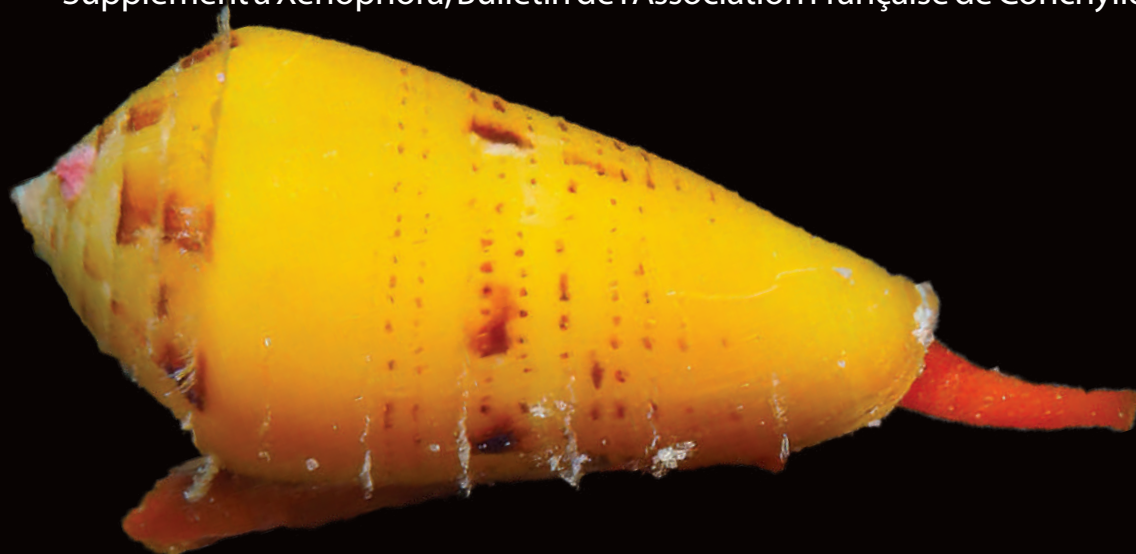
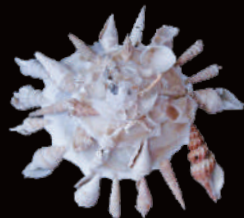




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DESCRIPTION OF SIX NEW SPECIES OF MURICIDAE (GASTROPODA: NEOGASTROPODA: MURICOIDEA) FROM THE EAST CHINA SEA, THE RED SEA, EAST PANAMA AND BRAZIL AND REHABILITATION OF *MUREX HEROS* FULTON, 1936.

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ABSTRACT

Murex (Murex) heros Fulton, 1936 from the Solomon Islands and Papua New Guinea is rehabilitated as a valid species.

Six new species of Muricidae are described from the East China Sea, the Western Atlantic, and the Red Sea. *Murex (Murex) maresinensis* n. sp. from the East China Sea is compared to *M. (M.) heros* Fulton, 1936 and *M. (M.) troscheli* Lischke, 1968. *Chicoreus (Chicoreus) major* n. sp. from Taiwan Strait is compared to *C. (C.) asianus* Kuroda, 1942 and to *C. (C.) exuberans* Cossignani, 2004. *Calotrophon (Panamurex) delicatus* n. sp. from Honduras is compared to *C. (P.) turbinelloides* (Grateloup, 1833) †, to *C. (P.) gibsonsmithi* (Vokes, 1992) † and, in extant species, to *C. (P.) carnicolor* (Clench & Pérez Farfante, 1945). *Aspella fernandi* n. sp. from Brazil is compared to three *Aspella* species also occurring off Brazil, *A. castor* (Radwin & D'Attilio, 1976), *A. cryptica* Radwin & D'Attilio, 1976 and *A. morchi* Radwin & D'Attilio, 1976. Two species are described from the Red Sea, along the coast of Egypt, *Murexsul falsomarianae* n. sp. is compared to *M. marianae* (Houart, 2003), a species occurring from South Africa to south Mozambique and south Madagascar and to *Favartia roseotincta* Houart & Gori, 2011 from Oman; *Favartia lorenzi* n. sp. is compared to *F. salmonea* (Melvill & Standen, 1899) from the Indo-West Pacific and *F. maculata* (Reeve, 1845) from the western Indian Ocean.

KEYWORDS

Gastropoda, Muricidae, taxonomy, synonymy, new species

RÉSUMÉ

Murex (Murex) heros Fulton, 1936 des Iles Salomon et de Papouasie Nouvelle Guinée est réhabilité en tant qu'espèce valide.

Six nouvelles espèces de Muricidae sont décrites de la mer de Chine orientale, de l'Atlantique Ouest et de la mer Rouge. *Murex (Murex) maresinensis* n. sp., de la mer de Chine orientale, est comparé à *M. (M.) heros* Fulton, 1936 et à *M. (M.) troscheli* Lischke, 1868. *Chicoreus (Chicoreus) major* n. sp., du détroit

de Taïwan, est comparé à *C. (C.) asianus* Kuroda, 1942 et à *C. (C.) exuberans* Cossignani, 2004. *Calotrophon (Panamurex) delicatus* n. sp., du Honduras, est comparé à *C. (P.) turbinelloides* (Grateloup, 1833) †, à *C. (P.) gibsonsmithi* (Vokes, 1992) † et, parmi les espèces actuelles, à *C. (P.) carnicolor* (Clench & Pérez Farfante, 1945). *Aspella fernandi* n. sp., du Brésil, est comparé à trois espèces du même genre également présentes au large du Brésil : *A. castor* (Radwin & D'Attilio, 1976), *A. cryptica* Radwin & D'Attilio, 1976 et *A. morchi* Radwin & D'Attilio, 1976. Deux espèces sont décrites de la mer Rouge, le long de la côte égyptienne : *Murexsul falsomarianae* n. sp. est comparé à *M. marianae* (Houart, 2003), une espèce présente depuis l'Afrique du Sud jusqu'au sud du Mozambique et au sud de Madagascar, ainsi qu'à *Favartia roseotincta* Houart & Gori, 2011 d'Oman ; *F. lorenzi* n. sp. est comparé à *F. salmonea* (Melvill & Standen, 1899), de l'Indo-Ouest Pacifique, et à *F. maculata* (Reeve, 1845), de l'océan Indien occidental.

INTRODUCTION

Eighteen new Muricidae species were recently described by Houart & Garrigues (2023) followed by a small erratum correcting the erroneous illustration of a paratype (Ibid, 2024). In this article, we describe six species assigned to the subfamily Muricinae, one to the Ergalataxinae, nine to the Muricopsinae, and two to the Pagodulinae.

Two other important contributions concerning this family were subsequently published by Russini *et al.* (2023) and Houart (2024). Russini *et al.* (2023) reduced the number of subfamilies from the initial twelve to nine following a molecular study in which Muricopsinae, Aspellinae, and Tripterotyphinae were found to belong to a same clade and that the Trophoninae represented a primitive stage within an ocinebrine clade. Houart (2024), taking these new elements into account, published an update of the subfamilies, genera, and species, where nine subfamilies were assigned to Muricidae, as well as 214 genera or subgenera and 1961 living species or subspecies. The following paper describes three new species belonging to Muricinae and three Aspellinae (formerly Muricopsinae) subfamilies respectively.

MATERIAL AND METHODS

The material studied here originates from the collection of the authors and from other sources cited in the acknowledgements.

Morphological analyses

The characters used to describe the shell morphology address the general aspect of the shell including its shape, size, length/width ratio, and colour, the shape of the spire, including the number and features of the protoconch and teleoconch whorls, details of the suture and of the subsutural ramp, details of axial and spiral sculpture, the aperture, and the siphonal canal. Width is the greatest width of the shell, including the varical spines, perpendicular to the shell axis, and length is the distance between the apex and the tip of the siphonal canal. The method used to determine diameter and height, and to count the number of protoconch whorls, follows Bouchet & Kantor (2004) as shown in Fig. 1.

Unless otherwise mentioned, the new species descriptions are based on the holotype and a representative selection of the paratypes.

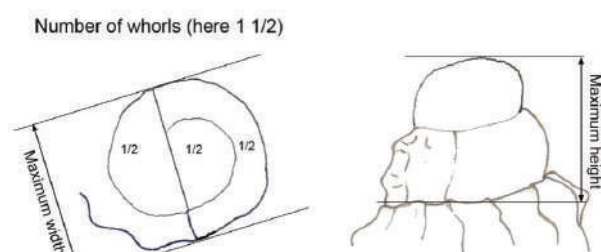


Figure 1. Method for determining diameter, height, and the number of protoconch whorls.

ABBREVIATIONS

Repository

CBG: Collection of Bernard Garrigues, Goudourville, France.
CDL: Collection of Dominique Lamy, Baie-Mahault, Guadeloupe.
CFL: Collection of Felix Lorenz, Buseck, Germany.
CRH: Collection of Roland Houart, Landen, Belgium.
IRSNB: Institut royal des Sciences naturelles de Belgique, Bruxelles.
MNHN: Muséum national d'Histoire naturelle, Paris, France.
MSF: Molluscan Science Foundation, Inc., Owings Mills, Maryland, U.S.A.
NHMUK: Natural History Museum, London, United Kingdom.
NMB: Naturhistorisches Museum, Basel, Switzerland.

Specimens

ad: adult shell(s);
dd: empty shell(s);
juv: juvenile shell(s);
lv: live collected specimen(s);
subad: subadult shell(s).
†: extinct species.

Terminology used to describe the spiral cords and the apertural denticles (after Merle 2001, 2005). Variable features are given in parentheses.

Ab: abapical: away from shell apex toward base along axis or slightly oblique to it; abapertural: away from shell aperture; Ad: adapical: toward shell apex along axis or slightly oblique to it; adapertural: toward shell aperture; P: primary spiral cord; s: secondary spiral cord; t: tertiary spiral cord.

Subsutural ramp

abis: abapical infrasutural secondary cord; IP: infrasutural primary cord; adis: adapical infrasutural secondary cord.

Convex part of teleoconch whorl and siphonal canal

P1: shoulder cord;

P2–P6: other abapical primary cords;

s1–s6: Secondary cords (example: s1 - secondary cord between P1 and P2; s2 - secondary cord between P2 and P3, etc.); t: tertiary cord.

ADP: adapertural primary cord on the siphonal canal; MP: median primary cord on the siphonal canal; ABP: abapertural primary cord on the siphonal canal; abs: abapertural secondary cord on the siphonal canal; EAB1, EAB2 and EAB3: distal primary cords on the siphonal canal.

Aperture

D1 to D6: abapical denticles;

ID: infrasutural denticle.

LT: labral tooth.

SYSTEMATICS

Family **MURICIDAE** Rafinesque, 1815

Subfamily **MURICINAE** Rafinesque, 1815

Genus ***Murex*** Linnaeus, 1758

Subgenus ***Murex (Murex)*** Rafinesque, 1815

Type species: *Murex pecten* [Lightfoot], 1786. . Indo-West Pacific.

***Murex (Murex) heros* Fulton, 1936**

Pl. 2, Figs G–L

Murex heros Fulton, 1936: 2, pl. 2, fig. 1.

Murex heros —Fair, 1976: 48, fig. 27; Cernohorsky, 1978: 64, pl. 17, fig. 8.

Murex troscheli troscheli Lischke, 1868 —Ponder & Vokes, 1988: 29, fig. 14, 82B.

Murex (Murex) troscheli heros —Merle *et al.*, 2011: 59, pl. 3, fig 6.

Type material. Holotype NHMUK 1936.5.26.1, 186.5 mm.

Type locality. Habitat unknown.

Distribution. Solomon Islands and Papua New Guinea.

Remarks. According to Fulton (1936), the type locality of the large holotype of *Murex heros* deposited at NHMUK was unknown (Pl. 2, Figs G–H). Several specimens were subsequently collected in the Solomon Islands and Papua New

Guinea. Fair (1976) repeats Fulton's description and places this species in Japan with a question mark. Cernohorsky (1978: 64, pl. 17, fig. 8) located this species on Great Barrier Reef, without, however, providing illustrations of specimens from this locality, which remains doubtful, the single specimen illustrated being the holotype. Afterwards, the identity of this species has often been contested. Radwin & D'Attilio (1976) synonymised *M. heros* with *M. troscheli*. Ponder & Vokes (1988) illustrated the holotype (p. 31, fig. 14) and a specimen from the Solomon Islands (AMS C. 36392, fig. 82B). They mentioned it as a geographic subspecies of *M. troscheli* that would require more material and data to have a more precise idea. Merle *et al.* (2011) made it a subspecies of *M. troscheli*. Houart (2014) expressed doubts about the validity of this species.

To separate *Murex heros* from *M. troscheli*, we first need to go back to Fulton's description: "*This giant of this group is allied to troscheli Lischke, but is more solid and readily separated by its much more numerous and finer spirals. The varices are not in a straight axial line but are nearer so than in troscheli*". Other differential characteristics should also be taken into account as the thickness and the stronger varices which are more abaperturally excavated. Other consequence of the thickness of the varices is that the outer lip of the aperture is significantly wider and as Fulton explained, the varices, instead of appearing to be aligned axially as in *M. troscheli*, are offset from one another. Moreover, the varical spines of *M. heros* are shorter, straighter and broader, which, together with an adapertural wider siphonal canal, give the shell a triangular appearance. *Murex heros*' spiral sculpture is also characterized by thin, granulose cords dotted with brown spots (Pl. 2, Fig. L) which distinguishes it from that of *M. troscheli*, whose the crest of spiral cords are uniformly uninterrupted reddish brown (Pl. 2, Fig. Q). The background colour of *M. heros* is creamy yellow, lighter than that of *M. troscheli* which is rather light tan.

Overall, *Murex heros* differs from *M. troscheli* in having a heavier shell, thicker and excavated varices, non-aligned varices, shorter and stronger spines as well as dotted spiral cords. As things stand at present, and in the absence of molecular sequencing, the sum of all these differential characteristics, combined with a different geographical distribution and the absence of intermediate forms suggests that *M. heros* and *M. troscheli* are two different valid species.

***Murex (Murex) maresinensis* n. sp.**

Pl. 1, Figs A–M; Pl. 2, Figs A–F

Murex (Murex) troscheli heros Fulton, 1936 —Merle *et al.* (2011): 59, pl. 3, figs 4,5 & 7.

Murex (Murex) troscheli Lischke, 1968 —Houart (2014), pl. 18, figs D–F (only).

Type material. Holotype (MNHN-IM-2000-40127), East China Sea, 100 m deep, (ex CBG), 134.2 mm; paratype (MNHN-IM-2000-40128), East China Sea, 100 m deep, (ex CBG), juvenile, 67.8 m; three paratypes CBG, two paratypes CRH, 131.7 and 147 mm.

Type locality. East China Sea, trawled about 100 m deep.

Other material. Three specimens from East China Sea.

Distribution. East China Sea, Taiwan, in 100–180 m.

Description of the holotype. Robust shell with fusiform teleoconch of eight whorls, 134.2 mm in length and 72 mm in width including P1 spines. Bulbous, smooth and convex protoconch of two whorls, ending in a sinusigeral scar (Pl. 1, Figs E, J; Pl. 2, Fig. E). Low spire. Apical angle 74°. Suture very impressed. Subsutural ramp convex.

Shell background beige. Spiral cord light orange-brown. Aperture white.

Axial sculpture on first teleoconch whorl of 12 rounded ribs, on second whorl of 12 rounded ribs, two of which with short spinelet at the shoulder, on third and fourth whorls appearance of three varices spaced by two intervarices, on fifth and sixth whorls three varices spaced by three intervarices, on seventh whorl three varices spaced by 7 intervarical ridges and on the last whorl intervarical axial ridges increasing in number. Spiral sculpture with primary, secondary and tertiary cords: on the subsutural ramp adis, IP and abis; on the convex part of the whorl, well-expressed P1, P3 and P5 with strong spines adapically curved, P1 more developed with intervarical nodules more important, P2 atrophied, P4 and P6 intermediate, secondary spiral cords produced into closed spines shorter than those of major cords and adaperturally curved, shorter tertiary spines; on the siphonal canal ADP, MP, ABP, EAB1, EAB2 and EAB3 with long spines adaperturally curved alternating with secondary cords spines directed at about 45° to primary spines. Aperture ovate. Columellar lip smooth and partially erect widening into a moderate-sized inductura. Anal notch shallow. Strong crenulations at edge of outer lip. Flat labral tooth between P4 and P5. Inner side of outer lip excavated and dotted with brown spots. Siphonal canal long, straight, recurved at distal end and spinose for almost entire length. Microsculpture formed by intersection of primary, secondary and tertiary cords with numerous intervarical axial ridges producing an appearance of thin granulous cords dotted with brown spots. Dark brown operculum with apical nucleus.

The adult size of *Murex (Murex) maresinensis* n. sp. varies from 113 to 170 mm. The spines may be shorter on the penultimate whorls as in a juvenile specimen (Pl. 1, Fig. L–M). The inductura is not necessarily as developed as in the holotype.

Remarks. *Murex (Murex) maresinensis* n. sp. has already been confused with two species occurring in more southerly areas: *M. heros* and *M. troscheli*.

Murex (Murex) maresinensis n. sp. is very close to these species but is easily distinguished by a different protoconch. A protoconch with about two bulbous, smooth, glossy and convex whorls of *M. maresinensis* n. sp. (Pl. 1, Figs E, J; Pl. 2, Fig. F) differs from the conical protoconch of about three whorls of *M. heros* (Pl. 2, Fig. K) and *M. troscheli* (Pl. 2, Fig. R–S). The very first whorls of their teleoconch are also different. In *M. maresinensis* n. sp. the first whorl have 12 rounded ribs without spinelet at the shoulder whereas the other two species have 7–9 sharply angulate ribs with short P1 spine (compare Pl. 2, Fig. F, K, S). Moreover *Murex (Murex) maresinensis* n. sp. can be distinguished from *M. heros* by its lower spire, a stockier shape and longer spines.

Compared to *Murex troscheli*, *M. maresinensis* n. sp. has a lower spire, a heavier shell, thicker and excavated varices, stronger spines and broader siphonal canal. Unlike *M. troscheli*, the varices of *M. maresinensis* n. sp. are not in a straight axial line, but are offset from one another. Furthermore in *M. maresinensis* n. sp. the spiral cords are dotted with brown spots which also helps to distinguish it from *M. troscheli* whose spiral cord crest is uniformly brown (Pl. 2, Fig. Q).

Etymology. From the Latin *mare sinensis*: China Sea.

Genus ***Chicoreus*** Montfort, 1810

Subgenus ***Chicoreus*** Montfort, 1810

Type species by original designation: *Murex ramosus* Linnaeus, 1758. Indo-West Pacific.

Chicoreus (Chicoreus) major n. sp.

Pl. 3, Figs A–O

Chicoreus (s.s.) asianus Kuroda, 1942 —Merle *et al.* (2011): Pl. 45, Fig. 9.

Type material. Holotype (MNHN-IM-2000-40129), (ex CBG), 119.3 mm; one paratype (MNHN-IM-2000-40130), 83.8 mm; one paratype CBG, 112.9 mm; two paratypes CRH, 120 mm and 73 mm.

Type locality. South Taiwan Strait, Dongshan Isl., Fujian, China, trawled on gravel and sand bottom at 80 m deep.

Distribution. Taiwan Strait in 40–80 m.

Description of the holotype. Biconic, large-sized and robust shell of seven teleoconch whorls, 119.3 mm in length and 80.5 mm in width. Eroded protoconch. High spire. Apical angle 53°. Shouldered and spinose whorls. Suture impressed. Subsutural ramp weakly sloping and slightly convex.

Shell background and aperture white. Brown spiral bands of varying thickness on the crest of the spiral cords. Intervarical nodes darker.

