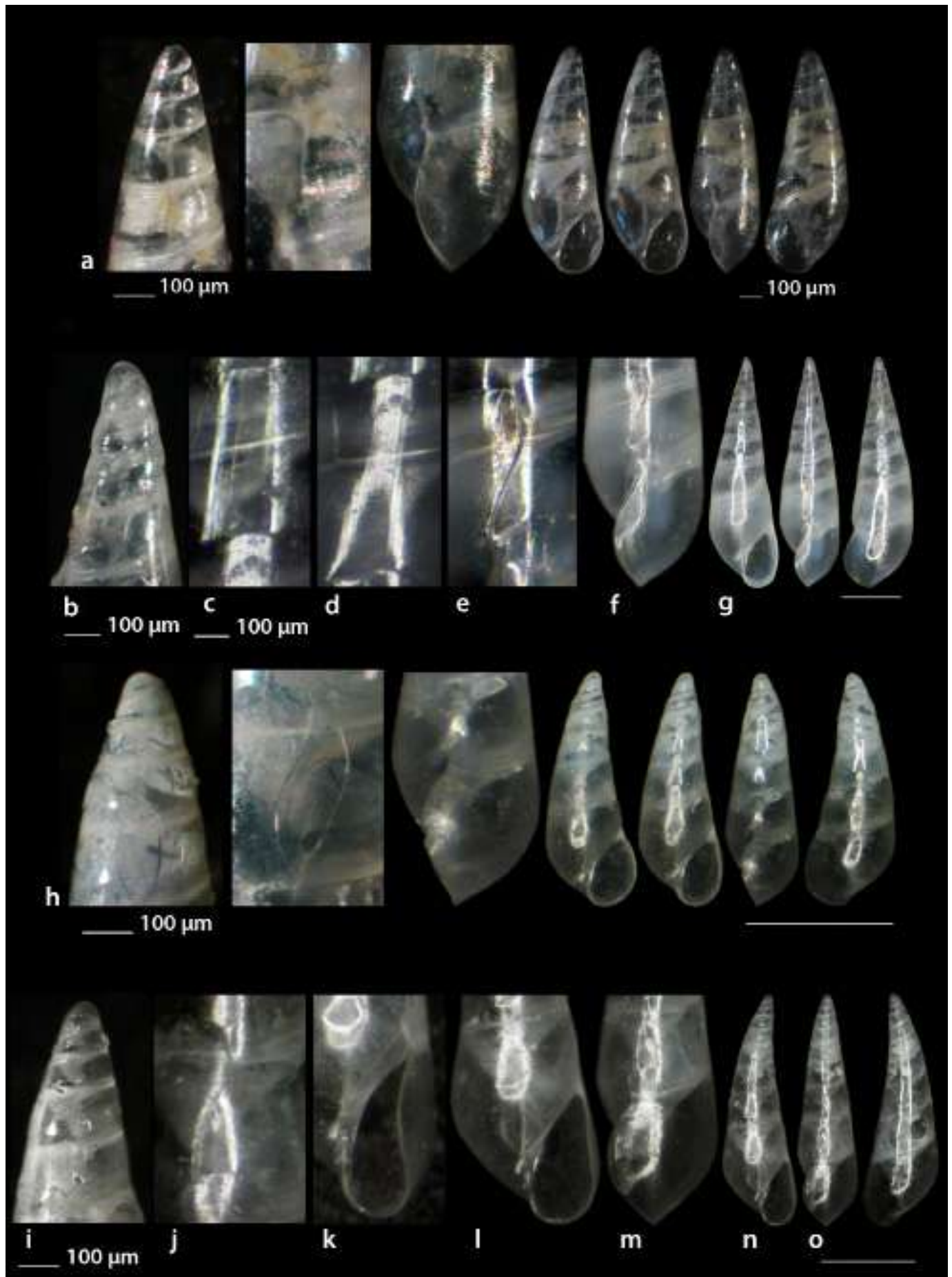


Figure 2: a. *Acrochalix callosa* Bouchet & Warén, 1986, b-g. *Campylorhaphion* sp., h. *Curveulima beneitoi* Penâs & Rolán, 2006, i-o. *Vitreolina* cf. *knudseni* Bouchet & Warén, 1986. Barr = 1 mm, unless otherwise indicated.



Figure 3: a. *Megalomphalus disciformis* (Granata-Grillo, 1877), b. *Eatonina matildae* Rubio & Rodríguez Babio, 1996, c & d. *Eatonina* sp., e. *Tubbreva micrometrica* (Aradas & Benoit, 1876), f. *Alvania balearica* J. D. Oliver & Templado, 2009. Barr = 1 mm, unless otherwise indicated.