Axial sculpture consisting of three spiny, frondose varices and nodose intervarical ribs. On the first whorls of the teleoconch: three varices and two medium size intervarical ribs; on the last whorl: three varices and one prominent intervarical node (Pl. 3, Fig. D). Spiral sculpture of the subsutural ramp consisting of poorly developed IP; on convex part of whorl of well-expressed P1, P3, P4, P5 and P6 with strong open, foliated, abaperturally curved spines, P2 atrophied and equivalent in size to s3; on siphonal canal ADP, MP and ABP with long hooked spine in ADP, ABP obsolete. Large and rounded aperture, 32 % of teleoconch length. Columellar lip adherent, narrow, smooth. Anal notch deep. Parietal callus well developed. Flared outer lip. Strong crenulations at edge of outer lip. Prominent labral tooth between P4 and P5 (Pl. 3, Fig. E). Pseudoumbilicus moderately broad. Short and broad siphonal canal, strongly curved dorsally. Microsculpture of numerous threads.

Remarks. The *Chicoreus (Chicoreus)* subgenus includes trivariolate and biconic species with frondose varices, often large in size, without columellar ornamentation and with a labral

tooth [Houart (1992)]. Progressive atrophy of P2 is observed during growth [Merle (2001)]. *C. (C.) major* n. sp. has all these characteristics.

Of the specimens examined, only one (paratype CBG) has four varices on the last whorl of the teleoconch (Pl. 3, Fig. G–I). The preceding whorls are classically trivariolate. The operculum preserved in one specimen show an apical nucleus (Pl. 3, Fig. J). *Chicoreus (Chicoreus) major* n. sp. should first be compared to a closely related species occurring in the same or adjacent geographical areas: *C. (C.) asianus* Kuroda, 1942 (Pl. 4, Figs A–F). This species lives from Japan, Boso Peninsula as northern limit, southern Korea, eastern China Sea to Vietnam, in 5 to 72 m. *Chicoreus (C.) major* n. sp. differs by a more solid shape, shorter spines, higher spire and shorter, wider siphonal canal. Its aperture is proportionally larger and abapically offset. In *C. (C.) major* n. sp. there is only one large intervarical nodule instead of two small, inconspicuous nodules in *C. (C.) asianus*. Moreover *C. (C.) major* n. sp. is darker coloured.

As mentioned above, the presence of four varices on the last whorl of the teleoconch in one specimen of *C. (C.) major* n. sp. is reminiscent of a species occurring in the Nha Trang region (Vietnam) between 20 and 50 m deep: *C. (C.) exuberans* Cossignani, 2004. This large species also has a labral tooth and usually four varices on its last whorl (Pl. 4, Figs G–J). The number of varices of some *C. (C.) exuberans* specimens since the first whorls of the teleoconch can be totally anarchic and may reach a number of five even six (Pl. 4, Figs K–M). The intervarical ribs disappear when replaced by varices (Pl. 4, Fig. M). It should be noted that this arrangement of varices, combined with the labral tooth and the P2 atrophy, is reminiscent of certain forms of *Hexaplex (Hexaplex) cichoreum* (Gmelin, 1791). Moreover the labral tooth and P2 atrophy are derived character shared by *Chicoreus (Chicoreus)* and *Hexaplex (Hexaplex)* [Merle *et al.* (2011)].

Chicoreus (Chicoreus) major n. sp. differs from *C. (C.) exuberans* by a less biconical shape, a higher spire, a shorter, wider siphonal canal and shorter shoulder spines adapically curved. However, in most cases *C. (C.) major* n. sp. has three varices and a large intervarical node. In addition its background color is much darker.

Etymology. From the Latin *major*: tall and imposing.

Genus ***Calotrophon*** Hertlein & Strong, 1951

Subgenus ***Panamurex*** Woodring, 1959

Type species by original designation: *Murex gatunensis* Brown & Pilsbry, 1911, Pliocene, Gatun Formation, Panama.

Calotrophon (Panamurex) delicatus n. sp.

Pl. 5, Figs A–I

Calotrophon (Panamurex) sp.—Merle *et al.* (2011), pl. 149, figs 8–9.

Type material. Holotype (MNHN-IM-2000-40131) (ex CBG), Roatan Isl., Honduras, dredged at 250 m deep, paratype CBG, Panama (Atlantic coast), dredged at 200 m deep.

Type locality. Roatan Isl., Honduras, 250 m deep.

Distribution. Roatan Isl., Honduras, Atlantic coast of Panama

in 200–250 m.

Description. Biconic shell, small for the genus, up to 11.5 mm in length and 8.2 mm in width including P1 spines. Bulbous protoconch of 1.5 whorl. Teleoconch of 5 shouldered and spinose whorls. Suture standard. Conical spire. Apical angle 52°. Slightly convex subsutural ramp.

Shell background and aperture cream to light tan. Darker spiral strip near the suture and between P3 and P4.

Axial sculpture consisting of 10 varices from first to penultimate teleoconch whorl and of 6 varices on last whorl. Strong, slightly adapically oriented shoulder spine appearing from third whorl. Spiral sculpture of primary and secondary cords: IP on subsutural ramp; P1, s1, P2, P3, P4, P5 and P6 on convex part of whorl, relief of s1 equal to that of P1 and P2; ADP little expressed and MP larger with short cord spine on siphonal canal. Deltoidal aperture forming a small angulation opposite shoulder spine. Slightly and partially erect columellar lip. Sharp, erect and crenulate outer lip. Inner side of outer lip lirate. Wide, straight and short siphonal canal. Wide pseudoumbilicus. Operculum unknown.

Remarks. The second known specimen of this species (paratype BG, Pl. 5, Fig. G–I) collected on the Atlantic coast of Panama is 9.1 mm in length and 6.7 mm in width. Its structure is entirely similar to that of the holotype.

Based on the morphology of the teleoconch, Vokes (1992) and Merle *et al.* (2011) considered three species group of *Panamurex*, mostly represented by extinct species:

- 1- The species group of *Calotrophon* (*Panamurex*) *gatonensis* (Brown & Pilsbry, 1911), with a strong labral tooth and no spines encircling the siphonal canal.
- 2 – The species group of *Calotrophon* (*Panamurex*) *fusinoides* (Gardner, 1947) †, without labral tooth but with a row of cord spines encircling the siphonal canal.
- 3 – The species group of *Calotrophon* (*Panamurex*) *velero* (Vokes, 1970), less ornamented, without labral tooth or spines encircling the siphonal canal.

Due to its morphological characteristics, *Calotrophon* (*Panamurex*) *delicatus* n. sp. belongs to the second group. The new species is closely related to some extinct species. Among these species, we would particularly like to highlight the oldest known species of *Panamurex*: *C. (P.) turbinelloides* (Grateloup, 1833) † from the Early Miocene of France (Pl. 5, Fig. P–Q) [Vokes (1992)] as well as *C. (P.) gibsonsmithi* (Vokes, 1992) † from the Early Miocene of Venezuela (Pl. 5, Fig. O).

Compared to *C. (P.) turbinelloides*, *C. (P.) delicatus* n. sp. has a wider, biconical shape, a shorter siphonal canal and longer shoulder spines that are more perpendicular to the shell axis. *Calotrophon* (*Panamurex*) *delicatus* n. sp. differs from *C. (P.) gibsonsmithi* by its smaller aperture, its wider columellar lip without rugae and by a non-flaring outer lip with a closed inner side, not opening into the shoulder spine.

The only extant species in this group is *Calotrophon* (*Panamurex*) *carnicolor* (Clench & Pérez Farfante, 1945), known from Lesser Antilles between 130 and 300 m deep (Pl. 5, Figs J–N). This species was described on the basis of a juvenile shell

from Barbados, in the Lesser Antilles, collected by the *Blake* at a depth of 185 m. More recently, adult specimens were collected in Guadeloupe by D. Lamy between 130 and 300 m deep. Their thin, rather fusiform shells are very spinose, with a long siphonal canal ornamented with a strong, hooked spine. They range from 40 to 60 mm in size (Pl. 5, Fig. J–K). Apart from an important difference in size, *C. (P.) delicatus* n. sp. differs from this species in having a wider biconical shape with a lower spire, more rounded varices and an oval, less circular aperture. The siphonal canal of *C. (P.) delicatus* n. sp. is distinctly shorter with a row of much shorter, incurved spines encircling the siphonal canal.

Etymology. From the Latin *delicatus*: delicate, cute.

Subfamily **ASPELLINAE** Keen, 1971

Genus ***Aspella*** Mörch, 1857

Type species by monotypy: *Ranella anceps* Lamarck, 1822, Mediterranean.

Aspella fernandi n. sp.

Pl. 6, figs A–F, J–L

Type material. Dredged at 80 m, in dead coral, Brazil, holotype IRSNB I.G.34981/MT.4262 (ex CRH); East Panama, paratype CRH.

Type locality. Dredged at 80 m, in dead coral, off Brazil (no other data available).

Distribution. Currently only known from the type material, East Panama and off Brazil.

Description. Shell small for the genus, up to 7.6 mm in length (holotype). Length/width ratio 1.5. Lanceolate, biconical, flattened, broad. Subsutural ramp narrow, strongly sloping, convex.

Shell entirely covered by white intritacalx; aperture glossy white.

Intritacalx consisting of very narrow, overlapping axial bands, topped with numerous, narrow striae (Pl. 6 fig. F). Spire high, acute, with 3–3.15 protoconch whorls and teleoconch of 4 broad, strongly ventrally and dorsally flattened, shouldered whorls. Suture of whorls deeply impressed. Protoconch small, conical, acute, acuminate, smooth. Maximum width 600 µm, length 900 µm; terminal lip thin strongly curved, of sinusigera type, partially obscured by narrow first varix of second teleoconch whorl.

Axial sculpture of teleoconch whorls consisting of high, narrow, rounded varices, first and second whorls with 6 varices, 4 varices from third to last whorl, with ventral and dorsal varices reduced to intervarical nodes (Pl. 6, Fig. D) connected to previous whorl by broad, high, buttress. Lateral varices, narrow, high. Spiral sculpture of flat, low, broad, primary and secondary cords, occasionally visible under the intritacalx. Ontogeny unknown but last whorl probably with P1–P6, s6.

Aperture small, ovate, smooth within. Columellar lip narrow, smooth, very weakly erect abapically. Outer lip low, smooth. Siphonal canal short, 17–19% of total shell length, weakly

dorsally recurved, narrowly open ventrally. Operculum unknown.

Remarks. Three *Aspella* species live along the Brazilian coast, *Aspella castor* Radwin & D'Attilio, 1976 (Pl. 6, Figs G, M–P), was described from Puerto Rico and the Virgin Islands. Other specimens are also known from Andres in the Dominican Republic (CRH) and from Esperito Santo, Brazil (CBG); *A. cryptica* Radwin & D'Attilio, 1976 (Pl. 6, Figs H, Q–T) and *A. morchi* Radwin & D'Attilio, 1976 (Pl. 6, Figs I, U–X), both known from northeastern Brazil.

A fourth species, *A. senex* Dall, 1903 is also present in the western Atlantic, where it lives from the Gulf of Mexico, near the coast of Florida and in North Carolina, but has not yet been reported farther south and don't need to be compared here. *Aspella fernandi* n. sp. differs from these species in having broader and flatter teleoconch whorls, a conical, multispiral protoconch denoting a planktotrophic larval development as opposed to a rounded, globose, paucipiral protoconch in the other three species and in having a different intritacalx.

The intritacalx, a chalky layer with a typical microsculpture pattern, deposited on the shell by the animal during shell formation, is a common character in all species of *Aspella* and a few other muricid genera such as *Dermomurex* (D'Attilio & Radwin, 1971). The very distinctive morphology of this intritacalx is a useful tool for species identification.

Compared to the new species, *Aspella castor* has a thick intritacalx, consisting of axial narrow bands, separated with moderately deep grooves (Pl. 6, Fig. G). There are also numerous axial microscopic tubes but which are only visible under high magnification.

In *A. cryptica* the intritacalx consists of numerous, narrow, rounded axial bands, fine axial striae and numerous, shallow, spiral lines (Pl. 6, Fig. H).

The shell morphology of *A. morchi* differs by the presence of small rounded nodes at the intersection of the low axial ribs with four low, narrow primary spiral cords. The intritacalx also covers these small pustules and consist of narrow, axial bands connected with small axial tubes, giving a cancellate appearance to the texture (Pl. 6, Fig. I).

Etymology. Named for Fernand De Donder, Peutie-Vilvoorde, Belgium, who, with his wife Rika, has provided the second author with many species for identification and/or for his collection. These little *Aspella* species are among them, and are the subject of an anecdote that they never hesitate to remind him of with a big smile.

Genus *Murexsul* Iredale, 1915

Type species by original designation: *Murex octogonus* Quoy & Gaimard, 1833, New Zealand.

Murexsul falsomarianae n. sp.

Pl. 7, Fig. A–H

Type material. Abu Ramada, Hurghada, Egypt, at 18–22 m, under ledges of reef, 2008, ad, holotype MSF-mx1783 (ex CFL); one paratype subad, CRH (ex CFL)

Type locality. Abu Ramada. Hurghada, Egypt, at 18–22 m, under ledges of reef.

Distribution. Currently only known from the type locality.

Description. Shell small for the genus, up to 8.4 mm in length (holotype), biconical, broad, spinose, lightly built. Length/width ratio 1.7. Subsutural ramp narrow, strongly sloping, weakly convex.

Shell light orange with lighter coloured axial varices and base of siphonal canal. Aperture light orange within, with creamy white edge of columellar lip. Protoconch whitish.

Spire high with 1.5 protoconch whorls and teleoconch of 5 broad, strongly shouldered, spinose whorls. Suture of whorls impressed. Protoconch small, whorls rounded, smooth. Terminal lip delicate thin, raised, strongly curved.

Axial sculpture of teleoconch whorls consisting of high, narrow, rounded, spinose varices, each varix with short, blunt, narrow, open primary spines of approximately similar strength and length and very small occasional spinelets. First teleoconch whorl with 5 varices, second with 6 or 7, third and fourth with 7 and last whorl with 5 varices. Spiral sculpture of moderately high, rounded, narrow, nodose primary cords and very narrow, weak, secondary cords. P1–P3 visible on first whorl P1 broad, P2 and P3 narrow, second and third whorls with visible, broader P1, and narrower P2 or P2 and P3, fourth whorl starting narrow secondary cords, P2 and P3 becoming broader. All primary cords reaching a similar strength and size on last teleoconch whorl, consisting of adis, IP, abis, P1, s1, P2, s2, P3, s3, P4, P5 and very narrow P6, ADP broad on siphonal canal.

Aperture small, ovate. Columellar lip broad, strongly flaring, smooth, rim partially erect, a small portion adherent at adapical extremity. Anal notch shallow, broad. Outer lip narrow, weakly erect, crenulated, with low, narrow denticles within: ID and D1 very low, followed by D2, D3, D4 and D5 (holotype), shell not reached adult stage in paratype. Siphonal canal moderately long, narrow, strongly dorsally recurved, narrowly open ventrally, with ADP at base.

Operculum unknown.

Remarks. *Murexsul falsomarianae* n. sp. resembles *M. marianae* (Houart, 2003) (Pl. 7, Figs I–L), a species occurring from South Africa to south Mozambique and south Madagascar, but the new species differs in having a comparatively smaller shell in relation to the number of teleoconch whorls, an obviously smaller protoconch and the ABP spiral cord located much closer to the P6 cord than in *F. marianae*.

Murexsul falsomarianae n. sp. also somewhat resembles *Favartia roseotincta* Houart & Gori, 2011 from Oman (Pl. 7, Figs M–P) but it differs constantly in having a rounded protoconch as opposed to a narrow, weakly shouldered, small, elongate one

in *F. roseotincta*. It also differs in having broader teleoconch whorls and obvious primary and secondary cords on the subsutural area while this area is often smooth in *F. roseotincta*, rarely with a shallow IP cord. As far as we know, *F. roseotincta* is endemic to Oman.

Etymology. *Falso* (L): False, named for its resemblance to the East African *Murexsul marianae*.

Genus *Favartia* Jousseaume, 1880

Type species by original designation: *Murex breviculus* G. B. Sowerby II, 1834, Indo-West Pacific.

Favartia lorenzi n. sp.

Pl. 8, Figs A–H

Type material. Umm Gamar, Egypt, at 60–80 m, under ledges of reef, 2008, holotype MSF-mx1784, ad, lv; one paratype MSF mx-1785, dd, juv; one paratype CFL, dd, ad; one paratype CRH, lv, subad, (all ex CFL).

Type locality. Umm Gamar, Egypt, at 60–80 m, under ledges of reef.

Distribution. Currently only known from the type locality.

Description. Shell small for the genus, up to 11.1 mm in length (holotype, protoconch missing). Length/width ratio 1.7. Lanceolate, broad, heavy, weakly spinose, squamous. Subsutural ramp narrow, strongly sloping, weakly concave. Shell entirely white. Aperture glossy white.

Spire high with 1.15 protoconch whorls and teleoconch of 5 broad, weakly shouldered, spinose whorls. Suture of whorls impressed. Protoconch small, whorls rounded, smooth. Maximum width 600 µm, height 500 µm. Terminal lip unknown (eroded).

Axial sculpture of teleoconch whorls consisting of high, strong, broad, rounded varices with very short, broad, blunt, open primary spines. Other axial sculpture of low growth lamellae. First teleoconch whorl with 6 varices, second with 7 or 8, third and fourth with 7 and last whorl with 5 varices. Spiral sculpture of high, strong, rounded, narrow, grooved primary cords and narrow secondary cords. First whorl with visible P1 and P2, second and third with IP, P1 and P2, fourth with adis, IP, abis, P1, s1, P2 and P3 partially covered by last whorl. Last whorl with adis, IP, abis, (t), P1, s1, P2, (s2), P3, s3, P4, P5, s5, P6, (s6) and ADP; P6 cord very narrow and spine very small.

Aperture moderately large, ovate. Columellar lip narrow, strongly flaring, with small denticles abapically, rim partially erect, a small portion adherent at adapical extremity. Anal notch shallow, broad. Outer lip broad, weakly erect, crenulated, with 7 weak and strong, low, narrow denticles within: ID low, broad, D1–D6 increasing in size abapically. Siphonal canal short, narrow, dorsally recurved, narrowly ventrally open, with ADP cord and spinelet at base.

Operculum unknown.

Remarks. Taking into account the overall shell morphology, the small size and shape of the protoconch and its few number of whorls, this species differs strongly from any of the other Indo-Pacific *Favartia* species.

The shell of *Favartia lorenzi* n. sp. remind us two species, *F. salmonea* (Melvill & Standen, 1899) (Pl. 8, figs I–L) (= *Favartia dorotheae* W. K. Emerson & D'Attilio, 1979) known from throughout the Indo-Pacific and *F. maculata* (Reeve, 1845) (Pl. 8, Figs M–O) from the western Indian Ocean. However, both species have a planktotrophic larval development, as can be seen from their conical, multispiral, protoconch of sinusigera type (Pl. 8, Figs L & O), which is completely different from that of the new species.

The shell of *Favartia lorenzi* n.sp. differs also in having a usually broader aperture than *F. salmonea*. Otherwise the two shells look quite similar and without the presence of intact protoconchs in two specimens of the new species (paratype MSF and paratype CRH), it could have gone completely undetected.

Favartia maculata has a quite larger and broader shell but here too the protoconch is essential in distinguishing the two species, *F. maculata* also having a conical, multispiral protoconch.

Etymology. This species is named for Felix Lorenz who provided the type material.

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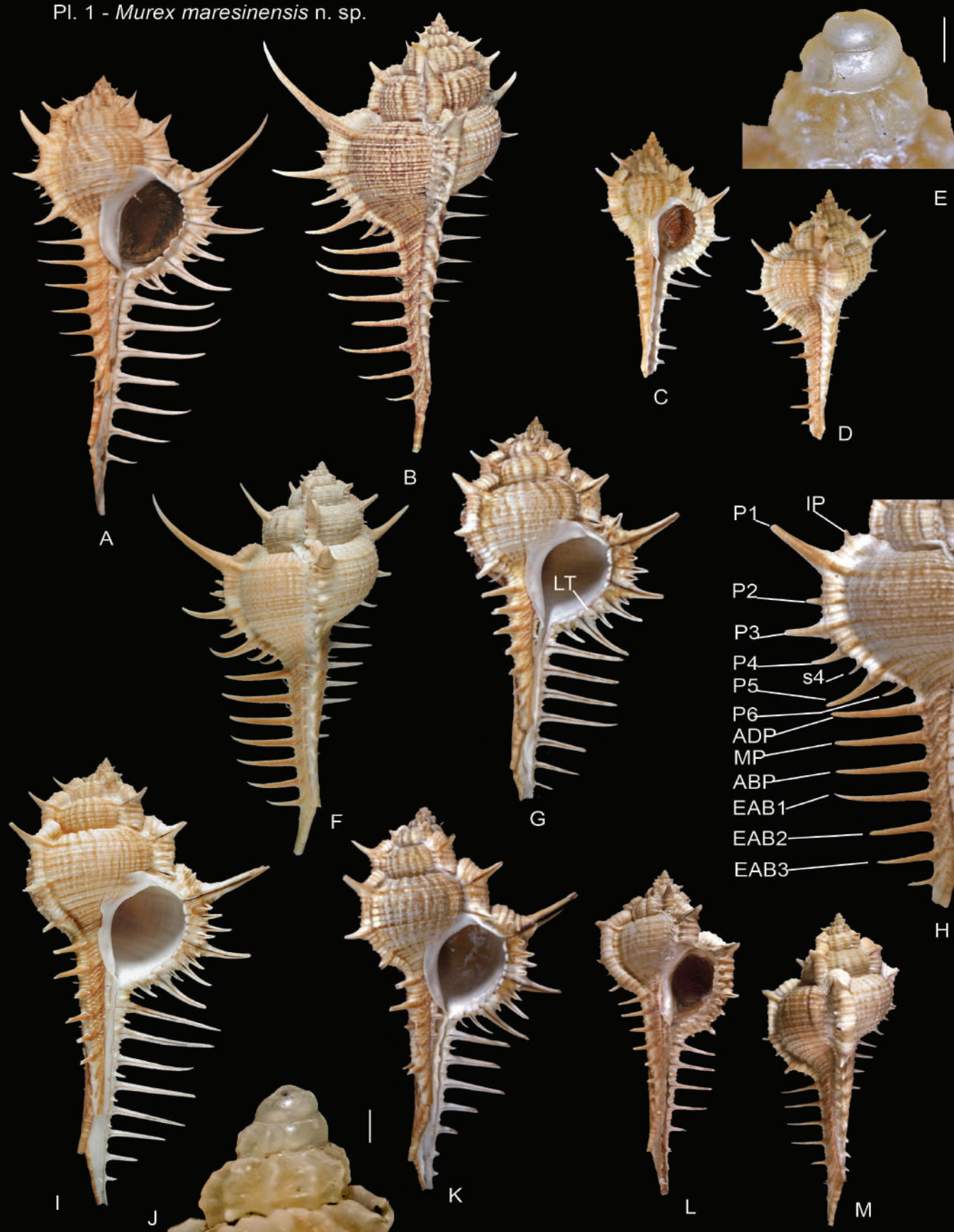
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Pl. 1 - *Murex maresinensis* n. sp.



A–M. *Murex (Murex) maresinensis* n. sp.

A–E. East China Sea, 100 m, A–B. Holotype (MNHN-IM-2000-40127), 134.2 mm; C–E. Paratype (MNHN-IM-2000-40128.), 67.8 mm, juv., with protoconch; F. Southwest Taiwan (paratype CRH), 131.7 mm.

G–H, K. Taiwan Strait, trawled about 100–180 m; G–H. Paratype CBG, 122 mm, with detail of microsculpture; K. (CBG), 118 mm.

I–J, L–M. East China Sea, 150 m, with protoconch; I–J. (paratype CRH), 147 mm; L–M. (paratype CBG), juv., 102.7 mm.

(scale bars 500 µm)

Pl. 2 - *Murex maresinensis* n. sp. / *M. heros* / *M. troscheli*



A–F. *Murex (Murex) maresinensis* n. sp.; A–B, E–F. East China Sea, 120 m, (CBG), 157 mm, with protoconch and detail of microsculpture; C–D. Paratype (MNHN-IM-2000-40128.), East China Sea, 100 m, juv., 67.8 mm.

G–L. *Murex heros* Fulton, 1936; G–H, L. Holotype (NHMUK 1936.5.26.1), 186.5 mm; L : detail of microsculpture ; I–K. Solomon Islands, (CRH), juv., H: 84.1 mm, with protoconch.

M–S. *Murex troscheli* Lischke, 1868; M. Philippines, (CBG), 144 mm; N, Q. Philippines, (CBG), 167 mm, with detail of the microsculpture; O–P. North of Taiwan, 10–20 m, (CBG), juv., 97 mm; R. Cebu, Philippines, (CRH), Protoconch; S. Philippines, (CBG), 143 mm, first whorls of teleoconch.

(scale bars E, K, Q: 500 µm; F, L, R: 10 mm)

Pl. 3 - *Chicoreus major* n. sp.

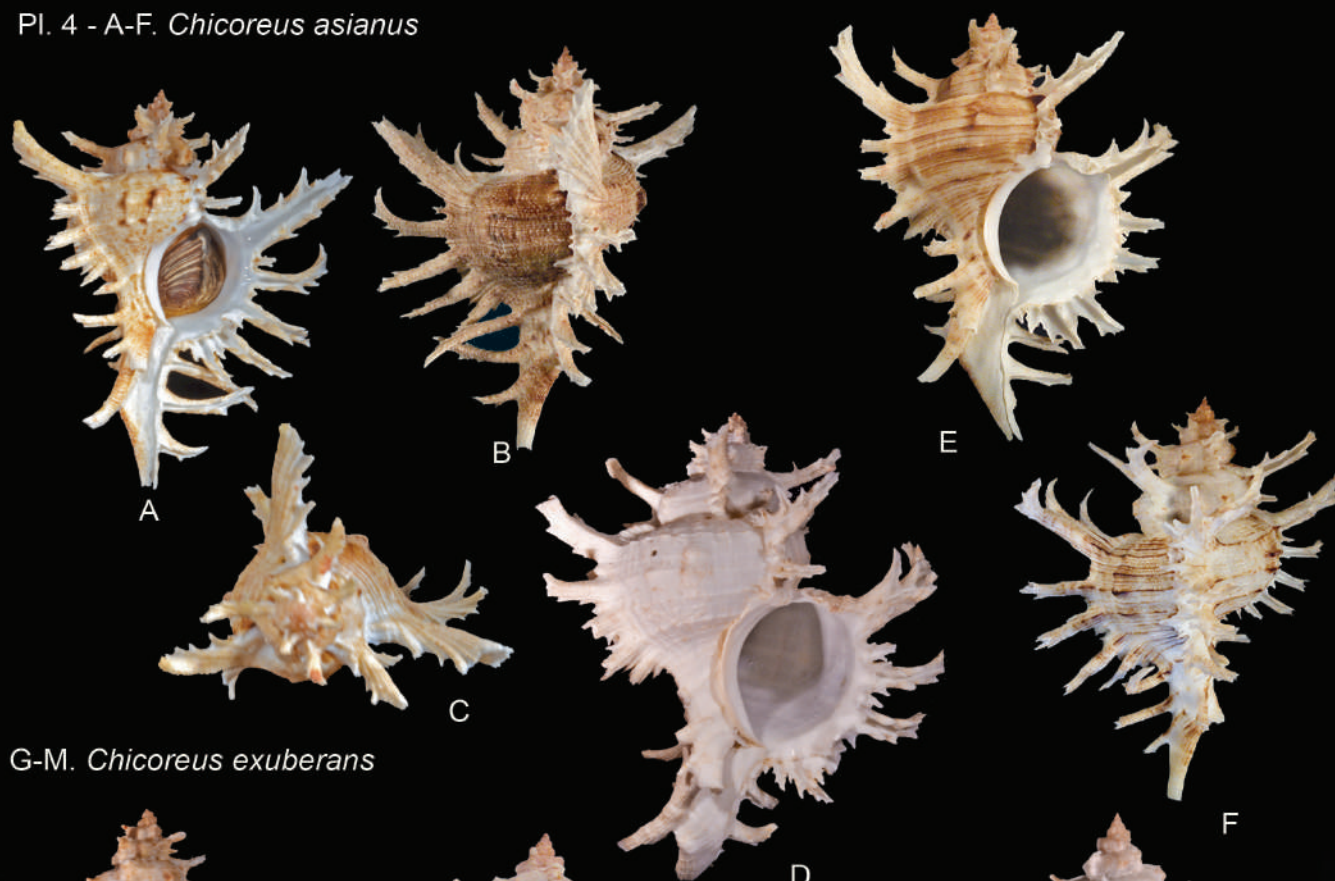


A-O. *Chicoreus(Chicoreus) major* n. sp.

A-I. South Taiwan Strait, Dongshan Isl., Fujian, China, 50–80 m; A–F. Holotype (MNHN-IM-2000-40129), 119.3 mm, with detail of labral tooth and spiral sculpture; G–I. Paratype CBG, 112.9 mm.

J–O. Taiwan Strait, 40 m; J–K. Paratype (MNHN-IM-2000-40130), 83.8 mm; L–M. Paratype CRH, 73 mm; N–O. Paratype CRH, 120 mm.

Pl. 4 - A-F. *Chicoreus asianus*



G-M. *Chicoreus exuberans*



A–F. *Chicoreus (Chicoreus) asianus* Kuroda, 1942.

A–C. Nada, Wakayama Prefecture, Japan, on rocky bottom between 36 and 72 m deep, CBG, 100.6 mm. D–F. Nha Trang, Vietnam, CBG; D. 124; E. 111.2 mm; F. 104.7 mm

G–M. *Chicoreus (Chicoreus) exuberans* Cossignani, 2004, Nha Trang, Vietnam, CBG. G. 84 mm; H–J. 122 mm; K–M. 103.3 mm.

Pl. 5 - *Calotrophon delicatus* n. sp.



A–I. *Calotrophon* (*Panamurex*) *delicatus* n. sp.

A–F. Holotype (MNHN-IM-2000-40131), Roatan Isl., Honduras, 250 m, 11.5 mm.

G–I. paratype CBG, Panama (Atlantic coast), 200 m, 9.1 mm.

J–N. *Calotrophon* (*Panamurex*) *carnicolor* (Clench & Perez Farfante, 1945).

J–K. Fajou Isl., Guadeloupe, 130 m, (CDL), 49.3 mm. L–N. Les Saintes, Guadeloupe, (CBG), 35 mm.

O. *Calotrophon* (*Panamurex*) *gibsonsmithi* (Vokes, 1992), holotype (NMB 17516), Cantaure Formatin, Paraguana Peninsula, Venezuela, 26.6 mm.

P–Q. *Calotrophon* (*Panamurex*) *turbinelloides* (Grateloup, 1833), Early Oligocene, Gaas, Ephibos, Aquitaine Bassin, France, MNHN, 14 mm.

(scale bar 500 µm)

Pl. 6 - *Aspella*



A–F, J–L. *Aspella fernandi* n. sp.

A–E. Dredged at 80 m, in dead coral, Brazil, holotype IRSNB I.G.34981/MT.4262 (ex CRH), 7.6 mm

F. Intritacalx; J–L. East Panama, paratype CRH, 8.2 mm.

G, M–P. *Aspella castor* Radwin & D'Attilio, 1976, Andres, Dominican Republic, under coral rubble, un 1.2–2.2 m, CRH, 10 mm; G. Intritacalx.

H, Q–T. *Aspella cryptica* Radwin & D'Attilio, 1976, Itapoan, Bahia, Brazil, rocks, low tide, CRH, 5.8 mm; H. Intritacalx.

I, U–X. *Aspella morchi* Radwin & D'Attilio, 1976, 20°32' S, 38°11' W, SE Brazil, 52 m, CRH, 7.6 mm; I. Intritacalx.

(scale bars, E, P, T, X: 500 µm; F–I: 200 µm)

Pl. 7 - *Murexsul* - *Favartia*



A–H. *Murexsul falsomarianae* n. sp. Abu Ramada, Hurghada, Egypt, at 18–22 m under ledges of reef, 2008.

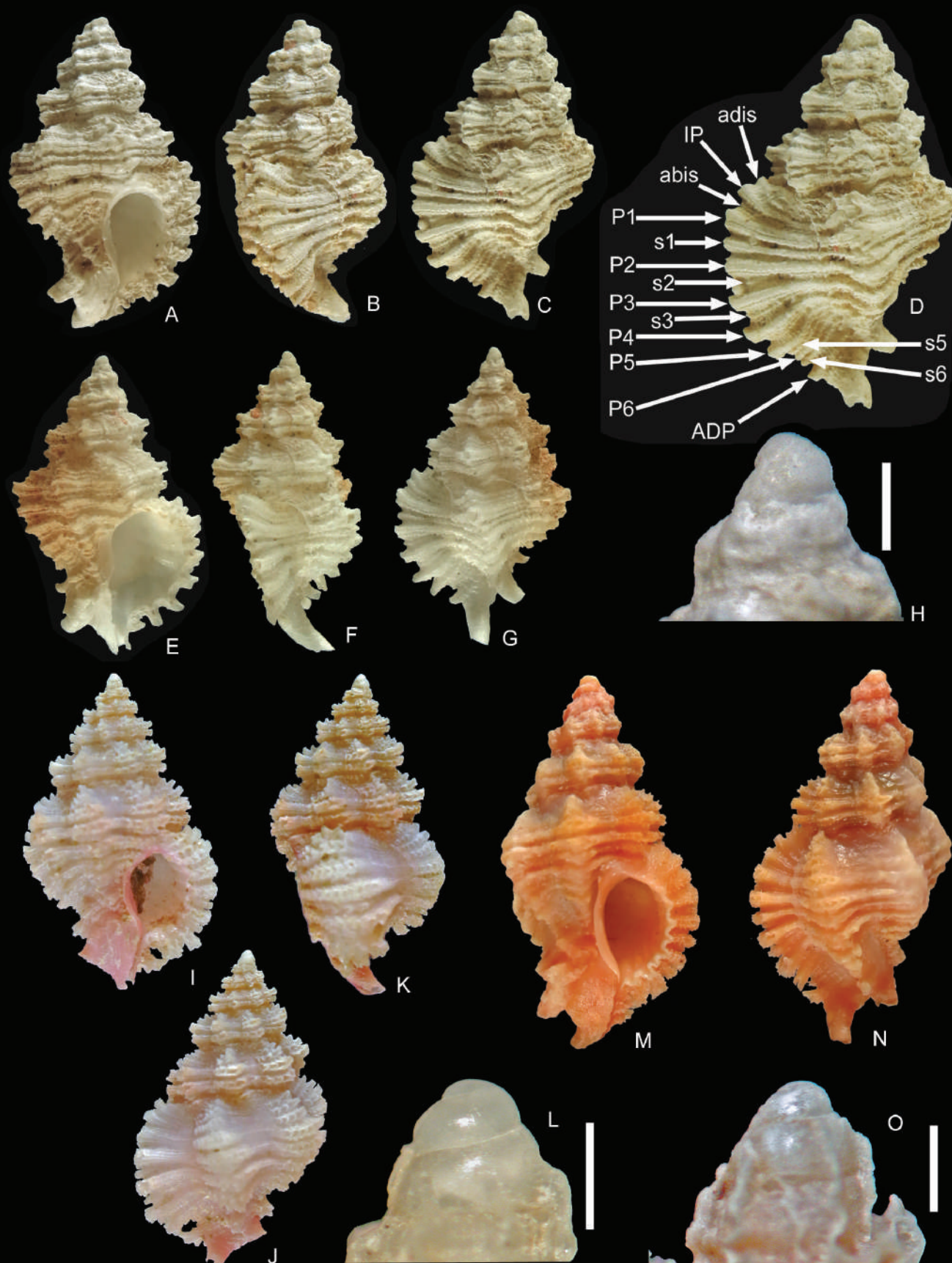
A–E. Holotype MSF - mx1783 (ex CFL), 8.4 mm; F–H. Paratype CRH (ex CFL), 7.5 mm; E. Protoconch.

I–L. *Murexsul marianae* (Houart, 2003), Zavora, north east of Maputo, Mozambique, in traps, 95–145 m, CRH, 9.3 mm; L. Protoconch.

M–P. *Favartia roseotincta* Houart & Gori, 2011, East Mirbat, Dhofar, Oman, 32–36 m, CRH, 8.4 mm; P. Protoconch.

(scale bars 500 μ m)

Pl. 8 - *Favartia*



A–H. *Favartia lorenzi* n. sp. Umm Gamar, Egypt, 60–85 m

A–D. Holotype MSF-mx1784 (ex CFL), 11.1 mm; E–H. Paratype CRH (ec CFL), 10.2 mm; H. Protoconch.

I–L. *Favartia salmonea* (Melvill & Standen, 1899), Sulu Sea, Philippines, CRH, 11.8 mm; L. Protoconch.

M–O. *Favartia maculata* (Reeve, 1845), Nacala, Mozambique, CRH, 21.2 mm; O. Protoconch.

(scale bars 500 µm)

CREPIATELLA DILATATA, A NEW SPECIES INTRODUCED IN FRANCE.

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RÉSUMÉ

Crepidatella dilatata (Lamarck, 1822) est une espèce de Calyptraeidae (Caenogastropoda) originaire des côtes de l'hémisphère sud, du Chili et de l'Argentine (Richter *et al.*, 2012). Elle a été introduite involontairement, en Galice, Espagne vers 2005 du fait de transferts de *Mytilus galloprovincialis* (Rolán *et al.*, 2005). Elle est signalée depuis dans d'autres zones de mytiliculture en Espagne, mais aussi au Portugal (Rubal *et al.*, 2023), et plus récemment en Italie (Salvi *et al.*, 2024).

Photographiée en avril 2023 sur des pierres rapportées par des pêcheurs professionnels travaillant en baie de Paimpol ou en Baie de Saint-Brieuc, l'espèce est bien présente actuellement dans le port de Pors-Even, à Ploubazlanec, dans les Côtes d'Armor. Après séquençage d'une douzaine d'individus, il est montré que l'espèce est bien *Crepidatella dilatata*, clade 2, lignée que l'on trouve en Galice et à Aveiro, au Portugal (Rubal *et al.*, 2023), mais avec une à deux substitutions par rapport aux séquençages faits dans ces deux régions.

On peut en conclure que la population bretonne de *Crepidatella dilatata* provient de la péninsule ibérique, très probablement du fait de transferts mytilicoles. L'élevage de moules sur bouchots est en effet important en baie de Saint-Brieuc et aux environs de Paimpol.

ABSTRACT

Crepidatella dilatata (Lamarck, 1822) is a species of Calyptraeidae (Caenogastropoda) native to the coasts of the southern hemisphere, Chile and Argentina (Richter *et al.*, 2012). It was unintentionally introduced into Spain, in Galicia around 2005 due to transfers of *Mytilus galloprovincialis* (Rolán *et al.*, 2005). It has since been reported in other mussel farming areas in Spain, but also in Portugal (Rubal *et al.*, 2023), and more recently in Italy (Salvi *et al.*, 2024).

Photographed in April 2023 on stones brought back by professional fishermen working in the Bay of Paimpol or the Bay of Saint-Brieuc, the species is currently present in the port of Pors-Even, in Ploubazlanec, in the Côtes d'Armor. After

sequencing a dozen individuals, it is shown that the species is indeed *Crepidatella dilatata*, clade 2, a lineage found in Galicia and Aveiro, Portugal (Rubal *et al.*, 2023), but with one or two substitutions compared to the sequencing carried out in these two regions.