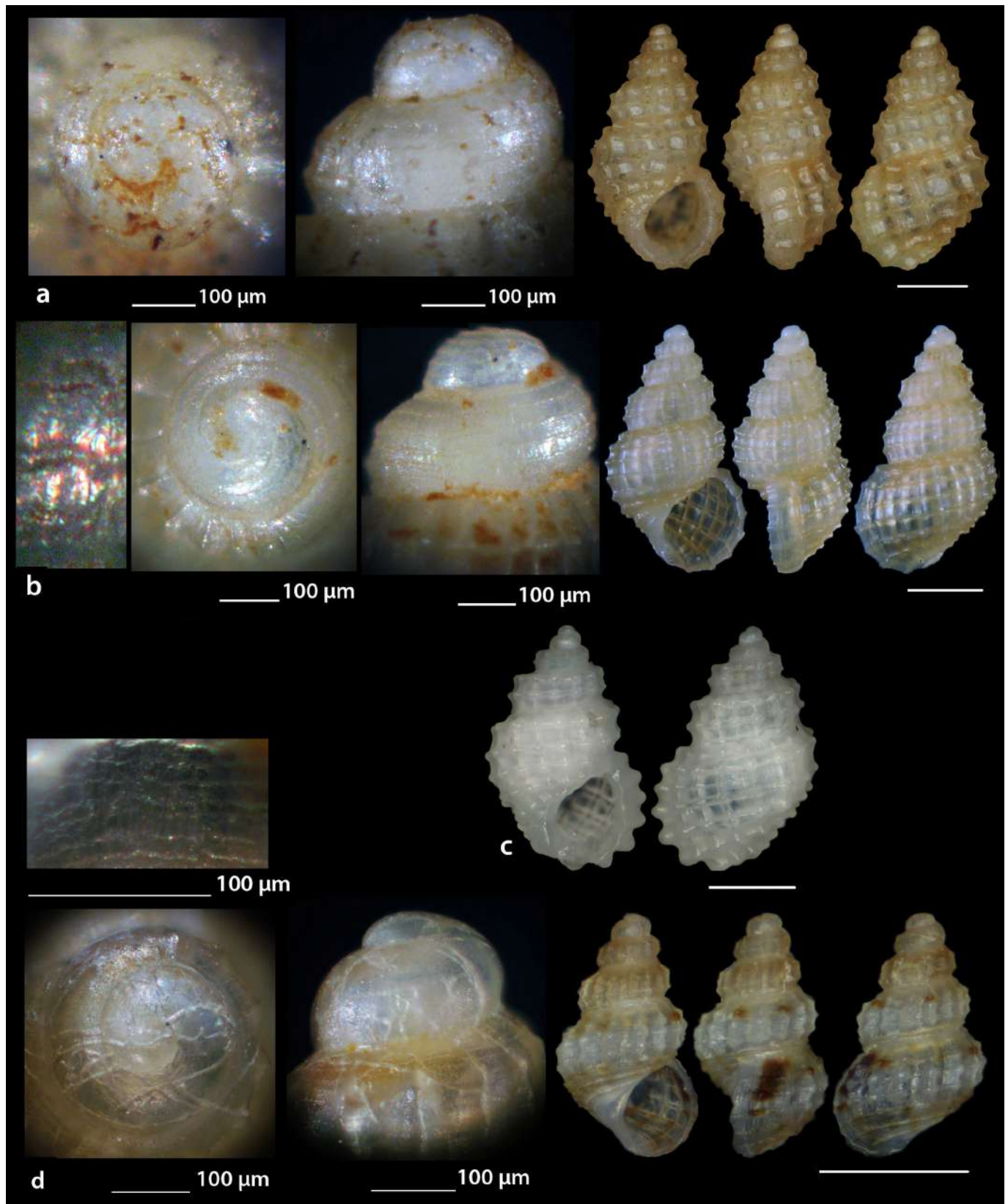


Figure 4: a. *Alvania clathrella* L. Seguenza, 1903, b. *Alvania dalmatica* Buzzurro & Prkic, 2007, c. *Alvania hirta* (Monterosato, 1884), d. *Alvania lucinae* Oberling, 1970. Barr = 1 mm, unless otherwise indicated.

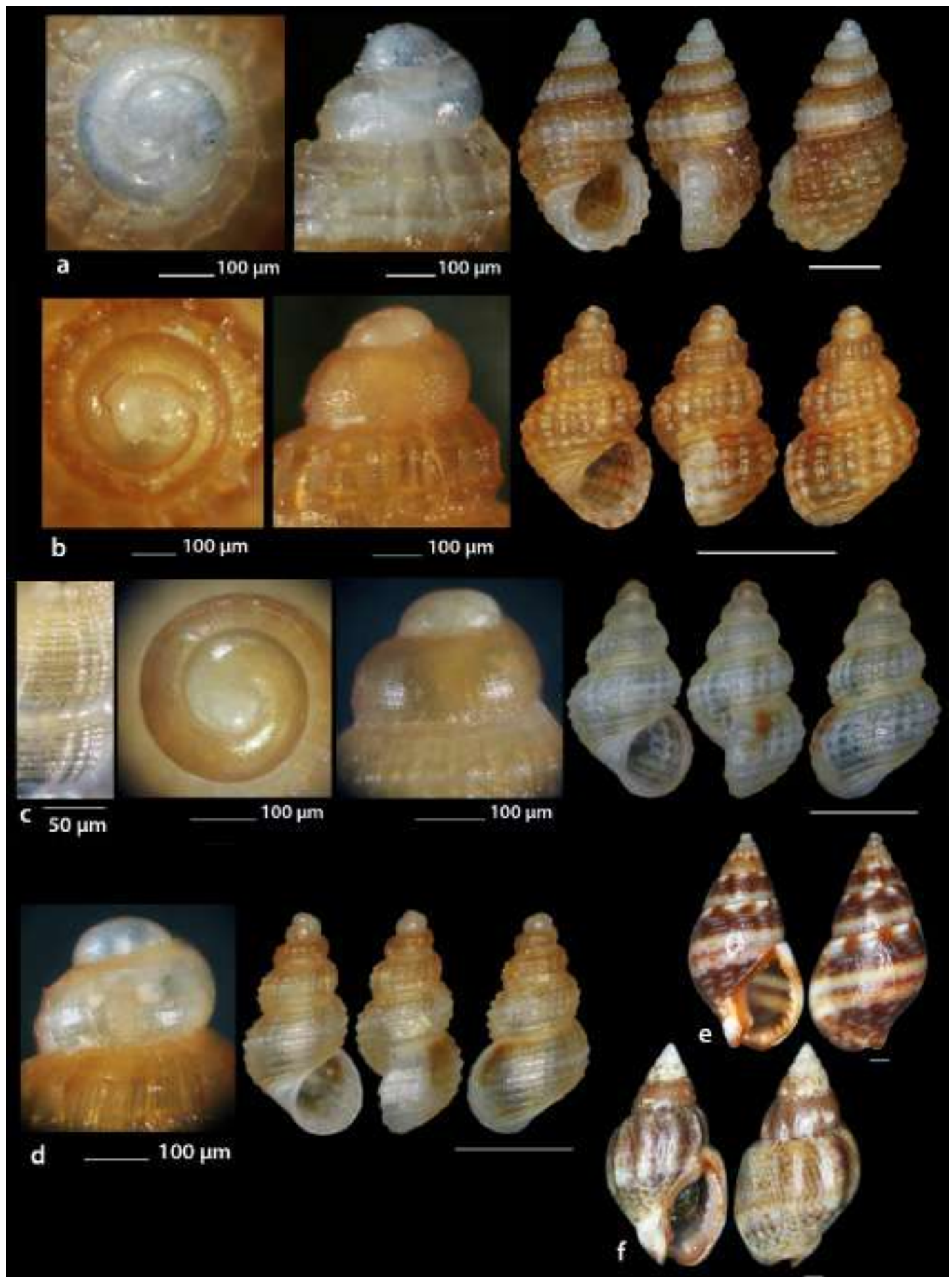


Figure 5: a. *Alvania marmarisensis* Bitlis & Öztürk, 2017, b. *Alvania scuderii* Villari, 2017, c. *Alvania sculptilis* (Monterosato, 1877), d. *Alvania sororcula* Granata-Grillo, 1877, e. *Tritia elongata* (Bucquoy, Dautzenberg & Dollfus, 1882), f. *Tritia corniculum* (Olivi, 1792). Barr = 1 mm, unless otherwise indicated.