We can conclude that the Breton population of *Crepidatella dilatata* comes from the Iberian Peninsula, most probably due to mussel farming transfers. The farming of mussels on bouchots is indeed important in the bay of Saint-Brieuc and around Paimpol.

INTRODUCTION

L'aquaculture moderne, avec des transferts réguliers d'animaux vivants entre zones conchylicoles est cause fréquente d'introductions involontaires d'autres organismes marins dans les zones concernées. Ces organismes s'adaptent souvent à leur nouveau milieu de vie et peuvent parfois devenir invasifs.

La mytiliculture et l'ostréiculture sont principalement concernées du fait de quantité importantes d'animaux déplacés.

Il existe sur les côtes du Chili trois espèces de *Crepidatella*, morphologiquement très similaires, tant par l'examen de la coquille que des parties molles. Seul le séquençage permet d'affirmer l'espèce (Collin *et al.*, 2009).

Crepidatella dilatata a été introduite vers 2005 en Galice, dans la Ria de Aldan, dans une zone mytilicole (Rolán *et al.*, 2005), puis dans la Ria de Pontevedra en 2008 (Collin *et al.*, 2009). Toujours en Galice, elle est trouvée dans la Ria de Vigo et la Ria de Arousa en 2009 (Fernández-Gutiérrez *et al.*, 2024) puis dans les Asturies, Espagne, près du port de Gijón en 2010 (Richter *et al.*, 2018) et (Salvi *et al.*, 2024), ceci près ou dans des zones de mytiliculture.

Toujours en Espagne, mais en Méditerranée, quelques exemplaires ont été découverts dans le delta de l'Ebro, dans une zone mytilicole, en 2014 (López Soriano *et al.*, 2014).

Au Portugal, l'espèce est retrouvée dans deux zones côtières au nord et au centre du pays, à Aveiro, où sa présence pourrait être liée à l'aquaculture et à Aguda, où sa présence est beaucoup plus énigmatique car le milieu est ouvert, sans aquaculture ni transport maritime (Rubal *et al.*, 2023).

En Italie, *Crepidatella dilatata* vient d'être signalée, en 2024, dans trois fermes mytilicoles, deux dans le nord de l'Adriatique et une dans l'est de la Sardaigne (Salvi *et al.*, 2024).

INTRODUCTION

Modern aquaculture, with regular transfers of live animals between shellfish farming areas, frequently causes unintentional introductions of other marine organisms into the affected regions. These organisms often adapt to their new environment and can sometimes become invasive. Mussel and oyster farming are particularly affected due to the large quantities of animals being moved.

On the Chilean coasts, there are three species of *Crepidatella*, morphologically very similar, both in shell structure and soft body examination. Only sequencing can confirm the species (Collin *et al.*, 2009). *Crepidatella dilatata* was introduced around 2005 in Spain, in Galicia, in the Ria de Aldán, in a mussel farming area (Rolán *et al.*, 2005), then in the Ria de Pontevedra in 2008 (Collin *et al.*, 2009). Still in Galicia, it was found in the Ria de Vigo and the Ria de Arousa in 2009 (Fernández-Gutiérrez *et al.*, 2024) and later in Asturias, near the port of Gijón in 2010 (Richter *et al.*, 2018; Salvi *et al.*, 2024), always near or within mussel farming areas. In Spain's Mediterranean region, a few specimens were discovered in the Ebro Delta, a mussel farming area, in 2014 (López Soriano *et al.*, 2014). In Portugal, the species was found in two coastal areas in the north and center of the country: in Aveiro, where its presence could be linked to aquaculture, and in Aguda, where its presence is more enigmatic since the area is open, without aquaculture or maritime transport (Rubal *et al.*, 2023). In Italy, *Crepidatella dilatata* was reported in 2024 in three mussel farms: two in the northern Adriatic and one in eastern Sardinia (Salvi *et al.*, 2024).

Habitat

L'espèce, pour se développer, préfère les milieux abrités mais supporte mal la désalinisation (Fernández-Gutiérrez *et al.*, 2024), elle est fréquente sur les estrans et en subtidal (Fernández-Gutiérrez *et al.*, 2024).

Elle se retrouve sur nombre de substrats durs : roches, coquillages vivants (moules, huîtres, ...) ou coquilles mortes. Elle peut aussi adhérer à des matériaux artificiels : matières plastiques, métaux, etc. (Rubal *et al.*, 2023) et (Fernández-Gutiérrez, 2024).

Habitat

The species prefers sheltered environments for development but poorly tolerates desalination (Fernández-Gutiérrez *et al.*, 2024). It is frequently found in intertidal and subtidal zones. It inhabits various hard substrates: rocks, live shells (mussels, oysters, etc.), or dead shells. It can also adhere to artificial materials such as plastics and metals (Rubal *et al.*, 2023; Fernández-Gutiérrez, 2024).

Reproduction

Les sexes sont séparés, avec pour un individu un stade juvénile, puis un stade mâle, puis un stade intersexué, puis un stade femelle (Richter *et al.*, 2018). Dans son aire de répartition naturelle, *Crepidatella dilatata* est plutôt solitaire ou forme des groupes de peu d'individus. En Espagne, l'espèce est le plus souvent grégaire, et Richter montre que le succès d'une invasion locale est fortement lié à la grégarité. La population bretonne a elle aussi, comme le montre la photo (Fig.1 Port de Pors-Even, avril 2023), une forte tendance à la grégarité.

A la différence de *Crepidula fornicata*, les larves de *Crepidatella dilatata* ne sont pas planctoniques mais lécithotrophiques (Richter *et al.*, 2018), (Fernández Gutiérrez *et al.*, 2024). Sa dispersion géographique naturelle est donc relativement lente, à moins que l'homme s'en charge par des transferts d'individus d'un lieu à un autre.

Reproduction

The sexes are separate, with individuals passing through a juvenile stage, a male stage, an intersex stage, and finally a female stage (Richter *et al.*, 2018). In its natural range, *Crepidatella dilatata* is mostly solitary or forms small groups. In Spain, the species is usually gregarious, and Richter shows that the success of a local invasion is strongly linked to gregariousness. The Breton population, as seen in photos (Fig.1 Port de Pors-Even, April 2023), also exhibits strong gregarious behavior.

Unlike *Crepidula fornicata*, *Crepidatella dilatata* larvae are not planktonic but lecithotrophic (Richter *et al.*, 2018; Fernández-Gutiérrez *et al.*, 2024). Therefore, its natural geographic dispersion is relatively slow unless assisted by human transfers.

MATÉRIEL ET MÉTHODE

La baie de Saint-Brieuc, située au nord de la Bretagne, constitue le second plus grand gisement français de coquilles Saint-Jacques (*Pecten maximus*). De nombreux pêcheurs professionnels opérant depuis le port de Pors-Even (quartier maritime de Paimpol) pratiquent principalement la pêche à la drague de ce bivalve durant la saison réglementaire, allant d'octobre à avril. Une activité secondaire, mais plus marginale, concerne également la pêche à la drague de la praire (*Venus verrucosa*).

La découverte de *Crepidatella dilatata*, un gastéropode non indigène, sur de grosses pierres rapportées au port de Pors-Even semble être liée à ces pratiques de pêche. Les premiers spécimens vivants ont été observés et photographiés en avril 2023 (Fig. 1), puis à nouveau en avril 2024 au même endroit (Fig. 2). La présence de juvéniles (environ 10 mm) collés sur les pierres ainsi que de pontes visibles sous des adultes décollés (Fig. 3) suggère une reproduction locale et une installation réussie dans cet environnement.

Des adultes prélevés ont été maintenus en aquarium pendant deux mois, ce qui a permis d'observer l'éclosion de 200 à 300 juvéniles (Fig. 4), confirmant la viabilité de l'espèce en conditions contrôlées.

En juillet 2024, un nouvel apport de pierres recouvertes de *C. dilatata* a été observé dans le port de Pors-Even (Fig. 5),

accompagné à nouveau d'un grand nombre de juvéniles et de pontes, y compris chez des individus de petite taille (14 à 16 mm), suggérant une maturité sexuelle précoce.

À cette période de l'année, la pêche à la coquille Saint-Jacques étant interdite, l'origine de ces nouveaux apports de *C. dilatata* semble distincte des zones habituelles de pêche de *P. maximus*. Les profondeurs de prélèvement dans la région varient de 10 à 40 mètres selon les espèces commerciales ciblées.

La coquille de *C. dilatata* est de forme circulaire, souvent ornée de rides sur le bord supérieur (Fig. 11), bien que des formes allongées soient également observées chez les individus jeunes ou de taille moyenne, rappelant *Crepidula fornicata*. Sa coloration est généralement rouge-rosé ou brun clair, avec fréquemment un sillon blanc en arc de cercle partant du sommet (Fig. 6), caractéristique également observée chez *C. fornicata*. Les juvéniles sont moins colorés, tendant vers le blanc (Fig. 7). L'intérieur de la coquille est blanc brillant, parfois nuancé de rose ou rouge foncé (Fig. 8), et le septum est blanc laiteux, bien distinct de celui de *C. fornicata* (Fig. 9).

Actuellement, la présence de *C. dilatata* en Bretagne nord n'est confirmée que dans le port de Pors-Even (Ploubazlanec). Un spécimen mort a été trouvé en baie de Paimpol dans d'anciens déchets ostréicoles (datant de plus de dix ans), mais aucun autre signalement n'a été fait à ce jour.

Des inventaires de mollusques récents menés depuis 2023 n'ont pas détecté la présence de cette espèce ailleurs :

- Mission ATLASea/DIVE-sea (23 juin – 7 juillet 2024) à la Station Biologique Marine de Dinard, dans le golfe Normano-Breton.
- Inventaires de l'estran en divers points des Côtes-d'Armor, réalisés par Florence Gully et Marc Cochu, créateurs du site « Estran22 ».
- Observations de l'Observatoire Breton des Changements sur l'Estran (OBCE), réunissant scientifiques et naturalistes lors de sorties régulières sur les estrans de Bretagne.

MATERIALS AND METHODS

The Bay of Saint-Brieuc, located in northern Brittany, is the second-largest French bed for the great scallop (*Pecten maximus*). Many professional fishers operating out of the port of Pors-Even (in the maritime district of Paimpol) primarily engage in dredge fishing for this bivalve during the regulated season, which extends from October to April. A smaller number of professionals also target the warty venus clam (*Venus verrucosa*) using similar dredging methods, although to a much lesser extent.

The discovery of *Crepidatella dilatata*, a non-native gastropod, on large stones brought into the port of Pors-Even is likely linked to these fishing activities. The first living specimens were observed and photographed in April 2023 (Fig. 1), and again at the same location in April 2024 (Fig. 2). The presence of juveniles (approximately 10 mm) attached to stones, as well as egg masses revealed beneath detached adult individuals (Fig. 3), strongly suggests local reproduction and successful

establishment of the species in this environment.

Some adult specimens were kept in aquaria for two months, during which time between 200 and 300 juveniles hatched (Fig. 4), confirming the species' ability to reproduce under controlled conditions.

In July 2024, several more stones covered with *C. dilatata* were brought into the port of Pors-Even (Fig. 5), again accompanied by numerous juveniles and egg masses. Notably, egg-laying was observed even in very small individuals (14–16 mm), indicating early reproductive maturity.

At this time of year, scallop fishing is prohibited, as is customary each season, suggesting that these new *C. dilatata* individuals may not originate from *Pecten maximus* fishing grounds. Fishing depths in the region vary from 10 to 40 meters depending on the commercial species being targeted.

The shell of *C. dilatata* is generally circular and often bears ridges on the upper margin (Fig. 11), though elongated forms resembling *Crepidula fornicata* are also observed, particularly among smaller individuals. Shell coloration is typically pinkish-red or light brown, frequently marked with a white, arc-shaped groove originating from the apex (Fig. 6)—a feature also common in *C. fornicata*. Juveniles tend to be paler, mostly white (Fig. 7). The shell interior is glossy white with occasional pink to dark red hues (Fig. 8), and the septum is consistently milky white and clearly distinct from that of *C. fornicata* (Fig. 9). To date, *C. dilatata* has only been confirmed in northern Brittany at the port of Pors-Even (Ploubazlanec). A single dead specimen was also found in the Bay of Paimpol among old oyster-farming debris (over ten years old), but no additional findings have been reported.

Several mollusk surveys conducted since 2023 have not detected the presence of this species elsewhere:

- In the Norman-Breton Gulf during the ATLASea/DIVE-sea mission held at the Marine Biological Station in Dinard from June 23 to July 7, 2024.
- At various locations along the Côtes-d'Armor by Florence Gully and Marc Cochu, creators of the «Estran22» website, which catalogs mollusk species found on the intertidal zone.
- By the Breton Observatory of Changes on the Shoreline (OBCE), composed of scientists, knowledgeable amateurs, and nature enthusiasts conducting regular field outings along the shores of Brittany.

Analyses moléculaires

Neuf individus collectés à Ploubazlanec et identifiés morphologiquement comme *Crepidatella dilatata* ont été séquencés pour le fragment du code-barres COI selon la procédure décrite dans Salvi *et al.* (2024). Toutes les nouvelles séquences COI générées étaient identiques, représentant le même haplotype (numéro d'accèsion PV231798). Nous avons comparé cet haplotype à la base de données des nucléotides NCBI en utilisant NCBI BLASTn pour effectuer une identification moléculaire au niveau de l'espèce. Les résultats des recherches BLASTn ont récupéré comme meilleur résultat des séquences assignées au clade 2 de *Crepidatella dilatata* (accessions OR689296 et AF546052) avec une identité de séquence de 99,8 %. En particulier, l'haplotype COI trouvé à Ploubazlanec diffère de seulement deux substitutions par rapport aux spécimens collectés au Portugal à Aveiro (haplotype Dil5 ; accessions OR689296-7 ; Salvi *et al.*, 2024).

et en Espagne à Playa de Beluso (haplotype Dil4 ; accession AF546052 ; Collins *et al.*, 2009).

Molecular Analyses

Nine individuals collected at Ploubazlanec and morphologically identified as *Crepidula dilatata* were sequenced for the COI barcode fragment following the procedure described in Salvi *et al.* (2024). All new COI sequences were identical, representing the same haplotype (accession number PV231798). This haplotype was compared to the NCBI nucleotide database using NCBI BLASTn for species-level molecular identification. The BLASTn searches retrieved as the best match sequences assigned to clade 2 of *Crepidula dilatata* (accessions OR689296 and AF546052) with 99.8% sequence identity. Specifically, the COI haplotype found at Ploubazlanec differs by only two substitutions compared to specimens collected in Aveiro, Portugal (haplotype Dil5; accession OR689296-7; Salvi *et al.*, 2024) and in Playa de Beluso, Spain (haplotype Dil4; accession AF546052; Collins *et al.*, 2009).

CONCLUSION

Une fois de plus nous sommes en présence d'une espèce non désirée sur notre littoral et qui aura probablement bénéficié dans le cas présent des échanges conchylicoles entre la Péninsule Ibérique et la Bretagne. Cela nous rappelle l'arrivée en France, dans la première moitié du vingtième siècle, d'une autre espèce de calyptréidés, *Crepidula fornicata*, originaire des Etats-Unis et du Canada, et devenue très invasive depuis les années 1970 en Manche et sur la côte atlantique, en concurrençant fortement encore aujourd'hui nos espèces indigènes.

L'arrivée de *Crepidula dilatata* en France ne présage rien de bon. Elle peut être localement invasive et malgré une capacité lente de diffusion de ses larves, les échanges d'espèces pour les cultures ou les élevages marins entre régions et pays s'intensifiant, pourraient favoriser l'extension de ce nouvel « alien » assez rapidement !

CONCLUSION

Once again, we are facing an unwanted species on our coastline, which has likely benefited from shellfish trade exchanges between the Iberian Peninsula and Brittany. This situation is reminiscent of the introduction of another calyptraeid species, *Crepidula fornicata*, from the United States and Canada to France in the early 20th century. Since the 1970s, it has become highly invasive in the English Channel and Atlantic coast, continuing to compete strongly with native species.

The arrival of *Crepidula dilatata* in France does not bode well. It can be locally invasive, and despite the slow natural dispersal of its larvae, increasing interregional and international transfers of marine species for aquaculture could facilitate the rapid expansion of this new «alien» species.

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Fig. 1 Port de Pors-Even (Avril 2023)



Fig. 2 Pors-Even, 1 an après, en juin 2024

Fig. 3



Fig. 3.2



Fig. 3.3

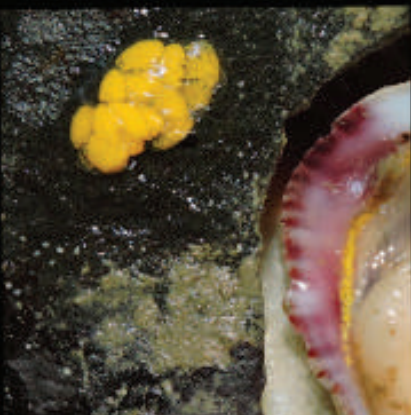


Fig. 3.4

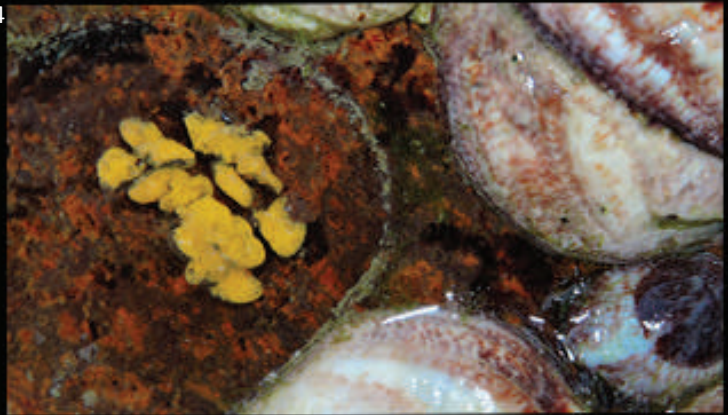


Fig. 3 , Fig. 3.2 , Fig. 3.3 , Fig. 3.4 Présence de juvéniles (10-12 mm), et de pontes suite au décollement de quelques crépidules.



Fig. 4 Eclosion de jeunes crépidules 2 mois après la mise d'adultes en aquarium.



Fig. 5 Port de Pors-Even (juillet 2024)



Fig. 6 Variabilité des formes et couleurs.



Fig. 7 exemplaires juvéniles (7 mm et plus)



Fig. 8 Face interne de *Crepipatella dilatata*.



Fig. 9 *C. dilatata* , *C. fornicata*



Fig. 10 *C. dilatata* , *C. fornicata*



Fig. 11 Exemples présentant des rides sur le bord supérieur



Fig. 12 *Crepidatella dilatata*
- le pied est blanc crème
- le manteau est gris clair ponctué de blanc.



Fig. 13 *Crepidatella fornicata*
- le pied est marron clair
- le manteau est gris plus foncé et ponctué de blanc.

APPORTS À LA SYSTÉMATIQUE DU GENRE *PACHYBATHRON* : DESCRIPTION DE *PACHYBATHRON PICTURATUM* (GASTROPODA: CYSTISCIDAE) DE GUADELOUPE (PETITES ANTILLES).

CONTRIBUTIONS TO THE SYSTEMATICS OF THE GENUS *PACHYBATHRON*: DESCRIPTION OF *PACHYBATHRON PICTURATUM* (GASTROPODA: CYSTISCIDAE) FROM GUADELOUPE (LESSER ANTILLES).

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MOTS-CLÉS

Cystiscidae, *Pachy bathron picturatum*, Guadeloupe, Petites Antilles, diagnose.

KEYWORDS

Cystiscidae, *Pachy bathron picturatum*, Guadeloupe, Lesser Antilles, Diagnosis.