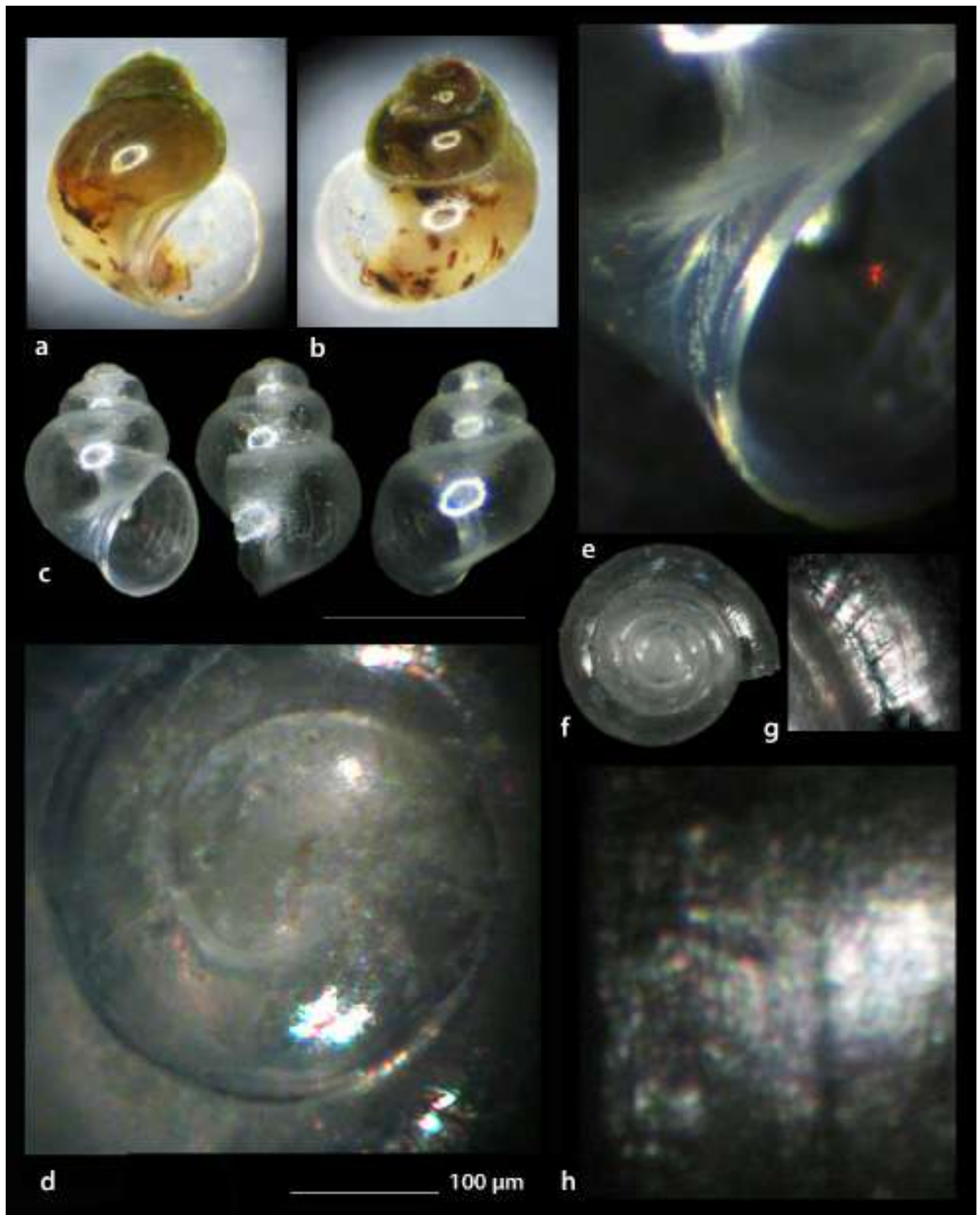


Figure 6: : a-h. *Rissoella angeli* n. sp. holotype – MNHN-IM-2000-35849. Barr = 1 mm, unless otherwise indicated.

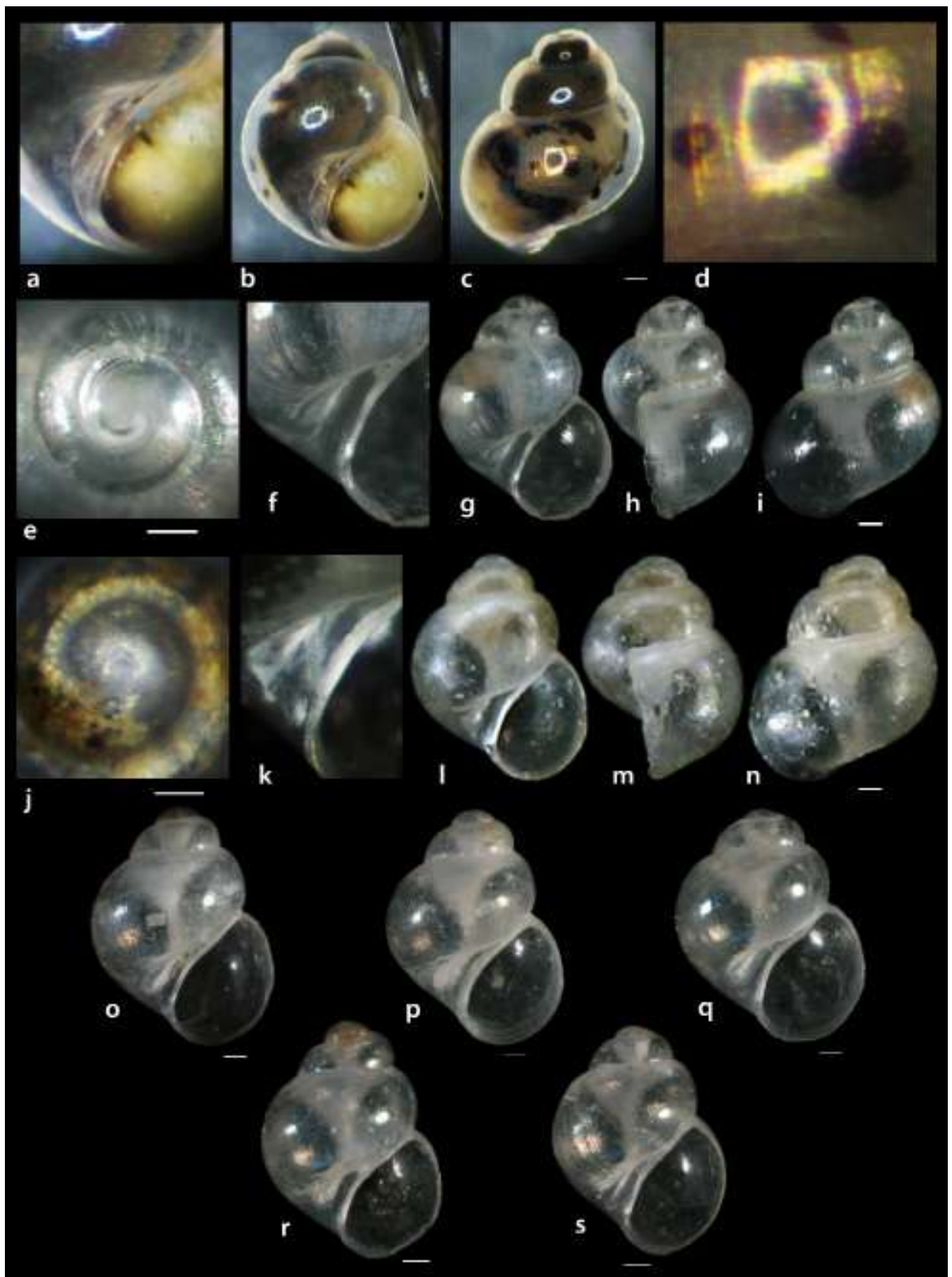


Figure 7: *Rissoella angeli* n. sp.: a-d. Paratype 1, e-i. Paratype 2, j-n. Paratype 3, o-s. Paratypes 4-8. Barrs = 0.1 mm

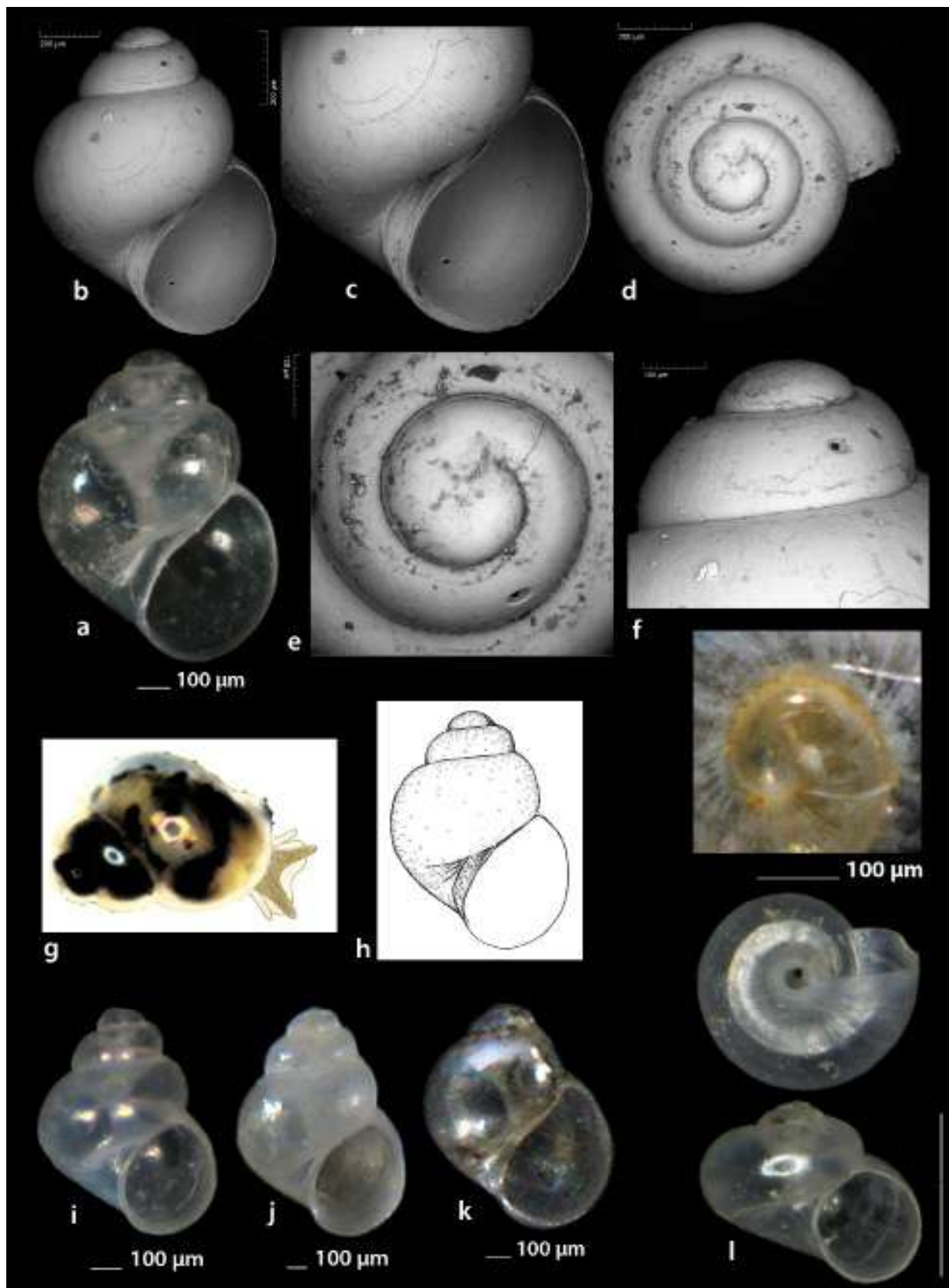


Figure 8: a. *Rissoella angeli* n. sp. paratype 9 – MNHN-IM-2000-35850, b-f. Paratype 9 SEM images, g. *R. angeli* n. sp. artistic presentation, h. *R. angeli* n. sp. representative drawing, i. *R. globularis* (Forbes & Hanley, 1853), j. *R. inflata* (Monterosato, 1880), k. *R. opalina* (Jeffreys, 1848), l. *Hyalogyra zibrowii* Warén in Warén, Carrozza & Rocchini, 1997. Barr = 1 mm, unless otherwise indicated.



Figure 9: a and b. *Haloa japonica* (Pilsbry, 1895), c. *Melanochlamys algerae* (A. Adams, 1850), d. *Runcina adriatica* T. Thompson, 1980, e. *Trinchesia caerulea* (Montagu, 1804). Barr = 1 mm, unless otherwise indicated.

Table 1: List of recorded species with collection data and corresponding references.

Class	Family	Species	Figure	Shells	Live Depth	Bottom	Area	Global coordinates	Rarity	Origin	Record	Literature
Bivalvia	Lusidae	<i>Kurtilda ovata</i> (Jeffreys, 1881), in text	1a	1	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Un	WCMS	GI, DMSI	Gofas & Silias, 2008 Cosignani & Ardovini, 2011
	Verticordidae	<i>Kurtilda bidentata</i> (Montagu, 1803), for comparison	1b, c	1	40	MB	Stratoni, Ierissos Gulf N. Aegean Sea	40°31'N–23°54'E	Un	WCMS	GI, DMSI	Gofas & Silias, 2008
		<i>Kurtilda trianguliferis</i> (R. B. Watson, 1897), in text	1d	1	400	Mu		40°30'N–24°52'E	Ra	CEMS	GI	Seguenza, 1876 Repetto <i>et al.</i> , 2005 Cosignani & Ardovini, 2011 http://www.marinespecies.org/aphia.php?p=taxon&id=508016&pic=57414 http://www.vendicella.it/PTM/relievi%20foto/Verticordidae.htm
Gastropoda	Skeneidae	<i>Dikolepis umbilicostriata</i> (Gagliuti, 1987)	1f	1	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Un	WCMS	GI, DMSI	Repetto <i>et al.</i> , 2005 Gofas <i>et al.</i> , 2011 Manousis <i>et al.</i> , 2018a
	Eulimidae	<i>Acerodax callasa</i> Bouchet & Warén, 1986	2a	2	200	MB	N. Aegean Sea	40°26'N–24°37'E	Ra	NEA	G2	
		<i>Campylorhaphia</i> sp., in text	2b–g	1	80 60	BB MB	Skyros Island C Sığirtikos Gulf	38°50'N–24°30'E 40°12'N–23°57'E				
Vanikoridae	Cingulopidae	<i>Caraculina brevis</i> Perle & Rolán, 2006	2h	1	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Un	WCMS	GI, DMSI	Perle <i>et al.</i> , 2006 Cosignani & Ardovini, 2011 Gofas <i>et al.</i> , 2011
		<i>Vireolina cf. lundani</i> Bouchet & Warén, 1986, in text	2i–o	1	200	MB	N. Aegean Sea	40°26'N–24°37'E	Ra	NEA	GI, MSI	Bouchet & Warén, 1986
		<i>Megalonopsis disciformis</i> (Gemma-Gelilo, 1877)	3a	10	10	MB	Stavros, Crete	35°35'N–24°05'E	Co	WCMS	GI, DMSI	Warén & Bouchet, 1988
Rissoiidae		<i>Eatonina mutillae</i> Rubio & Rodríguez-Babio, 1996	3b	4	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Un	WCMS	GI, DMSI	Rubio & Babio, 1995 Gofas <i>et al.</i> , 2011
		<i>Eatonina</i> sp., in text	3c, d	2	70	MB	C. Tharmikos Gulf	40°06'N–23°02'E	Un	MS	G2	Scapenotta <i>et al.</i> , 2014
		<i>Tuberosa micrometrica</i> (Audas & Benoit, 1876)	3e	1	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Un	WCMS	GI, DMSI	Oliver & Templado, 2009
Nassariidae		<i>Atania baltarica</i> J. D. Oliver & Templado, 2009	3f	1	80	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Co	WCMS	GI, DMSI	Scapenotta <i>et al.</i> , 2012
		<i>Atania clathrella</i> L. Seguenza, 1903	4a	2	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Un	MS	G2	Bazzano & Pekic, 2007
		<i>Atania delmatica</i> Bazzano & Pekic, 2007	4b	4	120	CB	Paxos Island	39°10'N–20°06'E	Un	MS		Romani <i>et al.</i> , 2017
Rissoiellidae		<i>Atania hirta</i> (Montenato, 1884)	4c	5	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Co	MS	G2	Romani <i>et al.</i> , 2017
		<i>Atania lucina</i> Obesling, 1970	4d	4	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Un	WCMS	GI, DMSI	Repetto <i>et al.</i> , 2005 Azzati <i>et al.</i> , 2020
		<i>Atania marmaricensis</i> Bitlis & Özlük, 2017	5a	1	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Co	EMS	GI	Bitlis & Özlük, 2017
		<i>Atania sodalis</i> Villani, 2017	5b	8	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Un	CMS	GI, DMSI	Villani, 2017
		<i>Atania sculpilis</i> (Montenato, 1877)	5c	2	60	MB	C Sığirtikos Gulf	40°12'N–23°57'E	Co	WCMS	GI, DMSI	Gofas <i>et al.</i> , 2011 Azzati <i>et al.</i> , 2020
		<i>Atania corollae</i> Gemma-Gelilo, 1877	5d	6	70	MB	C. Tharmikos Gulf	40°06'N–23°02'E	Co	WCMS	GI, DMSI	Azzati <i>et al.</i> , 2020 Assaoui <i>et al.</i> , 2017
		<i>Tritia elongata</i> (Bucquoy, Deutziembg & Dollfus, 1882), in text	5e	3	2	MB	Angelochori, Tharmikos Gulf	40°29'N–22°48'E	Co	MS	GI	Assaoui <i>et al.</i> , 2017 http://www.marinespecies.org/aphia.php?p=taxon&id=591266&pic=126544
		<i>Tritia corniculata</i> (Olivi, 1792), for comparison	5f	1	50	MB	Manthia, S. Toroneos Gulf	39°56'N–23°53'E			GI, WI	Repetto <i>et al.</i> , 2005
		<i>Rissoella angeli</i> n. sp., in text	6, 7, 8a–h	1	40	MB	Porto Koufi, S. Toroneos Gulf	39°56'N–23°53'E	Co	Co	G2	Oliver <i>et al.</i> , 2012 Manousis <i>et al.</i> , 20