RÉSUMÉ

Une nouvelle espèce du genre *Pachy bathron*, *Pachy bathron picturatum* nov. sp., est décrite de Guadeloupe. Sa comparaison avec des espèces proches, notamment *P. cypraeoides* (C. B. Adams, 1845), met en évidence des différences morphologiques justifiant son statut d'espèce distincte.

ABSTRACT

A new species of the genus *Pachy bathron*, *Pachy bathron picturatum* nov. sp., is described from Guadeloupe. Its comparison with closely related species, particularly *P. cypraeoides* (C. B. Adams, 1845), highlights morphological differences that support its recognition as a distinct species.

INTRODUCTION

Située au cœur des Caraïbes, la Guadeloupe appartient à l'une des 34 zones prioritaires mondiales pour la conservation de la biodiversité. Ces régions se caractérisent par une forte concentration d'espèces, souvent endémiques, associée à une dégradation marquée des habitats naturels. En Guadeloupe, 12 % des espèces évaluées sont endémiques, tandis que 15 % des 574 espèces indigènes recensées sont aujourd'hui menacées. Par ailleurs, 25 % d'entre elles sont encore trop peu documentées pour faire l'objet d'une évaluation rigoureuse (IUCN, 2021).

Parmi cette richesse biologique, la biodiversité marine, et en particulier celle des mollusques, suscite un intérêt scientifique croissant (Garrigues & Lamy, 2019 ; Pointier & Lamy, 2018 ; Maniel *et al.*, 2021). Afin d'en améliorer la connaissance, le Muséum national d'Histoire naturelle (MNHN) a conduit plusieurs campagnes d'exploration au cours des dernières années.

La mission KARUBENTHOS 1, menée en 2012, a permis d'inventorier les algues et les invertébrés marins des zones côtières de Guadeloupe, menant à la découverte de plus de

300 espèces nouvelles et à la publication de plus de 300 articles scientifiques. En 2015, KARUBENTHOS 2 s'est concentrée sur les milieux profonds de la zone économique exclusive (ZEE), entre 48 et 898 mètres de profondeur, enrichissant de manière significative les connaissances sur la faune benthique. En 2017, KARUBENTHOS 3 a poursuivi ces travaux en étendant les explorations à d'autres secteurs profonds de la ZEE. Parallèlement, la mission MADIBENTHOS, conduite en 2016 en Martinique, a permis d'enrichir l'inventaire du benthos marin de l'île, en révélant de nombreuses espèces jusque-là inconnues. D'autres missions, telles que Guyane 2014, la convention APA-973-1 (Îles du Salut) et PROTEUS (2017), ont également mis en lumière une diversité remarquable de mollusques, doublant presque le nombre d'espèces alors recensées dans ces régions. Dans ce contexte d'exploration soutenue, l'étude de la famille des Cystiscidae a montré un potentiel important pour la découverte de nouvelles espèces. Ce groupe de gastéropodes marins comprend encore de nombreuses espèces mal connues ou non décrites, notamment dans les habitats profonds. Le genre *Pachy bathron*, principalement réparti dans l'Atlantique Ouest, est représenté par quelques espèces s'étendant du Brésil aux Caraïbes.

La présente étude décrit une nouvelle espèce de ce genre, collectée en Guadeloupe lors de KARUBENTHOS 2.

INTRODUCTION

Located in the heart of the Caribbean, Guadeloupe belongs to one of the world's 34 global biodiversity hotspots. These regions are characterized by a high concentration of species—many of them endemic—coupled with significant degradation of natural habitats. In Guadeloupe, 12% of assessed species are endemic, while 15% of the 574 recorded native species are currently considered threatened. Furthermore, 25% remain insufficiently documented to undergo rigorous evaluation (IUCN, 2021). Among this rich biological diversity, marine biodiversity—and particularly that of mollusks—is attracting growing scientific interest (Garrigues & Lamy, 2019; Pointier & Lamy, 2018; Maniel *et al.*, 2021). To improve knowledge in this field, the Muséum national d'Histoire naturelle (MNHN) has conducted several exploratory campaigns in recent years.

The KARUBENTHOS 1 expedition, carried out in 2012, aimed to inventory algae and marine invertebrates in Guadeloupe's coastal zones, leading to the discovery of more than 300 new species and the publication of over 300 scientific papers. In 2015, KARUBENTHOS 2 focused on deep-sea environments

within the Exclusive Economic Zone (EEZ), between 48 and 898 meters depth, significantly enhancing knowledge of benthic fauna. KARUBENTHOS 3, conducted in 2017, continued this effort by expanding exploration to additional deep-sea sectors within the EEZ. In parallel, the MADIBENTHOS mission, conducted in 2016 in Martinique, enriched the island's marine benthic inventory by revealing many previously unknown species. Other campaigns, such as Guyane 2014, the APA-973-1 agreement (Îles du Salut), and PROTEUS (2017), also highlighted remarkable mollusk diversity, nearly doubling the number of known species in these areas.

Within this framework of sustained exploration, studies on the family Cystiscidae have revealed strong potential for the discovery of new species. This group of marine gastropods still includes many poorly known or undescribed taxa, especially in deep-sea habitats. The genus *Pachybatron*, mainly distributed in the western Atlantic, is represented by a few species ranging from Brazil to the Caribbean.

The present study describes a new species of this genus, collected in Guadeloupe during KARUBENTHOS 2.

MATERIELS ET MÉTHODES

La campagne océanographique KARUBENTHOS 2 s'inscrit dans le programme Tropical Deep-Sea Benthos d'exploration des faunes profondes benthiques tropicales. Elle s'est déroulée du 6 au 30 juin 2015. Faisant suite à l'expédition KARUBENTHOS¹ 1 qui, en 2012, avait inventorié les petits fonds (0-50 mètres) autour de la Guadeloupe, la campagne KARUBENTHOS 2 avait pour objectif l'inventaire des invertébrés benthiques du large, dans la tranche bathymétrique 50-850 mètres ; 143 opérations (dragages et chalutages) ont été effectuées².

Pour cela, la drague Warén, utilisée pour la première fois, a été traînée à faible vitesse (1 à 2 nœuds) derrière le navire océanographique *Antéa*, récoltant sédiments et organismes des fonds marins meubles. Les échantillons ont été tamisés à bord, et les mollusques triés et photographiés vivants lorsque possible, permettant ainsi de documenter les spécimens dans leur état naturel. Cette méthodologie a révélé une biodiversité insoupçonnée, même pour les experts locaux, et a considérablement enrichi nos connaissances des écosystèmes marins profonds des Caraïbes.

MATERIALS AND METHODS

The oceanographic expedition KARUBENTHOS 2 was conducted from June 6 to 30, 2015, as part of the Tropical Deep-Sea Benthos program dedicated to the exploration of tropical deep-sea benthic fauna. Following the KARUBENTHOS 1 campaign in 2012, which surveyed shallow waters (0–50 meters) around Guadeloupe, KARUBENTHOS 2 focused on inventorying offshore benthic invertebrates within the 50–850 meter depth range. A total of 143 sampling operations, including dredging and trawling, were carried out.

For this purpose, the Warén dredge—used for the first time—was towed slowly (1–2 knots) behind the research vessel *Antéa*, collecting sediments and organisms from soft

seabeds. Samples were sieved onboard, and mollusks were sorted and photographed alive whenever possible, enabling documentation of specimens in their natural state. This methodology revealed an unexpected level of biodiversity, even for local specialists, and significantly enriched our understanding of deep-sea ecosystems in the Caribbean.

ABRÉVIATIONS ET ACRONYMES

- spm : spécimen.
- Fig(s) : Figure (s).
- LC : longueur de la coquille.
- MNHN : Muséum national d'Histoire naturelle, Paris.
- ABC : Aruba, Bonaire, Curaçao

ABBREVIATIONS AND ACRONYMS

- spm: specimen.
- Fig(s): Figure(s).
- LC: shell length.
- MNHN: National Museum of Natural History, Paris.
- ABC: Aruba, Bonaire, Curaçao

SYSTÉMATIQUE

- Phylum Mollusca
 - Classe: Gastropoda
 - Sous-classe: Caenogastropoda
 - Ordre: Neogastropoda
 - Superfamille: Volutoidea Rafinesque, 1815
 - Famille: Cystiscidae W. Stimpson, 1865
 - Genre: *Pachybatron* Gaskoin, 1853

SYSTEMATICS

- Phylum: Mollusca
 - Class: Gastropoda
 - Subclass: Caenogastropoda
 - Order: Neogastropoda
 - Superfamily: Volutoidea Rafinesque, 1815
 - Family: Cystiscidae W. Stimpson, 1865
 - Genus: *Pachybatron* Gaskoin, 1853

Le genre *Pachybatron*. Le genre *Pachybatron* appartient à la famille des Cystiscidae, un groupe de petits gastéropodes marins. D'après la base de données WoRMS, il comptait jusqu'ici six espèces valides : *P. cassidiforme* Gaskoin, 1853, *P. cypraeoides* (C. B. Adams, 1845), *P. guadeloupense* F. Boyer & D. Lamy, 2014, *P. kienerianum* (Petit de la Saussaye, 1838), *P. olssoni* Wakefield, F. Boyer & McCleery, 2002 et *P. tayrona* Díaz & Velásquez, 1987.

La première révision du genre a été réalisée par Coomans (1972), qui a clarifié un point essentiel de la nomenclature : Wenz avait formellement établi *P. marginelloides* (synonyme junior de *P. cypraeoides*) comme espèce-type du genre. Ainsi, l'espèce-type de *Pachybatron* est *P. marginelloideum* Gaskoin, 1853 [synonyme junior de *Erato cypraeoides* C.B. Adams, 1845], par désignation ultérieure (Wenz, 1941 : 1048 ; *vide* Coomans, 1972 : 90). Le genre a été depuis solidement établi, notamment grâce aux travaux de Wakefield *et al.* (2002), bien que Faber (2006) ait proposé une approche plus large, liant *Pachybatron*

¹ L'acronyme de la campagne dérive de Karukera (nom amérindien de la Guadeloupe) et benthos

² La liste des stations et d'autres documents relatifs à la campagne peuvent être consultés sur <http://expeditions.mnhn.fr/campaign/karubenthos2015>

à *Gibberula* et *Persicula*, sur la base des études de De Jong & Coomans (1988) et de Covert & Covert (1995).

Le centre de diversité de *Pachy bathron* se trouve dans le sud-est de la mer des Caraïbes, où cohabitent plusieurs espèces géographiquement proches. On y trouve *P. cypraeoides* aux îles ABC (près du Venezuela), *P. kieneriana* à l'est du Venezuela, *P. cassidiforme* des îles Testigos (au large du Venezuela) jusqu'en Guadeloupe, et *P. guadeloupensis* sur la côte atlantique de la Guadeloupe. Les autres espèces, comme *P. tayrona* et *P. olssoni*, sont plus isolées dans le sud-ouest de la Caraïbe.

La découverte en Guadeloupe de *P. cassidiforme* (au nord-est de l'îlot Fajou, 80–90 m) et de *P. guadeloupensis* (côte atlantique, 150–250 m) marque la première occurrence du genre dans des habitats profonds. Précédemment, ce genre était limité aux eaux peu profondes (*P. cypraeoides* et *P. tayrona*), jusqu'à 120 m (*P. olssoni*) (voir Boyer & Lamy, 2014). La nouvelle espèce, *P. picturatum*, a été trouvée quant à elle à une profondeur intermédiaire (60–82 m). Des spécimens de *P. cypraeoides*, collectés à des profondeurs plus importantes (160 m au large de Port-Louis et 250 m au large de Saint-François), suggèrent toutefois que ce genre pourrait occuper des zones plus profondes que celles actuellement documentées.

Les espèces de *Pachy bathron* se distinguent par une coquille épaisse et robuste, de forme ovoïde à globuleuse, mesurant entre 5 et 15 mm. Leur ouverture est large, bordée de dents marquées sur le labre et la columelle. Les motifs sont souvent réticulés ou en zigzag. Bien que partageant certaines caractéristiques avec d'autres membres des Cystiscidae, *Pachy bathron* se distingue par ses traits morphologiques spécifiques et sa répartition écologique. En comparaison, le genre *Cystiscus* a des coquilles plus petites et translucides, tandis que *Gibberula* présente des coquilles ovoïdes plus légères et plus ornementées. Enfin, *Persicula* regroupe des espèces aux coquilles plus allongées et ornées de motifs contrastés.

Ces différences justifient l'attribution de la nouvelle espèce au genre *Pachy bathron*.

The Genus *Pachy bathron*. The genus *Pachy bathron* belongs to the family Cystiscidae, a group of small marine gastropods. According to the WoRMS database, it currently includes six valid species: *P. cassidiforme* Gaskoin, 1853; *P. cypraeoides* (C. B. Adams, 1845); *P. guadeloupense* F. Boyer & D. Lamy, 2014; *P. kienerianum* (Petit de la Saussaye, 1838); *P. olssoni* Wakefield, F. Boyer & McCleery, 2002; and *P. tayrona* Díaz & Velásquez, 1987. The first revision of the genus was conducted by Coomans (1972), who clarified a key nomenclatural point: Wenz had formally designated *P. marginelloides* (a junior synonym of *P. cypraeoides*) as the type species of the genus. Thus, the type species of *Pachy bathron* is *P. marginelloideum* Gaskoin, 1853 [a junior synonym of *Erato cypraeoides* C. B. Adams, 1845], by subsequent designation (Wenz, 1941: 1048; fide Coomans, 1972: 90). Since then, the genus has been well defined, particularly through the work of Wakefield et al. (2002), although Faber (2006) proposed a broader approach, linking *Pachy bathron* to *Gibberula* and *Persicula*, based on the studies of De Jong & Coomans (1988) and Covert & Covert (1995).

The center of diversity for *Pachy bathron* is located in the

southeastern Caribbean Sea, where several geographically close species coexist. These include *P. cypraeoides* in the ABC islands (near Venezuela), *P. kieneriana* off eastern Venezuela, *P. cassidiforme* from the Testigos Islands (off Venezuela) to Guadeloupe, and *P. guadeloupense* along the Atlantic coast of Guadeloupe. Other species, such as *P. tayrona* and *P. olssoni*, are more isolated in the southwestern Caribbean.

The discovery of *P. cassidiforme* (northeast of Fajou islet, 80–90 m) and *P. guadeloupense* (Atlantic coast, 150–250 m) in Guadeloupe marks the first record of the genus in deep-water habitats. Previously, the genus was thought to be restricted to shallow waters (*P. cypraeoides* and *P. tayrona*) or up to 120 meters (*P. olssoni*) (see Boyer & Lamy, 2014). The new species, *P. picturatum*, was found at an intermediate depth (60–82 m). Specimens of *P. cypraeoides* collected at greater depths (160 m off Port-Louis and 250 m off Saint-François) suggest that this genus may occupy deeper zones than previously documented. Species of *Pachy bathron* are characterized by a thick and robust shell, ranging from ovoid to globular in shape, and measuring between 5 and 15 mm. The aperture is broad, with prominent teeth along the outer lip and columella. The shell patterns are often reticulated or zigzag-shaped. While they share some features with other Cystiscidae members, *Pachy bathron* is distinguished by specific morphological traits and its ecological distribution. For comparison, the genus *Cystiscus* includes smaller, translucent shells, *Gibberula* features lighter, more ornamented ovoid shells, and *Persicula* encompasses species with more elongated shells bearing contrasting patterns.

These differences support the assignment of the new species to the genus *Pachy bathron*.

Pachy bathron picturatum nov. sp.
(Planche 1. Figs A–D)

Matériel type. spm. holotype MNHN-IM-2013-60401, LC 6.1 mm, Guadeloupe, nord de la Grande-Terre, Expédition Karubenthos 2, Navire océanographique *Antéa*, station DW4545, 60–82 m, 16°29.7'N, 61°31.4'W, 14 juin 2015.

Type material. spm. holotype MNHN-IM-2013-60401, LC 6.1 mm, Guadeloupe, northern Grande-Terre, Karubenthos 2 Expedition, research vessel *Antéa*, station DW4545, 16°29.7'N, 61°31.4'W, June 14, 2015.

Localité type. Guadeloupe, nord de la Grande-Terre, Karubenthos 2, station DW4545, 60–82 m, 16°29.7'N, 61°31.4'W. Espèce connue uniquement de Guadeloupe à ce jour.

Type locality. Guadeloupe, northern Grande-Terre, Karubenthos 2, station DW4545, 60–82 m, 16°29.7'N, 61°31.4'W. Species known only from Guadeloupe to date.

Description. À l'exception d'un spécimen figurant sous le nom *Pachy bathron cypraeoides* dans Boyer & Lamy (2014, Fig. 8), *P. picturatum* n'avait jusqu'alors jamais été documenté. La coquille présente une forme allongée et ovoïde, avec une silhouette légèrement bombée et une asymétrie marquée. L'épaule du labre est nettement défini. L'extrémité antérieure, plus effilée, abrite les organes sensoriels (tentacules et siphon) chez l'individu vivant.

La couleur dominante de la coquille varie entre le crème et le beige, avec un réseau complexe de motifs brun-orange disposés de manière irrégulière. Ces motifs se manifestent sous forme de lignes sinueuses entrecroisées, formant un dessin réticulé, principalement visible sur la face dorsale. Des taches brunes, diffuses et irrégulières, de tailles variées, sont réparties sur toute la coquille, bien que leur densité soit plus importante aux extrémités, s'étendant également sur la région centrale. Les motifs colorés sont particulièrement prononcés sur la face dorsale et latérale, tandis qu'ils se font progressivement plus discrets vers la face ventrale, où une teinte blanche prédomine. La transition entre les zones pigmentées et les zones plus claires est graduelle, produisant des nuances intermédiaires. L'ouverture est longue et étroite, bordée de denticules nettement définis dont la coloration blanche uniforme contraste avec les motifs environnants. La columelle, lisse, présente des plis peu marqués (Planche 1. Figs A-C).

Description

With the exception of a specimen listed as *Pachybathron cypraeoides* in Boyer & Lamy (2014, Fig. 8), *P. picturatum* had not been previously documented.

The shell exhibits an elongated ovoid shape, with a slightly swollen profile and marked asymmetry. The shoulder of the labrum is clearly defined. The anterior end, more tapered, houses the sensory organs (tentacles and siphon) in the living animal.

The dominant shell color ranges from cream to beige, overlaid with a complex network of irregular brown-orange patterns. These markings appear as interwoven sinuous lines forming a reticulated design, mostly visible on the dorsal surface. Diffuse and irregular brown blotches of varying sizes are scattered across the entire shell, with higher density at both extremities, extending also across the central region.

The color patterns are especially vivid on the dorsal and lateral sides, while becoming gradually fainter on the ventral side, where a white hue predominates. The transition between the pigmented and paler areas is gradual, creating intermediate tones.

The aperture is long and narrow, bordered by clearly defined denticles whose uniform white coloration contrasts sharply with the surrounding patterns. The columella is smooth, with weakly marked folds (Plate 1, Figs A-C).

Caractéristiques de l'animal. Le pied de *Pachybathron picturatum* est de couleur gris-blanc vitreux, avec une surface lisse et légèrement translucide. Il est marqué par de larges taches irrégulières dont la teinte varie du jaunâtre pâle au blanc cru. Le siphon est uniformément blanc, contrastant avec le reste du corps. Les tentacules sont allongés et présentent une teinte orange soutenue à leur extrémité, notamment autour de l'œil, où cette coloration est particulièrement marquée (Planche 1. Fig D).

Animal Characteristics

The foot of *Pachybathron picturatum* is glassy gray-white, with a smooth and slightly translucent surface. It is marked by large irregular patches, ranging in color from pale yellowish to pure white. The siphon is uniformly white, contrasting with the rest of the body. The tentacles are elongated and exhibit a deep

orange hue at their tips, particularly around the eye, where this coloration is especially pronounced (Plate 1, Fig D).

Comparaison au sein du genre *Pachybathron*.

L'analyse de *P. picturatum* par rapport aux six autres espèces du genre révèle des différences morphologiques et chromatiques claires, facilitant son identification et éliminant toute confusion.

Pachybathron cassidiforme Gaskoin, 1853.

La localité type de cette espèce est Saint-Vincent (Coomans, 1972). Elle est présente dans les Petites Antilles (Paulmier, 1997) et de la Martinique à Grenade (Wakefield et al., 2002). Faber (2006) étend sa distribution à Tobago, et Boyer & Lamy (2014) confirment sa présence en Guadeloupe, à l'île Fajou, à 80 m de profondeur. Sa coquille blanche opaque porte trois bandes spiralées gris pâle, un contraste marqué par rapport au réseau réticulé brun de *P. picturatum*. Faber (2006) note également un motif brun jaunâtre complexe, observé sur des spécimens de Martinique, Mustique et Tobago.

Pachybathron guadeloupense F. Boyer & D. Lamy, 2014.

Cette espèce est connue uniquement sur la côte atlantique de la Guadeloupe, entre 150 et 250 m de profondeur (localité type : « Guadeloupe, St François, 250 m »). Sa coquille, décrite par Boyer & Lamy (2014), se distingue de celle de *P. picturatum* par sa forme ovale subpyriforme élancée, sa spire basse et bombée, et son bourrelet externe du labre formant un étagement marqué à l'extrémité du dernier tour. De couleur beige-crème, souvent marbrée ou tachetée, elle présente des motifs réticulés mal définis, avec des lignes axiales brunes sur fond jaunâtre pâle et des pointes blanches orientées vers le bord labial. Sa protoconque, son labre, son bourrelet externe et sa zone columellaire sont blancs. Des spécimens très clairs, presque blancs, ont aussi été observés (Boyer & Lamy, 2014). Bien que *P. guadeloupense* soit géographiquement proche de *P. picturatum*, ses différences morphologiques marquées en font une espèce distincte, semblant même plus proche de *P. kienerianum*.

Pachybathron kienerianum (Petit de la Saussaye, 1838).

Cette espèce vénézuélienne (localité type : Venezuela, « plages de la Guayra ») a été découverte par M. Lemarié, capitaine de vaisseau. Elle se distingue par un motif de triangles blanchâtres sur un fond beige-crème, un schéma qui la sépare nettement de *P. picturatum*.

Pachybathron olssoni Wakefield, F. Boyer & McCleery, 2002.

Cette espèce nord-américaine des Caraïbes est présente sur la côte caraïbe septentrionale du Panama (localité type : « Eastern Panama, Bocas del Toro Archipelago ») ainsi que sur sa côte Pacifique. Elle se distingue par une teinte dorsale variant du beige au crème, ornée de motifs ondulés plus foncés disposés régulièrement. Le réseau de fines lignes sinueuses, brun clair à jaunâtre, constitue un critère diagnostique majeur.

Pachybathron tayrona Díaz & Velásquez, 1987.

Cette espèce est présente sur la côte Caraïbe de la Colombie, notamment dans les baies entre Santa Marta et Bahía de Nenguange, avec pour localité type la Bahía de Chengue, dans le Parc National Naturel Tayrona. On la trouve principalement dans les herbiers de posidonie (*Thalassia testudinum*) et sous les coraux, dans des eaux peu profondes jusqu'à 3 m. Sa coquille, beige à blanc sale, présente des stries brunes à la suture et 8 à 9 rangées spiralées de marques brunes sur le dernier tour, alternant avec des taches brunes, ce qui permet de la différencier de *P. picturatum*.

Pachybatron cypraeoides (C. B. Adams, 1845).

Cette espèce a été décrite à partir d'un seul spécimen, supposé provenir de la Jamaïque. Cependant, la localité n'a jamais été confirmée, et l'espèce n'a plus été observée, ni en Jamaïque, ni ailleurs dans les Grandes Antilles, ni entre le Yucatán et le Nicaragua. Cette incertitude remet en question la validité de la provenance du spécimen type.

Dans leur révision du genre *Pachybatron*, Wakefield et al. (2002) ont restreint la distribution de l'espèce aux archipels au large du Venezuela, remettant en question la localité jamaïcaine. Cependant, Faber (2006) a étendu sa répartition à la mer des Caraïbes, signalant des spécimens potentiellement attribuables à *P. cypraeoides* au sud-est de la République dominicaine. Faber a aussi illustré un spécimen de *P. cypraeoides*, sans localité précise autre que les «West Indies», mais cette illustration ne résout pas les incertitudes sur la répartition exacte de l'espèce. Il est donc possible que l'espèce ait une distribution fragmentée dans la mer des Caraïbes, ou qu'elle forme un complexe d'espèces proches, géographiquement différenciées, une hypothèse qui reste non résolue.

La forme de coquille observée aux îles ABC est largement reconnue comme celle de *P. cypraeoides* (De Jong & Coomans, 1988), et cette attribution est désormais acceptée scientifiquement. Les spécimens de *P. cypraeoides* des îles ABC présentent des caractéristiques similaires à celles de *P. picturatum*, notamment un motif de décoration parfois absent ou discret. Cependant, des différences chromatiques et morphologiques notables existent entre les deux espèces. En effet, l'animal vivant de *P. cypraeoides* des îles ABC a un pied orange clair, avec une frange orange autour des bords, tandis que l'animal observé en Guadeloupe a un pied gris-blanc avec des taches allant du jaune pâle au blanc, un siphon et des tentacules blancs, et un contour oculaire orange soutenu.

Ces observations, appuyées par les illustrations de *P. cypraeoides* dans l'étude de Wakefield et al. (2002), confirment que *P. cypraeoides* et *P. picturatum*, bien que similaires en forme de coquille et parfois en motifs de coloration, sont des espèces distinctes (De Jong & Coomans, 1988 ; Coomans, 1972, 1973 ; Wakefield et al., 2002 ; Faber, 2006 ; Boyer & Lamy, 2014).

Comparison within the Genus *Pachybatron*

The analysis of *P. picturatum* in comparison to the six other known species of the genus reveals clear morphological and chromatic differences, facilitating its identification and ruling out any confusion.

Pachybatron cassidiforme Gaskoin, 1853.

The type locality of this species is Saint Vincent (Coomans, 1972). It is found in the Lesser Antilles (Paulmier, 1997) and from Martinique to Grenada (Wakefield et al., 2002). Faber (2006) extended its distribution to Tobago, and Boyer & Lamy (2014) confirmed its presence in Guadeloupe, at Fajou Islet, at a depth of 80 m. Its opaque white shell bears three pale grey spiral bands, a stark contrast to the brown reticulated pattern of *P. picturatum*. Faber (2006) also noted a complex yellowish-brown pattern in specimens from Martinique, Mustique, and Tobago.

Pachybatron guadeloupense F. Boyer & D. Lamy, 2014.

This species is known only from the Atlantic coast of

Guadeloupe, at depths between 150 and 250 m (type locality: "Guadeloupe, St François, 250 m"). Its shell, as described by Boyer & Lamy (2014), differs from *P. picturatum* by its slender sub-pyriform oval shape, low rounded spire, and the prominent stepped ridge at the end of the last whorl formed by the outer lip thickening. The shell is beige-cream, often marbled or mottled, with poorly defined reticulated patterns, brown axial lines on a pale yellowish background, and white dots oriented toward the labial edge. The protoconch, lip, outer thickening, and columellar area are white. Very pale, almost white specimens have also been observed (Boyer & Lamy, 2014). Although *P. guadeloupense* occurs geographically near *P. picturatum*, the marked morphological differences make it a distinct species, apparently closer to *P. kienerianum*.

Pachybatron kienerianum (Petit de la Saussaye, 1838).

This Venezuelan species (type locality: Venezuela, "La Guaira beaches") was discovered by M. Lemarié, a naval captain. It is distinguished by a pattern of whitish triangles on a beige-cream background, a design clearly different from that of *P. picturatum*.

Pachybatron olssoni Wakefield, F. Boyer & McCleery, 2002.

This Caribbean species is found on the northern Caribbean coast of Panama (type locality: "Eastern Panama, Bocas del Toro Archipelago") as well as on its Pacific coast. It is distinguished by a dorsal hue ranging from beige to cream, with regularly arranged darker wavy markings. The network of fine sinuous lines, in light brown to yellowish tones, is a major diagnostic feature.

Pachybatron tayrona Díaz & Velásquez, 1987.

This species is found on the Caribbean coast of Colombia, notably in bays between Santa Marta and Bahía de Nenguange, with the type locality at Bahía de Chengue in Tayrona National Natural Park. It inhabits primarily seagrass beds (*Thalassia testudinum*) and coral substrates in shallow waters up to 3 m deep. Its shell, ranging from beige to dirty white, bears brown sutural striae and 8 to 9 spiral rows of brown marks on the last whorl, alternating with brown blotches, which differentiates it from *P. picturatum*.

Pachybatron cypraeoides (C. B. Adams, 1845).

This species was described from a single specimen, supposedly from Jamaica. However, the locality has never been confirmed, and the species has not been observed again in Jamaica, elsewhere in the Greater Antilles, or between Yucatán and Nicaragua. This uncertainty casts doubt on the validity of the type locality.

In their revision of the genus *Pachybatron*, Wakefield et al. (2002) restricted the species' distribution to the archipelagos off the coast of Venezuela, questioning the Jamaican origin. However, Faber (2006) extended its range into the Caribbean Sea, reporting specimens potentially attributable to *P. cypraeoides* southeast of the Dominican Republic. Faber also illustrated a specimen of *P. cypraeoides* without a precise locality other than the "West Indies," but this illustration does not resolve the uncertainties regarding the species' exact distribution. It is therefore possible that the species has a fragmented distribution in the Caribbean Sea or represents a complex of closely related, geographically differentiated species — a hypothesis that remains unresolved.

The shell form observed in the ABC Islands is widely accepted as *P. cypraeoides* (De Jong & Coomans, 1988), and this

identification is now scientifically recognized. Specimens of *P. cypraeoides* from the ABC Islands show some features similar to *P. picturatum*, particularly the sometimes faint or absent decorative pattern. However, significant chromatic and morphological differences exist between the two. Notably, the living animal of *P. cypraeoides* from the ABC Islands has a light orange foot with an orange fringe along the edges, while the specimen observed in Guadeloupe has a greyish-white foot with blotches ranging from pale yellow to white, a white siphon and tentacles, and a strong orange ring around the eyes.

These observations, supported by illustrations of *P. cypraeoides* in the study by Wakefield *et al.* (2002), confirm that *P. cypraeoides* and *P. picturatum*, despite similarities in shell shape and occasional coloration patterns, are distinct species (De Jong & Coomans, 1988; Coomans, 1972, 1973; Wakefield *et al.*, 2002; Faber, 2006; Boyer & Lamy, 2014).

Étymologie. Le terme *picturatum* vient du latin *pictura* (peinture, dessin) et du suffixe *-atum* (qui indique une caractéristique ou une qualité), signifiant «qui a été peint» ou «orné». Cette appellation fait référence aux motifs décoratifs, particulièrement présents sur la coquille, où des lignes sinueuses et des taches irrégulières créent des dessins évoquant une œuvre d'art naturelle.

Etymology. The term *picturatum* comes from the Latin *pictura* (painting, drawing) and the suffix *-atum* (which indicates a characteristic or quality), meaning «that has been painted» or «adorned.» This name refers to the decorative patterns, especially prominent on the shell, where sinuous lines and irregular spots create designs resembling a natural work of art.

DISCUSSION ET CONCLUSION

La Guadeloupe, en raison de son isolement géographique et de la diversité de ses habitats marins, constitue un foyer majeur d'endémisme. La découverte de *Pachybatron picturatum* met en évidence le potentiel encore largement inexploré des faunes profondes, révélées notamment par les missions KARUBENTHOS.

Les différences marquées de chromatisme entre *P. picturatum* et *P. cypraeoides* suggèrent l'existence d'espèces valides, difficilement discernables sur la seule base des caractères coquilliers. Ces éléments appuient l'hypothèse d'un complexe d'espèces cryptiques au sein du genre *Pachybatron*, potentiellement structuré selon des gradients géographiques ou bathymétriques.

Ce constat souligne l'importance d'une documentation systématique des spécimens vivants. L'analyse fine des caractères morphologiques et chromatiques, souvent sous-estimée, se révèle essentielle pour éviter des regroupements artificiels d'espèces et pour mieux comprendre les mécanismes de spéciation locale.

Des analyses moléculaires, en particulier fondées sur l'ADN mitochondrial, sont désormais indispensables pour valider la position taxonomique de *P. picturatum* et clarifier les relations phylogénétiques au sein du groupe.

Dans un contexte de pressions anthropiques accrues (pollution au chlordécone, prolifération des sargasses), ces découvertes renforcent la nécessité de développer les efforts de recherche et de conservation ciblant les écosystèmes marins profonds,

véritables réservoirs de biodiversité.

DISCUSSION AND CONCLUSION

Guadeloupe, due to its geographical isolation and the diversity of its marine habitats, constitutes a major hotspot of endemism. The discovery of *Pachybatron picturatum* highlights the still largely untapped potential of deep-sea faunas, as revealed notably by the KARUBENTHOS expeditions.

The marked chromatic differences between *P. picturatum* and *P. cypraeoides* suggest the existence of valid species that are difficult to distinguish based solely on shell characters. These findings support the hypothesis of a complex of cryptic species within the genus *Pachybatron*, potentially structured along geographical or bathymetric gradients.

This observation underscores the importance of systematic documentation of live specimens. Detailed analysis of morphological and chromatic characters—often underestimated—proves essential to avoid artificial species groupings and to better understand local speciation mechanisms.

Molecular analyses, particularly those based on mitochondrial DNA, are now indispensable to validate the taxonomic position of *P. picturatum* and clarify phylogenetic relationships within the group.

In a context of increasing anthropogenic pressures—such as chlordecone pollution and the proliferation of sargassum—these discoveries further emphasize the need to strengthen research and conservation efforts focused on deep marine ecosystems, which are true reservoirs of biodiversity.

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Planche 1

Figs ABCD : *Pachybatron picturatum* nov. sp., spm. holotype, MNHN-IM-2013-60401, LC 6.1 mm, Guadeloupe, nord de la Grande-Terre, expédition KARUBENTHOS 2, Navire océanographique *Antéa*, station DW4545, 60-82 m, 16°29.7'N, 61°31.4'W, 14 juin 2015. Photographies : Laurent Charles (spécimen vivant) & MNHN.



Planche 2

- Fig A : *Pachybatron picturatum* nov. sp., spm. holotype, MNHN-IM-2013-60401, LC 6.1 mm, Guadeloupe, nord de la Grande-Terre, expédition KARUBENTHOS 2, Navire océanographique *Antéa*, station DW4545, 16°29.7'N, 61°31.4'W, 14 juin 2015. Photographie : MNHN.
- Fig B : *Pachybatron picturatum* nov. sp., Guadeloupe, au large de Saint-François, 250 m, 6.5 mm, source : Boyer & Lamy (2014).
- Fig C : *Pachybatron cypracoides* (C. B. Adams, 1845), Oranjestad Harbour, Aruba, 1 m, 7.5 mm, source : www.forumcoquillages.com.
- Fig D : *Pachybatron cypracoides* (C. B. Adams, 1845), West Indies, 7.2 mm, source : Faber (2006).
- Fig E : *Pachybatron cassidiforme* Gaskoin, 1853, Martinique, Cap Salomon, 25 m, 5.3 mm, source : Faber (2006).
- Fig F : *Pachybatron cassidiforme* Gaskoin, 1853, Guadeloupe, Ilet Fajou (Grand Cul-de-Sac), 80 m, 6.27 mm, source : Boyer & Lamy (2014).
- Fig G : *Pachybatron kienerianum* (Petit de la Saussaye, 1838), MNHN-IM-2000-517, Venezuela, plages de La Guaira, photographies MNHN.
- Fig H : *Pachybatron olssoni* Wakefield, F. Boyer & McCleery, 2002, spm. holotype, NHMUK 20001283, Eastern Panama, Bocas del Toro Archipelago, NHMUK.
- Fig I : *Pachybatron guadeloupense*, holotype MNHN-IM-2000-31666, Guadeloupe, au large de Saint-François, 250 m, 9.73 mm, source : Boyer & Lamy (2014).
- Fig J : *Pachybatron guadeloupense*, paratype 1, 11.26 mm, Guadeloupe, au large de Saint-François, 250 m, 9.73 mm, source : Boyer & Lamy (2014).
- Fig K : *Pachybatron guadeloupense*, Guadeloupe, sud de la Désirade, 200-250 m, 11.4 mm, source : Boyer & Lamy (2014).
- Fig L : *Pachybatron tayrona* Díaz & Velásquez, 1987, holotype SMF 305966, Colombie, Bahía de Chengue (Parc National Naturel de Tayrona, près de Santa Marta), 10.2 mm, source : Díaz & Velásquez, 1987.



Planche 3

Fig A : *Pachybatron picturatum* nov. sp., spm. holotype, MNHN-IM-2013-60401, LC 6.1 mm, Guadeloupe, nord de la Grande-Terre, expédition KARUBENTHOS 2, Navire océanographique *Antéa*, station DW4545, 16°29.7'N, 61°31.4'W, 14 juin 2015. Photographie : MNHN.

Fig B : *Pachybatron picturatum* nov. sp., Guadeloupe, au large de Saint-François, 250 m, 6.5 mm, source : Boyer & Lamy (2014).

Fig C : *Pachybatron cypraeoides* (C. B. Adams, 1845), Oranjestad Harbour, Aruba, 1 m, 7.5 mm, source : www.forumcoquillages.com.

Fig D : *Pachybatron cypraeoides* (C. B. Adams, 1845), West Indies, 7.2 mm, source : Faber (2006).

Fig E : *Pachybatron cassidiforme* Gaskoin, 1853, Martinique, Cap Salomon, 25 m, 5.3 mm, source : Faber (2006).

Fig F : *Pachybatron cassidiforme* Gaskoin, 1853, Guadeloupe, îlet Fajou (Grand Cul-de-Sac), 80 m, 6.27 mm, source : Boyer & Lamy (2014).

Fig G : *Pachybatron kienerianum* (Petit de la Saussaye, 1838), MNHN-IM-2000-517, Venezuela, plages de La Guaira, photographies MNHN.

Fig H : *Pachybatron olssoni* Wakefield, F. Boyer & McCleery, 2002, spm. holotype, NHMUK 20001283, Eastern Panama, Bocas del Toro Archipelago, NHMUK.

Fig I : *Pachybatron guadeloupense*, holotype MNHN-IM-2000-31666, Guadeloupe, au large de Saint-François, 250 m, 9.73 mm, source : Boyer & Lamy (2014).

Fig J : *Pachybatron guadeloupense*, paratype 1, 11.26 mm, Guadeloupe, au large de Saint-François, 250 m, 9.73 mm, source : Boyer & Lamy (2014).

Fig K : *Pachybatron guadeloupense*, Guadeloupe, sud de la Désirade, 200-250 m, 11.4 mm, source : Boyer & Lamy (2014).

Fig L : *Pachybatron tayrona* Díaz & Velásquez, 1987, holotype SMF 305966, Colombie, Bahía de Chengue (Parc National Naturel de Tayrona, près de Santa Marta), 10.2 mm, source : Díaz & Velásquez, 1987.