Table 2: Comparison of characters of several species of *Rissoella* Gray, 1847 with preumbilical cord

Species/Reference	Pr I µm	Pr II µm	Shell colour, length	Al	Aa	L/W	Sa	Ua	U	E	HG	Band around HG	Pf	H	Type locality
<i>Rissoella angeli</i> n. sp.	290	-	Transparent, to 1.10 mm	80%	55-57%	1.29	63°	25°	Well developed	Black on light beige	Beige with lemon-yellow blotch and black spots	Black blotches forming a horseshoe	Dark chestnut- brown	Mixed bottom and <i>Zostera</i> , 0.2-50 m	Marathia, S. Toroneos Gulf, Aegean Sea, Greece
<i>Rissoella abacoensis</i> Caballer, Ortea & Redfern, 2014/ Caballer <i>et al.</i> , 2014	-	200	Transparent, to 1.30 mm	80.63%	52.25%	1.56	54°	17.5° -21°	Narrow and very deep	Black on unpigmented area	Brilliant yellow with partitions	Homogeneous black	Black- brown	<i>Halimeda</i> , <i>Laurencia</i> , <i>Cladophora</i> , 1 m	Joe's Creek, Abaco, Bahamas
<i>R. amelineae</i> Ortea & Espinosa, 2005/ Caballer <i>et al.</i> , 2011	-	-	Transparent, to 1.62 mm	75%	50%	1.57	45°	18°	Relatively large	Unpigmented	Sock-shaped, yellow with round pink/violet blotches	Unpigmented	Uniform violet	Reef slope 15-18 m	Habana, Cuba
<i>Rissoella belkisiae</i> Ortea & Espinosa, 2005/Caballer <i>et al.</i> , 2011	-	-	Transparent, to 1.20 mm	80%	50%	1.38	60°	25°	Narrow and shallow	Unpigmented	Sock-shaped, Yellow with blackish blotches	Large blackish blotches	Dark grey to blackish	Reef slope 20-30 m	Cayo Arenas, Cuba
<i>Rissoella contrerasi</i> Rolán & Hernández, 2004/Rolán & Hernández, 2003	140	220	Transparent, to 1.04 mm	85%	54%	1.35	73°	10°	Narrow and deep	Black on grey	Sock-shaped Intense yellow line	Homogeneous black	Homogeneous black	Algae, lower littoral-shallow sublittoral	Los Dos Riques, Gran Canaria
<i>Rissoella edhayri</i> Caballer, Ortea & Redfern, 2014/Caballer <i>et al.</i> , 2014	-	110	Transparent, to 1.10 mm	75.5 3%	49.35%	1.32	41°	15-18°	Very narrow and very deep	Black on unpigmented area	Grayish with black blotches	Pale yellow, oblong with squarish upper right extension a	Homogeneous black	Sargassum, 1 m	Thurstone Bay, Abaco, Bahamas
<i>Rissoella elsaie</i> Ortea & Espinosa, 2005/ Caballer <i>et al.</i> , 2011; 2014	-	-	Transparent, to 1.20 mm	76%	50%	1.69	45°	25°	Nearly closed by columellar edge	Unpigmented or absent	White with big green blotches	Kidney-shaped, white without transverse bands	Homogeneous green	Coralligenous, 15-25 m	Shores of Cuba
<i>R. ermelindoi</i> (Ávila & Cordeiro, 2015)/Cordeiro & Ávila, 2015	225	-	Translucent, to 1.0 mm	75-80%	52%	1.37	70°	30°	A moderately enlarged fissure	-	Unpigmented	Black animal	Black animal	Rocky shores covered by algae	Caloura, São Miguel Island, Azores
<i>Rissoella florae</i> Ortea & Espinosa, 2005/Caballer <i>et al.</i> , 2011	-	-	Transparent, to 1.20 mm	79%	55%	1.35	60°	18°	Narrow and deep	Black on light orange	Intense yellow with black spots	Gold-yellow with transverse bands	Homogeneous brown-grey	Coralligenous, 25-30 m	Shores of Cuba
<i>Rissoella galba</i> R. Robertson, 1961/Caballer <i>et al.</i> , 2011	-	-	Transparent, white band by umbilicus, to 0.95 mm	78.3%	46.1%	1.18- 1.46	49-66°	20- 21.5°	Very wide and deep	Black on pale yellow	Pale brown	Pale yellow	Pale yellow	<i>Cladophora</i> sp., 1 m	Bahama Islands
<i>Rissoella globosa</i> Ponder & Yoo, 1977/Ponder and Yoo, 1977	-	-	Semi- transparent, to 1.22 mm	80%	56%	1.23- 1.40	62-80°	19- 32°	Narrow and deep	-	Yellow loop with dark brown or black spots.	-	-	Algae, lower littoral-shallow sublittoral	Heron Island, Australia
<i>Hela inflata</i> Monterosato, 1880/Appolloni <i>et al.</i> , 2018	-	-	1.35 mm	80%	56%	1.33	61°	18°	Wide	-	-	-	-	-	-
<i>Rissoella inflata</i> (Monterosato, 1880)/Carrozza, 1976	-	-	Translucent white	80%	58%	1.24	74°	20°	-	-	-	-	-	-	-
<i>Rissoella inflata</i> Locard, 1892/ Cachia <i>et al.</i> (2001)	-	-	Transparent, to 1.20 mm	82%	60%	1.35	70°	30°	Very narrow, chink like	Black on unpigmented area	Animal colourless with yellow or orange and black spots inside the body whorl	-	Black and red	<i>Cystoseira</i> , 1-2 m	W. Mediterranean Sea
<i>Rissoella inflata</i> (Monterosato, 1880)(Gofas <i>et al.</i> , 2011; Scaperrotta <i>et al.</i> , 2012 ^b)	-	-	Transparent, 1.10 mm ^a , 1.60 mm ^b	85%	57% 50%	1.30	75°	14°	Narrow and deep	-	Animal vivid pink ^a , colourless ^b ,	-	-	<i>Cystoseira</i> , a few meters	Mediterranean Sea
<i>Rissoella inflata</i> (Monterosato, 1880)/Giannuzzi-Savelli <i>et al.</i> , 2014	-	-	Transparent, 1.8 mm	82%	53%	1.29	70°	20°	Wide and deep	-	-	-	-	Low depth	Mediterranean Sea
<i>Rissoella inflata</i> (Monterosato, 1880)/ WoRMS	-	-	Transparent, 1.20 mm	83%	60%	1.25	73°	13°	Narrow and deep	-	-	-	-	12 m	Çanakkale, Bozcaada Island, Turkey
<i>Rissoella kennethi</i> Caballer, Ortea & Redfern, 2014/Caballer <i>et al.</i> , 2014	290	-	Transparent, to 1.10 mm	81.46%	51.72%	1.47	58.5°	13-15°	Very wide, almost separated from columellar edge	Black on unpigmented area	White with black blotches	Brilliant yellow, oblong, upper right squarish extension	Dark brown with white granules.	On <i>Cladophora</i> and <i>Halimeda</i> <i>opuntia</i> , 1-2 m	Pelican Cay reef, Abaco, Bahamas
<i>Rissoella micra</i> (Finlay, 1924) / Ponder and Yoo, 1977	-	-	Translucent, to 1.20 mm	87%	58%	1.30- 1.45	76°	32°	Prominent	-	-	-	Colorless to grey	On algae mid- lower littoral and shallow sublittoral	Otago, New Zealand Long Reef, New South Wales
<i>Rissoella morrocoyensis</i> Caballer, Ortea & Narciso, 2011/Caballer <i>et al.</i> , 2014	-	200	Transparent, to 1.25 mm	85%	60%	1.32	60°	21-28°	Very narrow, deep partly closed by columellar edge	Black on unpigmented areas	Translucent white, with black blotches	Pale yellow, boomerang-shaped, no transversal bands	Homogeneous black	Leaves of <i>Thalassia</i> near mangroves, 1 m	Boca Grande, National Park Morrocoy, Venezuela
<i>Rissoella opalina</i> (Jeffreys, 1848)/Van Aartsen <i>et al.</i> , 1984	-	-	Translucent, pink-brown, to 1.70 mm	75%	56%	1.25	80°	20°	Narrow and shallow	Black on unpigmented areas	Animal pale yellowish or homogeneous grayish	-	-	Photophilic algae, infralittoral	British Islands
<i>Rissoella salasae</i> Ortea, 2019/Ortea, 2019	-	-	Transparent, to 1.00 mm	85%	52%	1.25	80°	35°	Large, wide and deep	-	Boot-shaped mottled with brown spots	Thick, golden yellow border	Dark brown with orange blotches	Coralligenous, 60-80 m	Lanzarote, Canary Islands
<i>Rissoella sanguinea</i> Caballer, Ortea & Redfern, 2014/Caballer <i>et al.</i> , 2014	-	110	Transparent, to 1.25	76.81%	52.27%	1.57	54°	13-14°	Narrow and deep	Black on unpigmented area	Opaque white with reddish- black blotches	Pale yellow, oblong upper right squarish extension	Black with red rounded blotches	On <i>Cladophora</i> , 1 m	Channel Cay, Abaco, Bahamas
<i>Rissoella taniae</i> Ortea & Espinosa, 2005/Caballer <i>et al.</i> , 2014	-	-	Transparent, to 1.10 mm	82%	52%	1.40	65°	43°	Wide	Unpigmented or absent	Curved, white with big green spots	Absent	Homogeneous dark green	Coralligenous 15 m	Shores of Cuba
<i>Rissoella trigoi</i> Rolán & Hernández, 2004/ Caballer <i>et al.</i> , 2011; Ortea, 2019	110	180	Transparent, to 0.74 mm	82%	56%	1.44	60°	28°	Very narrow, elongated	Black	Black, ovoid with a prolongation	Absent	Blackish	10-15 m	Goree, Dakar, Senegal
<i>Rissoella venezolanicola</i> Caballer, Ortea & Narciso, 2011/Caballer <i>et al.</i> , 2014	-	250	Transparent, to 1.02 mm	83%	57%	1.52	58°	23-25°	Narrow and deep	Black on unpigmented areas	Translucent white with black to greenish brown blotches	Yellow, quaver- shaped	Homogeneous black	Coralligenous, on <i>Dicryota</i> spp. 10 m	Leeward patch reef, Isla de Aves, Venezuela
<i>Rissoella zaidae</i> Ortea & Espinosa, 2005/Caballer <i>et al.</i> , 2014	-	-	Transparent, to 1.0 mm	78%	50%	1.63	50°	30°	Narrow and deep	Black on unpigmented areas	Kidney- shaped, pale violet with lilac blotches	Gold-yellow with transverse bands	Homogeneous lilac	Coralligenous 15-18 m	Shores of Cuba

One new species and one new subspecies of *Amphidromus* Albers, 1850 (Gastropoda, Pulmonata, Camaenidae) from Southeast Asia.

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Abstract:

Two new taxa of *Amphidromus* Albers, 1850 are described from Malaysia and Vietnam, respectively: *A. epidemiae* n. sp. and *A. noriokowasoei buonmathuotensis* n. ssp. Additional information on *A. frednaggsi* Thach & Huber, 2018 is given.

Introduction:

Camaenidae Pilsbry, 1895 is a highly diversified family of shelled terrestrial gastropods with *Amphidromus* Albers, 1850 currently being its most speciose component genus (WoRMS 2020). *Amphidromus*'s distribution ranges over eastern India, Bangladesh, Myanmar, Andaman and Nicobar Islands, Indochina Peninsula, southern China, Philippines, the bulk of Malay Archipelago and northern Australia (Laidlaw & Solem 1961; Solem 1983; Mitra et. al. 2004; He & Zhou 2017), and this genus is considered to be of significance in ecology, anatomy and evolutionary biology research (e.g. Goldberg & Severns 1997; Schilthuizen et. al. 2005; Craze et. al. 2006).