Planche 4

Fig A :
Pachybathron picturatum nov. sp.
 spm. holotype, MNHN-IM-2013-60401
 LC 6.1 mm, Guadeloupe, nord de la Grande-Terre
 expédition KARUBENTHOS 2
 Navire océanographique *Antéa*
 station DW4545
 16°29.7'N, 61°31.4'W, 14 juin 2015
 Photographie : Laurent Charles



Fig B :
Pachybathron cypracoides Gaskoin, 1853
 représentation de l'animal vivant
 source : Wakefield et al. (2002)

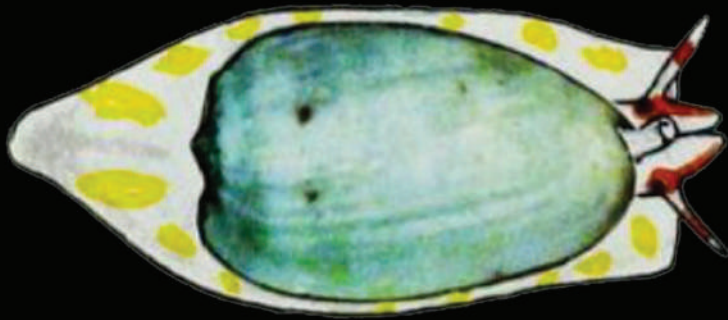


Fig C :
Pachybathron cassidiforme Gaskoin, 1853
 représentation de l'animal vivant
 source : Wakefield et al. (2002)



Fig D :
Pachybathron kienerianum Gaskoin, 1853
 représentation de l'animal vivant
 source : Wakefield et al. (2002)

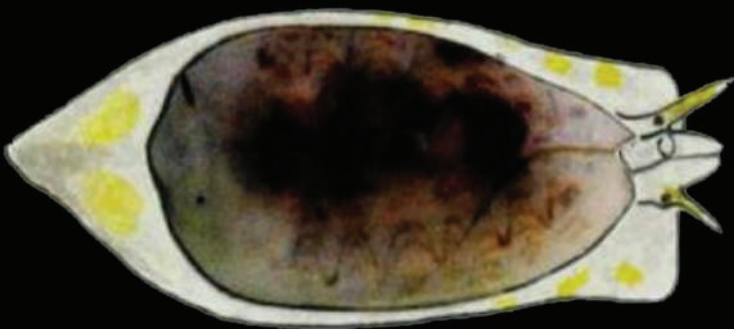


Fig E :
Pachybathron aff. *tayrona* Gaskoin, 1853
 représentation de l'animal vivant
 source : Wakefield et al. (2002)

FIRST RECORD OF THE ALIEN *ELYSIA FURVACAUDA* BURN, 1958 (SACOGLOSSA: ELYSIIDAE) FOR THE MEDITERRANEAN SEA, AND SOME OTHER HETEROBRANCHIA FOR GREECE

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KEYWORDS

Biodiversity, *Elysia*, Greece, Mediterranean Sea, New Alien, Sea Slugs

ABSTRACT

The Hellenic marine malacofauna is affected by current environmental changes, ongoing research, and the introduction of alien species. We first report here the presence of the alien Sacoglossan *Elysia furvacauda* Burn, 1958 in the Mediterranean Sea, together with other records of *Heterobranchia* for the Hellenic waters. Taxonomy is followed by discussion.

INTRODUCTION

The Mediterranean basin is a semi-enclosed geographical area that has been shown to be significant for marine biodiversity, endemism and migration (Cachia *et al.*, 1996; 2001a, b; Galil, 2000; Coll *et al.*, 2010; Danovaro *et al.*, 2010; Lejeusne *et al.*, 2010; Zenetos *et al.*, 2012; Tzomos *et al.*, 2012). With less than 1% of the Earth's oceanic surface the Mediterranean Sea harbours more than 4% of all recorded marine inhabitants and a percentage of endemism assessed at 45% (Bianchi & Morri, 2000; Coll *et al.*, 2010; Costello *et al.*, 2017). At the same time that the area is considered as a hotspot for biodiversity, it is significantly affected by environment alterations, mobility of people and goods, and invasions of allochthonous species with an increasing tendency in the last decades, and in parallel with research efforts (Giunchi *et al.*, 2001; Galil, 2009; Zenetos *et al.*, 2005a, 2012; Crocetta *et al.*, 2013; Öztürk *et al.*, 2015;

Mbazios *et al.*, 2022). Favorable geographical formations such as estuaries, lagoons and marinas, changing climatic conditions and intense human activity (e.g. freight transport, ferries, cruise ships and yachting) constitute factors which drive the spread of non-indigenous species (Galil, 2000; Ameer & Olof, 2008; Bianchi *et al.*, 2012; Manousis *et al.*, 2022). Consequently, due to the geographical position of Greece, a carrefour of aliens, the Hellenic marine molluscan biodiversity 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.*, 2005b; Abdulla & Linden, 2008; Galil *et al.*, 2008; Zenetos *et al.*, 2009; Skliris *et al.*, 2011; Tsiaras *et al.*, 2012). Molluscs represent a high proportion of the global biodiversity with some 100,000 identified species among which some 2500 inhabiting the Mediterranean Sea (Sabelli & Taviani, 2014) which incorporates the higher number of invaders with 156 alien species (Zenetos *et al.*, 2011, 2012; Sabelli & Taviani, 2014; Zenetos & Galanidi, 2020). Out of those 2500 species, some 57% are recorded to inhabit the Hellenic Seas (Manousis, 2021). The latter figure ever increases with new findings, thus bringing out the local malacofauna as a substantial part of the Mediterranean molluscan diversity (Mbazios *et al.*, 2020, 2022; Kontadakis *et al.*, 2021; Kontadakis & Manousis, 2022; Manousis *et al.*, 2022, 2023a-c; Winkel *et al.*, 2025). Mediterranean molluscs exhibit specialized ecological characteristics and feeding modes that directly influence their distribution (Gofas *et al.*, 2011) and this could represent one of the main limiting factors to the establishment of allochthonous species as they need to find appropriate environment and food resources and lack of possible native predators in a new habitat.

The genus *Elysia* Risso, 1818 is the largest group of Sacoglossa, and comprises about one third of all the species of the clade (Händeler *et al.*, 2009). Taxonomy of the group is largely confusing, while there are many undescribed species of the genus (e.g., Carlson & Hoff, 2003; Gosliner *et al.* 2008) as well as several cryptic species (e.g., Jensen, 1997; Pierce *et al.*, 2006) have been found. In addition, some authors even suggested that this genus might be paraphyletic (Bass & Karl, 2006; Händeler & Wägele, 2007). Species of the genus *Elysia* have a rather slender body with a pair of lateral extensions of the dorsum known as parapodia, and a pair of rolled or grooved rhinophores on the head (Thompson, 1973; Thompson & Jaklin 1988; Jensen 1992). Their general body form is conserved with little external variation; hence coloration and color patterns on the body are essential for identification. However, these later characters may be variable depending on the diet, nutrient condition, and/or age (Marcus, 1980; Hirose *et al.*, 2003). Other external characters considered reliable for the species identification include the presence of papillae on the head, the rhinophores, and/or the parapodia (Thompson, 1973; Marcus, 1980; Jensen, 1992). Nevertheless, these characters may be affected by their preservation or be subject to ontogenetic variation (Marcus, 1980). Furthermore, characters such as pattern of dorsal vessels or pericardium shape are not always given in the descriptions of the species. Taxonomic clarification in the genus *Elysia* based on COI and 16S rRNA has been also performed (e.g. Takano *et al.*, 2013). Taking into account the above issues, the objective of this study was to present any new autochthonous and allochthonous molluscs in localities of Crete Island.

METHODS

Searching took place by scuba diving at referent hours and dates in the upper sublittoral zone of Plakias, Crete Island (35.188984°N, 24.396418°E). The records are documented by photography using an Olympus TG 6 camera, macro setting and flash. All web sites were accessed by June 2025.

Results

Abbreviations: FE - further expansion; **G1, G2** - First or second record for Greece; **MS1** - First record for the Mediterranean Sea; **RB** - rocky bottom

Class: Gastropoda

Subclass: Heterobranchia

Superorder: Sacoglossa

Family: Plakobranchidae J. E. Gray, 1840

Elysia furvacauda Burn, 1958 (Fig. 1a). One live individual, 10 mm, 10 m, RB, 18/5/2025, 11:03AM, G1, MS1, recent description in Sea Slug Forum and known only from SE Australia (<https://www.seaslugforum.net/showall/elysfurv>). Our specimen is limaciform in its outlook, with narrow parapodia extending along either side of body for some three-quarters of the total length. The rhinophores are large, auriculate and involute. Body colour greenish-light brown, outer sides of parapodia speckled with numerous small pale blue spots. Upper anterior portion of parapodia greyish-green, while their margins form a blue mid-dorsal line outlined on either side by a line of interrupted white. Neck rather slender, pale pinkish-grey, base of the rhinophores and the neck spotted with white

dots, while the rhinophores are tipped with grey.

Superorder: Nudipleura

Family: Chromodorididae Bergh, 1891

Felimare tricolor (Cantraine, 1835) (Fig. 2a). One live individual, 20 mm, 17 m, RB, 9/5/2025, 11:35AM, FE, description in Gofas *et al.* (2011).

Family: Flabellinidae Bergh, 1889

Paraflabellina gabinieri (Vicente, 1975) (Fig. 2b). One live individual, 50 mm, 20m, RB, 14/5/2025, 14:24PM, G1 (Poursanidis, 2011, as *Piseinotecus gabinieri*), G2, description in Gofas *et al.* (2011, as *Piseinotecus gabinieri*).

Family: Facelinidae Bergh, 1889

Facelina rubrovittata (A. Costa, 1866) (Fig. 2c). One live individual, some 5 mm, 7 m, RB, 12/5/2025, 10:49AM, G1 (<https://www.inaturalist.org/observations/84488068>), G2 (<https://www.naturagraeca.com/ws/#>), FE, description in Gofas *et al.* (2011).

DISCUSSION

Elysia furvacauda seems to be a new alien immigrant for the Mediterranean Basin, as the species originates from the South Indo-Pacific and Australian waters (Burn, 1958). Once again we try to envisage how many more alien species are expected to be established and recorded in new seas.

***Felimare tricolor*.** Care was taken not to confuse young individuals of *F. villafranca* (Risso, 1818) with *F. tricolor* as the former is rather common in the area and at young age bears similarities with *F. tricolor* (Gofas *et al.*, 2011). Based on https://greece.inaturalist.org/listed_taxa/126051257 and <https://obis.org/taxon/597530> (accessed, June 2025) the species has been recently image documented for the Mediterranean Sea - the Greek seas included (three and two times in 2022 and 2024, respectively), twice from North Sporades - Kyra Panagia island (<https://obis.org/taxon/597530>) and from Kalymnos Island (<https://www.kalymnosdiving.gr/sites/default/files/unidentified-2.jpg>). Therefore, it is for rather long known from the whole Mediterranean. The species feeds upon *Dysidea fragilis* (Montagu, 1814) sponges.

Paraflabellina gabinieri is also a known inhabitant of the NW Mediterranean Sea and the West and South Turkey (Poursanidis, 2011) preferring infralittoral rocky substrates with hydrozoans (Gofas *et al.*, 2011).

Facelina rubrovittata is a known inhabitant of the West Mediterranean Sea and the near Atlantic coasts inhabiting infralittoral *Posidonia* meadows (Gofas *et al.*, 2011) and recently recorded in Central Mediterranean Sea (Lombardo & Marletta, 2024), and W Turkey (Poursanidis, 2011). It was recorded by Chris Taklis in SW Thermaikos Gulf (NW Aegean Sea) in June 2020 (<https://www.inaturalist.org/observations/49877484>). In the last few decades, internet sites, such as social networks and amateur observers' groups, have image documented marine organisms, even as first reports. This information represents a supplementary and useful biodiversity source that should be highly appreciated by the scientific community (Jensen, 2013). The recent faunistic works on the Hellenic marine malacofauna has been lately presented in Galinou-Mitsoudi *et al.* (2023) and the relevant biodiversity was last

presented in an annotated catalogue by Manousis (2025). Attentive search based on material management and multifaceted research activity in the field continues to produce and present new records for the area, while international efforts supply the scientific community with new information on species taxonomy and ecology.

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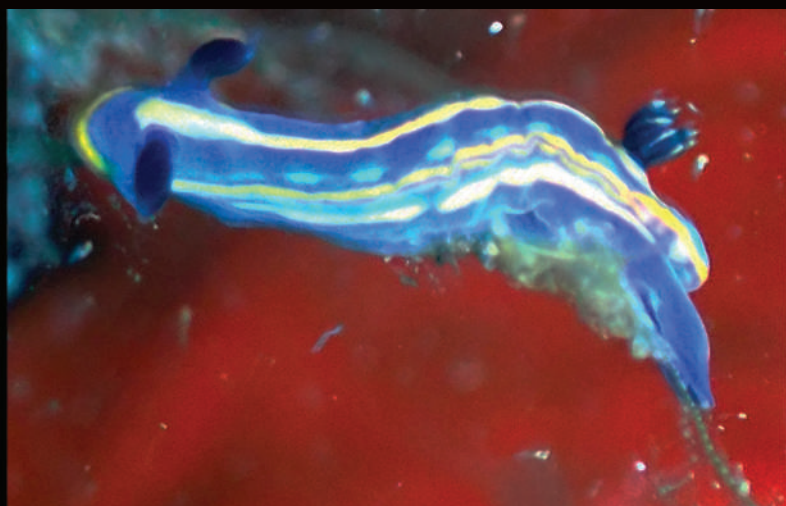
Plate 1.



a

Figure 1: a. *Elysia furvacauda* Burn, 1958.

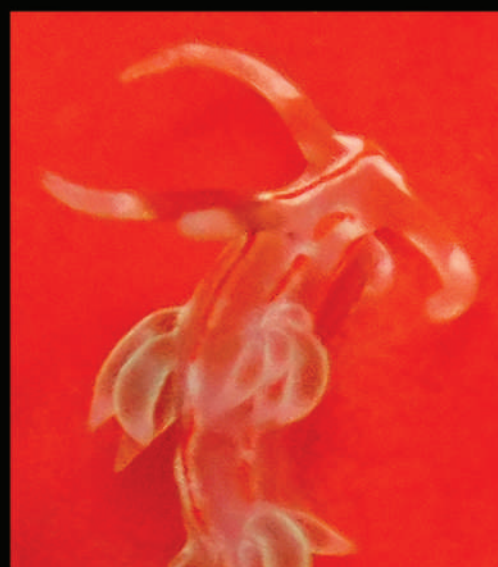
Plate 2.



a



b



c

Figure 2: a. *Felimare tricolor* (Cantraine, 1835); b. *Paraflabellina gabinieri* (Vicente, 1975); c. *Facelina rubrovittata* (A. Costa, 1866).

INTRODUCTION EN BRETAGNE ET DANS LES PAYS DE LA LOIRE D'UNE ESPÈCE DE MOLLUSQUE BIVALVE, *ARCUATULA SENHOUSIA*, POTENTIELLEMENT INVASIVE

INTRODUCTION OF THE POTENTIALLY INVASIVE BIVALVE *ARCUATULA SENHOUSIA* IN BRITTANY AND PAYS DE LA LOIRE

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RÉSUMÉ

Arcuatula senhousia (W.H. Benson, 1842) est une espèce de mollusque bivalve de la famille des Mytilidae originaire de la côte ouest du Pacifique, involontairement introduite par l'homme sur presque toutes les côtes de tous les continents. *A. senhousia* est signalée pour la première fois en Bretagne, dans le département de l'Ille-et-Vilaine, et dans les Pays de la Loire, en Loire-Atlantique. Elle a été récoltée début juillet 2024 dans le port de Saint-Malo, dans le cadre de la mission ATLASea de Dinard. Un exemplaire de l'espèce a aussi été observé dans le port de Saint-Nazaire en août 2024 dans le cadre d'une analyse de la faune benthique de la forme Joubert réalisée par le bureau d'études Bio-Littoral.

ABSTRACT

Arcuatula senhousia (W.H. Benson, 1842) is a bivalve mollusc species from the family Mytilidae, native to the western Pacific coast and unintentionally introduced by humans to nearly all coasts of all continents. *A. senhousia* is reported here for the first time in Brittany, in the Ille-et-Vilaine department, and in the Pays de la Loire region, in Loire-Atlantique. It was collected in early July 2024 in the port of Saint-Malo, as part of the ATLASea mission from Dinard. A specimen of the species was also observed in the port of Saint-Nazaire in August 2024 during an analysis of the benthic fauna of the Joubert dock (conducted by the consultancy Bio-Littoral for the GPMNSN).

INTRODUCTION

Arcuatula senhousia, connue en France sous le nom de «moule asiatique» ou «moule verte asiatique», est une espèce de Mytilidae originaire d'Asie, sur la côte ouest du Pacifique, de la Sibérie à la Malaisie (Crooks, 1996). Son introduction dans d'autres régions du monde date du vingtième siècle et est d'origine anthropique.

Sur les côtes asiatiques du Pacifique, l'espèce est présente en

Nouvelle-Zélande depuis 1980 et en Australie depuis 1983, présence probablement liée au commerce maritime (Willan, 1987). Elle est mentionnée en Inde depuis 1991 (Behera *et al.*, 2019).

Son introduction est plus ancienne sur la côte pacifique américaine. Après un premier signalement en 1924 dans l'état de Washington, elle est retrouvée en 1940 en Californie centrale puis au milieu des années 1960 au sud de la Californie. Des larves provenant de l'eau de ballast de navires marchands sont probablement là aussi la cause de ces introductions (Crooks, 1996).

En Méditerranée, l'espèce est signalée en Israël en 1960, puis d'un lac du Sinaï en 1969 (Barash *et al.*, 1971). Dans le sud de la France, elle est retrouvée dans l'étang de Thau depuis 1982 et signalée de l'étang de Leucate, sa présence étant probablement liée à l'introduction d'huîtres provenant du Japon (Hoenselaar *et al.*, 1989 ; Zenetos *et al.*, 2023). Elle est aussi présente dans le nord de l'Adriatique depuis 1994 dans la lagune de Venise, puis elle a colonisé vers le sud la côte italienne jusqu'à sa partie centrale (Marina di Altidona) (Solustri *et al.*, 2003). Elle est notée aussi de la région de Trieste (Crocetta 2011). La Sardaigne est également concernée en 2003 et 2005 (Delongueville *et al.*, 2005). Elle est signalée en Espagne dans le delta de l'Ebro en 2018 (Lopez-Soriano *et al.*, 2018), puis en Algérie en 2019 (Hamza *et al.*, 2022). Elle est retrouvée en Mer Noire et en Mer d'Azov en 2002 et 2015 (Kovalev, 2017).

En Afrique de l'Ouest, un seul exemplaire a été trouvé en Guinée-Bissau, dans l'archipel des Bijagos en 2018 (Lourenço, 2018). L'aspect plus allongé de la coquille photographiée dans ce document oriente plus vers l'espèce autochtone ouest africaine *Arcuatula elegans*.

Sur la façade atlantique française, elle est observée sur des collecteurs de naissain d'huître japonaise (*Magallana gigas*) importés en France en 1974 pour la baie de Bourgneuf et le trait du Croisic, mais elle n'est pas retrouvée un an plus tard en ces lieux (Gruet *et al.*, 1976), ni depuis. Elle est signalée dans le bassin d'Arcachon en 2007 (Charles, 2007), mais les premières découvertes en ce lieu datent de 2002. Elle est aussi retrouvée à Hossegor et dans l'estuaire de La Bidasoa en 2006 (Bachelet *et al.*, 2009). Plus récemment, les ports de La

Rochelle et de Dunkerque sont concernés en 2018 (Massé *et al.*, 2022), ainsi que l'Angleterre en 2017 (Barfield *et al.*, 2018) et les Pays-Bas en 2018 (Faasse, 2018).