In the recent decade, collecting activities of terrestrial snails in Southeast Asia and China have yielded a dazzling array of new taxa in *Amphidromus* (e.g. Cilla 2013; Gra-tes 2015; He & Zhou 2017; Huber 2015; Inkhavilay et. al. 2017; Parsons 2016; Segers 2020; Stark 2017; Sutcharit et. al. 2015; Tan et. al. 2011; Thach 2016, 2017, 2018, 2020; Wang 2019; but see Páll-Gergely et. al. 2020; Thach et. al. 2020; Thach 2020 for partial review and discussion). With the present paper, *Amphidromus epidemiae* n. sp. from Malaysian Kalimantan and *A. noriokowasoei buonmathuotensis* n. ssp. from Vietnam are described using discriminatory shell characteristics. A controversial *Amphidromus*, *A. frednaggsi* Thach & Huber, 2018, is also discussed.

Materials and Methods:

This study is based on materials gathered by the author. Observation of the shells is made with a 45x microscope; measurement is done using a mechanical Vernier caliper to the nearest 0.05 mm. They, along with photography and picture editing, are conducted by the author. The following abbreviations are used: DLSM = Da Lian Shell Museum, Da Lian, Liao Ning Province, China, SH = Shell height, SW = Shell width, WYC = Yung-Ching Wang's collection.

Systematic Descriptions

Family Camaenidae Pilsbry, 1895

Genus *Amphidromus* Albers, 1850

Amphidromus epidemiae n. sp. (Figure 1)

Type material: Holotype: SH 42.80 mm, SW 19.95 mm; Malaysia, Sarawak State, Kuching Division, Bau, 1° 25' N, 110° 09' E, on leaf litters; housed in DLSM. Paratype: SH 40.00 mm, SW 19.80 mm; same locality and environment as holotype, in WYC.

Description: *Shell:* Size medium for the genus, helicoid, dextral, conical-tapering in shape. Shell width 48.0% of shell height on average. Spire moderately elongate, periphery rounded, coloration in simple lemon yellow with whitish subsutural

band. Sculpture very weak and not notable. Aperture auriform, peristome white, calloused, and reflected. Columella white, straight, umbilicus fully sealed. Apex is not colored. Periostracum not observed. *Animal:* Not known. Both type specimens are collected as empty shells. No visible soft tissue remnant can be detected.

Habitat: Undetermined.

Distribution: Only known from the type locality.

Remarks: This species appears linked most tightly to *Amphidromus similis* Pilsbry, 1900 (Fig. 5), which has an nearly identical shell and occurs in Sarawak State of Malaysia. Nevertheless, *A. epidemiae* n. sp. is allopatric with and can be readily divided from *A. similis* for its lack of tinted subsutural area and parietal callus, which are always present on *A. similis* (Laidlaw & Solem 1961). Sumatran *A. alticola* Fulton, 1896, *A. djajasmitai* Dharma, 1993, and *A. sekincauensis* Dharma, 2007 are chirally dimorphic and smaller (Dharma 1993, 2007); *A. alticola*, moreover, usually does not exhibit the pale subsutural band. *A. atricallosus perakensis* (Fulton, 1901) and *A. a. temasek* Tan, Chan & Panha, 2011 are chirally dimorphic; *A. a. perakensis* often has a twisted columella, *A. a. temasek* is fairly restricted to Singapore and its vicinity (Tan et. al. 2011). *A. capistratus chuai* Parsons, 2018 not only is chiral dimorphic but also frequently possesses brownish streaks and white area surrounding the umbilicus. *A. ameliae* Dharma, 2007 shows two coiling directions, twisted columella and more inflated spire whorls. *A. epidemiae* n. sp. could also be distinguished from *A. palaceus taloensis* Dharma, 2007 as the latter has striated, uncalloused shell with occasional dark band patterns.

The following taxa are compared here owing to conchological similarity only; it is unlikely that they have close association with *A. epidemiae* n. sp. The singleton of *A. dautzenbergi* Fulton, 1899 is very slightly less swollen and its peristome is not thickened. *A. metabletus* Moellendorff, 1900 has both dextral and sinistral individuals and is highly variable in color pattern; *A. sandersae* Thach & Huber, 2020 alongside *A. kantori* Thach & Huber, 2020 are here deemed evident synonyms of *A. m. pachychilus* Moellendorff, 1901 and are separable from *A. epidemiae* n. sp. by the same token.

Etymology: The specific epithet of the new species is a Latin word that means "epidemic", commemorating the Coronavirus Disease 2019 crisis and the grievous harm it inflicts.

Amphidromus noriokowasoei Thach & Huber, 2017 (Figures 2-3)
Amphidromus noriokowasoei Thach & Huber 2017: 123, figs 1-8. Type locality: Dam Rong District, Lam Dong Province, Vietnam.

Amphidromus noriokowasoei buonmathuotensis n. ssp. (Figures 3)

Type material: Holotype: SH 32.75 mm, SW 13.05 mm; Vietnam, Dak Lak Province, Buon Ma Thuot City, 12°39'N, 108°02'E; housed in DLSM. Paratypes 1-4: same locality as holotype, in

WYC.

Description: *Shell:* Size medium for the genus, helicoid, sinistral, conical-tapering in shape. Shell width 40.2% of shell height on average. Spire elongate, periphery rounded, coloration in yellowish brown with brownish-purple streaks and blotches on top whorls. Sculpture very weak, not notable. Aperture auriform, peristome in black, slightly flares outward. Columella very dark purple, straight, umbilicus nearly closed, parietal callus plain, filmy. Apex is very light in color, opaque. Periostracum thin, corneous and transparent. *Animal:* Not available for study. All type specimens were obtained by the author as empty shells, yet they appear to be collected alive.

Habitat: Unknown.

Distribution: Only known from the type locality.

Measurements: (SH, SW) in mm: Paratype: 1 (33.35, 13.10); 2 (34.50, 13.35); 3 (30.75, 13.25); 4 (32.05, 12.95)

Remarks: *Amphidromus noriokowasoei buonmathuotensis* n. ssp. is different from the nominal subspecies, *A. n. noriokowasoei* Thach & Huber, 2017 (Fig. 2) chiefly by being uniform in shell color. Additionally, dark stripe patterns on shell's body whorls, which are often present on *A. n. noriokowasoei*, have not been observed on any type specimen of *A. n. buonmathuotensis* n. ssp. The average shell size of *A. n. buonmathuotensis* n. ssp. also appears smaller than that of *A. n. noriokowasoei*.

It is worth noting that *A. noriokowasoei*, together with several other *Amphidromus*, were regarded synonymous to *A. smithii* Fulton, 1896 by Páll-Gergely et. al. (2020). On account of that *A. smithii* is to a large degree distinct (Thach 2020; author personal observation), I do not agree with these conclusions, whereas Páll-Gergely et. al. correctly suggested the extremely intimate relationship between *A. noriokowasoei* and *A. christabaerae* Thach, 2017, which renders the latter a junior synonym of the former.

Etymology: The subspecific epithet of this taxa is derived from its type locality, Buon Ma Thuot.

Amphidromus frednaggsi Thach & Huber, 2018 (Figure 6)
Amphidromus frednaggsi Thach & Huber in Thach 2018: 52, figs 655-660. Type locality: 10 km north of Trang City, Trang Province, Thailand.

Remarks: This species is originally described using conchologically immature specimens with unexpanded peristome, despite that its authors claimed that the type specimens are "adults". Although a congener of *Amphidromus frednaggsi*, *A. inversus albulus* Sutcharit & Panha, 2006, is known to be sexually mature prior to forming an expanded out lip on the shell (Schilthuisen & Looijestijn 2009, as *A. inversus* (Müller, 1774), which is technically correct but confusing because *A. i. albulus* is conspicuously distinct in appearance from typical *A. inversus*), there is no evidence that the soft parts of the type series of *A. frednaggsi* have been investigated. Páll-Gergely et. al. (2020) argued that *A. frednaggsi* is a junior synonym of *A. areolatus* (Pfeiffer, 1861) (Figure 5) and that it is an intermediate form between *A. patamakanthini* Thach & Huber, 2018 and *A. pallgergelyi* Thach & Huber, 2018, which is considered erroneous

(Thach 2020; also see below). Panha et. al. (2001) reported a pair of specimens from eastern Thailand under *A. areolatus* (fig. 9E) that are virtually indistinguishable from *A. frednaggsi*. This record reveals the appearance of conchologically mature *A. frednaggsi* (figs 9F-G, also under *A. areolatus*), but is also perplexing for the reason that an individual almost identical to that on the left of fig. 9G was (probably incorrectly) identified as *A. semitessellatus* (Morlet, 1884) on fig. 4(5) and fig. 6(4). I am not able to interpret the anatomical and morphological data presented in the study of Panha et. al. Nonetheless, it implies a relatively vast distribution of *A. frednaggsi*, from peninsular Thailand (type locality) to eastern Thailand, which is in accordance with a set of specimens in WYC. A Cambodian specimen in Sutcharit et. al. (2020) under *A. semitessellatus* (fig. 11E) is likely to be *A. frednaggsi* instead (author personal observation). Authentic *A. areolatus* and its morphological diversity were studied by Inkhavilay et. al. (2017) in detail, whereby the hypothesis that *A. frednaggsi* is within *A. areolatus*'s morphological variation is disproven. Besides, Páll-Gergely et. al. may overestimated the distribution range of *A. areolatus* due to provisional identifications provided by Solem (1965), materials published in which resemble more to those in Panha et. al. and the author collection than to *A. areolatus*. Apart from *A. areolatus*, *A. frednaggsi* is also similar to a myriad of species in Indochina Peninsula with banded and checked patterns on shell, principally *A. flavus* (Pfeiffer, 1861) and *A. xiengensis* Morlet, 1891. However, they, at least specimens recognized as such with anatomically corroborated identity as presented by Inkhavilay et. al. (2017), are constantly and visibly nuanced in comparison to *A. frednaggsi*, thus I believe that *A. frednaggsi* should be retained as a valid species. With regard to *A. patamakanthini* and *A. pallgergelyi*, the former is comparatively more distinct by having a conical shell and demands further research, whilst the latter is perhaps a synonym of *A. flavus*.

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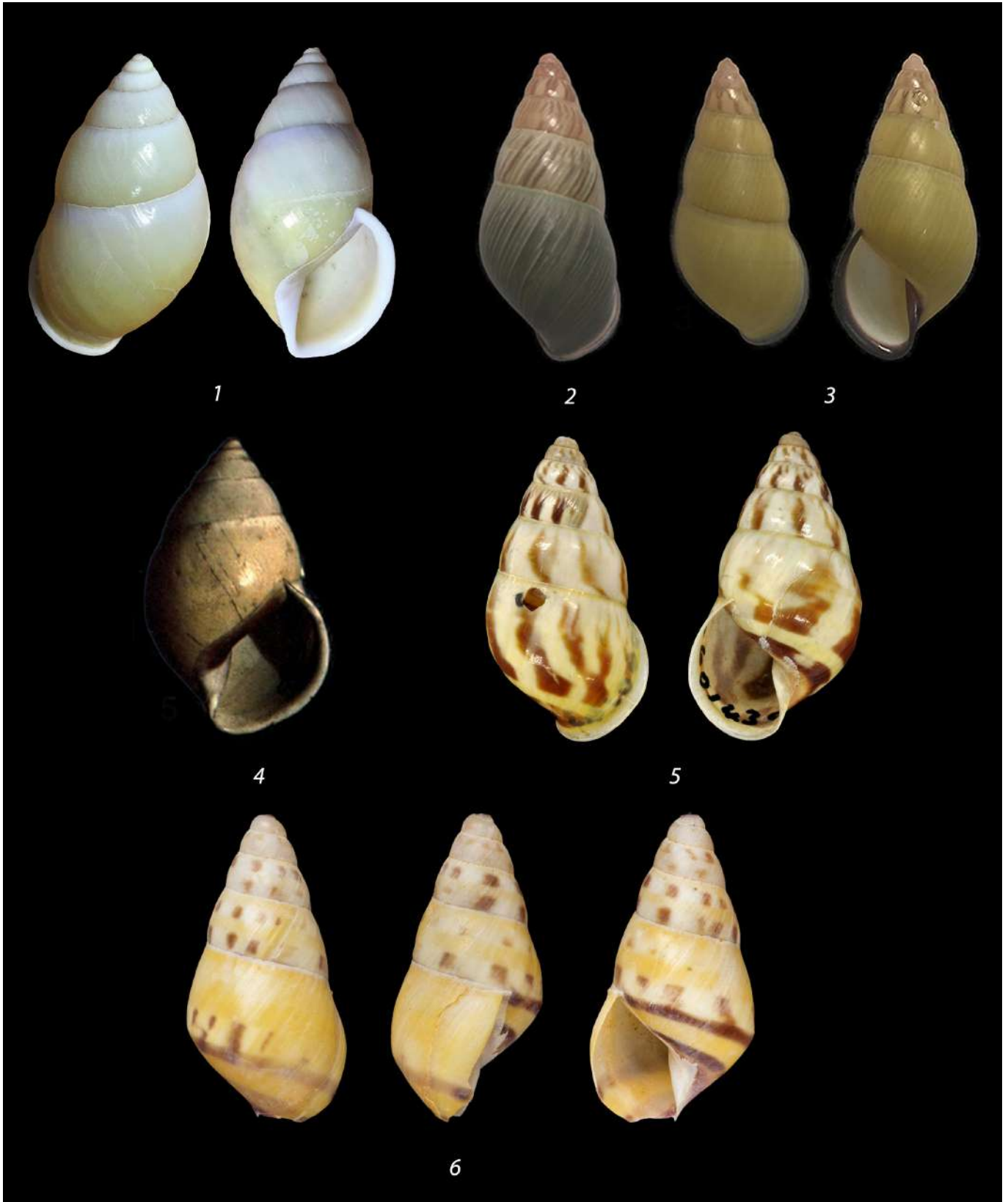


Figure 1: *Amphidromus epidemiae* n. sp., holotype

Figure 2: *Amphidromus noriokowasoei* Thach & Huber, 2017 in WYC

Figure 3: *Amphidromus noriokowasoei buonmathuotensis* n. ssp., holotype;

Figure 4: *Amphidromus similis* Pilsbry, 1900, holotype

Figure 5: *Amphidromus areolatus* (Pfeiffer, 1861), lectotype (Natural History Museum, UK, 2014)

Figure 6: *Amphidromus frednaggsi* Thach & Huber, 2018, holotype (Natural History Museum, UK, 2014)

(Pictures not to scale)