INTRODUCTION

Arcuatula senhousia, known in France as the “Asian mussel” or “Asian green mussel,” is a Mytilidae species native to Asia, along the western Pacific coast, from Siberia to Malaysia (Crooks, 1996). Its introduction into other regions of the world dates back to the twentieth century and is of anthropogenic origin. On the Asian Pacific coasts, the species has been present in New Zealand since 1980 and in Australia since 1983, a presence probably linked to maritime trade (Willan, 1987). It has also been reported in India since 1991 (Behera *et al.*, 2019). Its introduction to the American Pacific coast is older. After a first record in 1924 in the state of Washington, it was found again in central California in 1940 and in southern California in the mid-1960s. Larvae from the ballast water of merchant ships are likely the cause of these introductions as well (Crooks, 1996). In the Mediterranean, the species was first reported in Israel in 1960, and then in a Sinai lake in 1969 (Barash *et al.*, 1971). In southern France, it has been present in the Thau Lagoon since 1982 and reported from the Leucate Lagoon, its presence probably linked to the introduction of oysters from Japan (Hoenselaar *et al.*, 1989; Zenetos *et al.*, 2023). It has also been present in the northern Adriatic since 1994 in the Venice Lagoon, and it has since colonized southward along the Italian coast as far as central Italy (Marina di Altidona) (Solustri *et al.*, 2003). It has also been noted in the Trieste area (Crocetta, 2011). Sardinia was also affected in 2003 and 2005 (Delongueville *et al.*, 2005). It was reported in Spain in the Ebro Delta in 2018 (López-Soriano *et al.*, 2018), and then in Algeria in 2019 (Hamza *et al.*, 2022). It has been recorded in the Black Sea and the Sea of Azov in 2002 and 2015 (Kovalev, 2017). In West Africa, a single specimen was found in Guinea-Bissau, in the Bijagos Archipelago, in 2018 (Lourenço, 2018). However, the more elongated shape of the photographed shell in that report suggests it may rather belong to the native West African species *Arcuatula elegans*.

On the French Atlantic coast, it was observed on collectors of Japanese oyster (*Magallana gigas*) spat imported to France in 1974 for the Bay of Bourgneuf and the Croisic estuary, but it was not found again a year later in those locations (Gruet *et al.*, 1976), nor since. It was reported in the Arcachon Basin in 2007 (Charles, 2007), though the first findings there date back to 2002. It was also found in Hossegor and in the Bidasoa estuary in 2006 (Bachelet *et al.*, 2009). More recently, the ports of La Rochelle and Dunkirk were affected in 2018 (Massé *et al.*, 2022), as well as England in 2017 (Barfield *et al.*, 2018) and the Netherlands in 2018 (Faasse, 2018).

MATÉRIEL ET MÉTHODES

Dans le cadre du programme ATLASEa, l'espèce *Arcuatula senhousia* a été observée lors de la mission d'échantillonnage de Dinard qui s'est déroulée à la station marine du Muséum national d'histoire naturelle du 23 juin au 6 juillet 2024. ATLASEa est un programme de recherche exploratoire visant à séquencer le génome total de 4500 espèces marines de métropole et des territoires ultra-marins. Six spécimens ont été récoltés vivants le 2 juillet 2024 en plongée autonome

entre zéro et sept mètres dans les bassins du port de Saint-Malo. Les prélèvements de paquets de moules (*Mytilus edulis* ou *Mytilus galloprovincialis*) ont été effectués manuellement, sur les parois des quais et sur des objets reposant sur le fond vaseux (valves mortes de *Ostrea edulis*). Ce matériel a ensuite été trié à la station marine de Dinard (CRESCO - Centre de Recherche et d'Enseignement sur les Systèmes Côtiers). Les spécimens de *A. senhousia* étaient fixés aux byssus des moules, entre celles-ci et difficiles à voir (Fig.1). L'espèce ayant déjà été séquencée, les individus ont été conservés dans de l'éthanol.

Dans le cadre d'un échantillonnage réalisé par le bureau d'étude en environnement marin Bio-Littoral, un exemplaire a été récolté vivant le 26 août 2024 dans un bassin à flot près de la porte amont de la forme Joubert, grande écluse du port de Saint-Nazaire. Une analyse sédimentaire et faunistique a été demandée par le GPMNSN (Grand port maritime de Nantes Saint-Nazaire) en vue de travaux de remplacements de cette porte. Le prélèvement a été effectué par benne Van Veen depuis une embarcation. Après tamisage, à bord, à l'eau de mer sur maille de 1mm, les prélèvements ont été fixés dans une solution d'eau de mer formolée à 3%. Au laboratoire, après rinçage et tri, les organismes sont conservés dans de l'éthanol à 70% puis déterminés à l'espèce.

MATERIAL AND METHODS

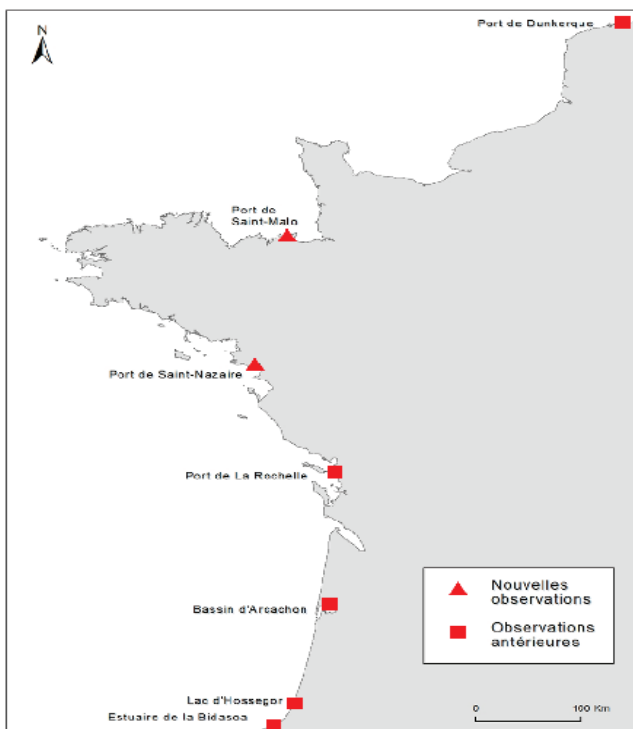
As part of the ATLASEa program, the species *Arcuatula senhousia* was observed during the Dinard sampling mission, which took place at the marine station of the French National Museum of Natural History from 23 June to 6 July 2024. ATLASEa is an exploratory research program aimed at sequencing the complete genome of 4,500 marine species from mainland France and overseas territories. Six live specimens were collected on 2 July 2024 by scuba diving at depths between zero and seven meters in the basins of the port of Saint-Malo. Clumps of mussels (*Mytilus edulis* or *Mytilus galloprovincialis*) were manually sampled from the quay walls and from objects lying on the muddy bottom (dead valves of *Ostrea edulis*). This material was then sorted at the Dinard marine station (CRESCO - Research and Teaching Center on Coastal Systems). The *A. senhousia* specimens were attached to the byssus threads of mussels, hidden between them and difficult to see (Fig. 1). Since the species has already been sequenced, the individuals were preserved in ethanol.

As part of a sampling survey carried out by the marine environmental consultancy Bio-Littoral, one live specimen was collected on 26 August 2024 in a wet dock near the upstream gate of the Joubert lock, the main lock of the port of Saint-Nazaire. A sediment and faunal analysis was commissioned by the GPMNSN (Grand Port Maritime de Nantes Saint-Nazaire) in preparation for replacement work on this gate. The sample was collected using a Van Veen grab from a small boat. Onboard, the material was sieved in seawater through a 1 mm mesh and then fixed in 3% formalin seawater solution. In the laboratory, after rinsing and sorting, the organisms were preserved in 70% ethanol and identified to species level.



Figure 1. exemplaire de *Arcuatula senhousia* de Saint-Malo entre les byssus de moules.

Figure 2. Localisation des observations de *Arcuatula senhousia* sur les côtes françaises atlantique et de la Manche-Mer du Nord.



RÉSULTATS ET DISCUSSION

Systématique de l'espèce :

Embranchement : Mollusca

Classe : Bivalvia

Ordre : Mytilida

Famille : Mytilidae

Genre : *Arcuatula*

Espèce : *senhousia*

Cette espèce, longtemps classée dans le genre *Musculista*, est identifiable par des valves symétriques fines et légèrement quadrangulaires. L'umbo, situé en arrière du bord antérieur, présente quelques côtes radiales tandis que le reste de la

coquille est lisse. Le périostracum est brillant, verdâtre à violacé, avec des lignes rayonnantes foncées additionné le plus souvent de motifs en zigzag concentriques. Ces caractères permettent de distinguer facilement cette espèce des espèces du genre *Mytilus* et du genre *Musculus*.

Arcuatula elegans a un aspect très proche de celui de *A. senhousia* (Cosel *et al.*, 2019), avec une coquille plus allongée et plus fine. Le périostracum est généralement plus clair. Cette espèce, strictement ouest-africaine, a une répartition allant du nord au sud, de la baie de Dakhla (Sahara Occidental), au nord de l'Angola. L'exemplaire photographié dans la publication de Lourenço, provenant des Iles Bijagos en Guinée Bissau correspond bien à cette description.

Arcuatula senhousia est une espèce dont la taille ne dépasse pas 35 mm (Delongueville *et al.*, 2005). Sa durée de vie est inférieure à deux ans (Zenetos, 2016), atteignant la taille de 17 à 23 mm au bout d'un an et exceptionnellement 25 mm (Crooks, 1996).

Les spécimens de Saint-Malo mesurent 7 mm, 10 mm, 10,5 mm, 15,5 mm, 15,5 mm et 21,5 mm de long. Ils sont de couleur verdâtre à brun avec des motifs en zigzag plus ou moins visibles (Fig.3).

Le spécimen de Saint-Nazaire, de 11 mm de long, est de couleur foncée avec des dessins en zigzag bien marqués (Fig.4). La faune benthique associée y est très réduite et constituée essentiellement d'annélides oligochètes et polychètes. Le substrat est caractérisé par un sédiment de type vaseux et riche en matière organique.

Les tailles des spécimens collectés dans les deux sites suggèrent que les individus sont dans leur première année.

RESULTS AND DISCUSSION

Species Systematics:

Phylum: *Mollusca*

Class: *Bivalvia*

Order: *Mytilida*

Family: *Mytilidae*

Genus: *Arcuatula*

Species: *senhousia*

This species, long classified in the genus *Musculista*, is identifiable by its thin, slightly quadrangular, symmetrical valves. The umbo, located behind the anterior margin, shows a few radial ribs, while the rest of the shell is smooth. The periostracum is shiny, greenish to purplish, with dark radial lines often complemented by concentric zigzag patterns. These features make it easy to distinguish this species from those of the genera *Mytilus* and *Musculus*. *Arcuatula elegans* is very similar in appearance to *A. senhousia* (Cosel *et al.*, 2019), with a more elongated and thinner shell. Its periostracum is generally lighter. This strictly West African species ranges from the Bay of Dakhla (Western Sahara) in the north to northern Angola in the south. The specimen photographed in Lourenço's publication, from the Bijagos Islands in Guinea-Bissau, fits this description well. *Arcuatula senhousia* is a species that does not exceed 35 mm in size (Delongueville *et al.*, 2005). Its lifespan is less than two years (Zenetos, 2016), reaching a size of 17 to 23 mm after one year, and exceptionally up to 25 mm (Crooks, 1996). The specimens from Saint-Malo measure 7 mm, 10 mm, 10.5 mm, 15.5 mm, 15.5 mm, and 21.5 mm in length. They are greenish to

brown in color with more or less visible zigzag patterns (Fig. 3). The specimen from Saint-Nazaire, measuring 11 mm in length, is dark in color with clearly marked zigzag patterns (Fig. 4). The associated benthic fauna there was very sparse, consisting mainly of oligochaete and polychaete annelids. The substrate was characterized by muddy sediment rich in organic matter. The sizes of the specimens collected at both sites suggest that the individuals are in their first year.

Figure 3. Exemples de *Arcuatula senhousia* du port de Saint-Malo.

Figure 4. Exemple de *Arcuatula senhousia* du port de Saint-Nazaire.



Ecologie et potentiel invasif :



Arcuatula senhousia colonise habituellement des milieux meubles comme le sable, la vase, les herbiers. On peut aussi la retrouver fixée à des algues, à des substrats durs, à d'autres mollusques, à des objets flottants, où elle est alors moins abondante (Willan, 1987), (Crooks, 1996), (Solustri *et al.*, 2003). En milieu meuble, l'espèce est grégaire. Chaque individu confectionne un «nid» avec du byssus, des particules du substrat et ses pseudofèces, formant un «tapis» pouvant abriter des milliers d'individus au mètre carré, bien endogés dans le substrat et ne laissant affleurer que leurs siphons (Willan, 1987), (Crooks, 1996). L'espèce est euryhaline, avec une préférence pour les estuaires, les lagons (Solustri *et al.*, 2003). Sa concentration en milieu favorable fait qu'elle peut modifier ce milieu avec un impact négatif sur la faune et la flore préexistante (Crooks, 1996).

La présence de *A. senhousia* dans le port de Saint-Malo peut

avoir plusieurs origines : nous sommes ici très proches de la baie du Mont Saint-Michel, haut lieu de la production de moules de bouchot et des individus auraient pu être apportés avec des moules provenant d'une zone infestée par cette espèce. Dans le cas présent, il est plus probable qu'elle soit arrivée dans des eaux ou du sédiment de déballastage, ses larves ayant un stade planctonique long (Crooks, 1996). Le déballastage étant interdit dans et près des ports depuis 2017, son introduction pourrait être antérieure à cette date. Concernant l'exemplaire de Saint-Nazaire, l'introduction de larves par de l'eau provenant d'un navire est plus que probable, l'espèce n'étant pas connue de l'estuaire de la Loire où se pratique la mytiliculture ni de ses environs dont la baie de Bourgneuf, lieu important d'ostréiculture. Il serait intéressant de la rechercher dans les bassins à flot du port où elle pourrait être présente depuis plusieurs années.

Ecology and Invasive Potential:

Arcuatula senhousia typically colonizes soft-bottom habitats such as sand, mud, and seagrass beds. It can also be found attached to algae, hard substrates, other mollusks, or floating objects, although it is less abundant in these situations (Willan, 1987; Crooks, 1996; Solustri *et al.*, 2003). In soft-bottom environments, the species is gregarious. Each individual constructs a "nest" using byssus threads, substrate particles, and its pseudofeces, forming a "carpet" that can shelter thousands of individuals per square meter, deeply embedded in the substrate with only their siphons protruding (Willan, 1987; Crooks, 1996). The species is euryhaline, showing a preference for estuaries and lagoons (Solustri *et al.*, 2003). Its high density in favorable environments enables it to modify these habitats, with a negative impact on the pre-existing flora and fauna (Crooks, 1996).

The presence of *A. senhousia* in the port of Saint-Malo may have several origins: the area is very close to the Bay of Mont-Saint-Michel, a major site for bouchot mussel farming, and individuals could have been introduced along with mussels from an area already infested with this species. In this case, however, it is more likely that it arrived in ballast water or sediment, as its larvae have a long planktonic stage (Crooks, 1996). Since ballast water discharge has been banned in and near ports since 2017, its introduction could date back to before that year.

As for the specimen from Saint-Nazaire, the introduction of larvae via water from a ship is highly probable, as the species is not known from the Loire estuary, where mussel farming takes place, nor from surrounding areas such as the Bay of Bourgneuf, a major oyster-farming site. It would be worth surveying the wet docks of the port, where it may have been present for several years.

CONCLUSION

Arcuatula senhousia vient grossir la liste des espèces introduites en Bretagne et dans les Pays de la Loire. Son arrivée en ces lieux est très probablement liée au transport maritime, bien qu'une introduction du fait de transferts conchylicoles ne puisse être totalement écartée. Les deux lieux où l'espèce a été trouvée sont proches de zones favorables à l'installation de cette espèce, et possiblement en mode invasif : l'estuaire de la Rance et la baie du Mont-Saint-Michel pour la population du port de Saint-Malo, l'estuaire de la Loire et la baie de

Bourgneuf pour la possible population du port de Saint-Nazaire. Il serait donc intéressant de rechercher l'espèce dans ces zones afin de mieux appréhender son expansion.

CONCLUSION

Arcuatula senhousia adds to the list of introduced species in Brittany and the Pays de la Loire. Its arrival in these areas is most likely linked to maritime transport, although an introduction through shellfish transfers cannot be completely ruled out. The two sites where the species was found are close to areas favorable to its establishment, and potentially in an invasive mode: the Rance estuary and the Bay of Mont-Saint-Michel for the population in the port of Saint-Malo, and the Loire estuary and the Bay of Bourgneuf for the possible population in the port of Saint-Nazaire. It would therefore be worthwhile to survey these areas in order to better understand its spread.

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TWO NEW SPECIES OF *JASPIDICONUS* AND *POREMSKICONUS* (GASTROPODA: CONIDAE) FROM THE BRAZILIAN COAST

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ABSTRACT

Two new species of Conidae are described from the Brazilian coast: *Jaspidiconus sabulorum* n. sp., from southern Bahia, and *Poremskiconus spiritussanctus* n. sp., from Guarapari, Espírito Santo. Both species are compared with closely related taxa and distinguished by shell morphology, coloration, and distribution.

Keywords: *Jaspidiconus*, *Poremskiconus*, Abrolhos, Guarapari, Bahian Province, Paulinian Province, Conidae

INTRODUCTION

The Brazilian marine province harbors a rich diversity of Conidae, many of which are endemic. More than half of the currently known Brazilian Conidae species belong to the genera *Jaspidiconus* and *Poremskiconus*, which range from Ceará to Rio de Janeiro. Recent biogeographic analyses have demonstrated that the Amazon River outflow acts as a significant barrier to larval dispersal, preventing exchange between the Caribbean and Brazilian provinces (Petuch, 1980s). Consequently, several Brazilian species previously thought to be Caribbean representatives are now recognized as distinct endemics.

Herein, we describe two new species: a small sand-colored *Jaspidiconus* from Abrolhos, and a *Poremskiconus* from Guarapari long misidentified as *P. archetypus*. Both species are documented, described, and compared to morphologically similar taxa.

SYSTEMATICS

Family Conidae Fleming, 1822

Genus *Jaspidiconus* Petuch, 2003

***Jaspidiconus sabulorum* n. sp.**

Holotype: MNRJ 37.570 (Museu Nacional, Rio de Janeiro, Brazil), 14.0 × 7.5 mm.

Paratypes: 4 specimens, 15.0–17.0 mm, in the author's collection.

Type locality: Recife de Areia, Abrolhos Archipelago, off Alcobaça, Bahia, Brazil; collected at 1–3 m depth on muddy sand.

Distribution: Alcobaça to Corumbau, Bahian Province.

Etymology: From the Latin *sabulorum* ("of the sand"), referring to the uniform sandy coloration of the shell.

Diagnosis and description:

Shell small (14–17 mm), slender, elongate, uniformly sandy beige. Last whorl with ca. 30 fine spiral grooves; sides straight. Protoconch mammillate, of two whorls, concolorous to light pink. Aperture beige.

Comparative remarks:

Distinguished from *J. valianti* Petuch, Coltro & Berschauer, 2020, by larger average size, uniform beige coloration, and absence of nodules on the shoulder. *J. valianti* is smaller (11–14 mm) and yellowish-orange. Differs from *J. kasieae* T. Cossignani, Allary & P. G. Stimpson, 2022, which has a spotted pattern on a white background. Both latter species are also known from the Abrolhos region.

Genus *Poremskiconus* Petuch, 2013

***Poremskiconus spiritussanctus* n. sp.**

Holotype: MNRJ 37.569 (Museu Nacional, Rio de Janeiro, Brazil), 27.0 × 17.0 mm.

Paratypes: 7 specimens, 19.0–31.0 mm, in the author's collection.

Type locality: Off Guarapari, Espírito Santo, Brazil; collected at 30 m depth on low-profile reefs with rubble.

Distribution: Paulinian Province.

Etymology: Named after the Brazilian state of Espírito Santo (*Spiritus Sanctus* in Latin), where the species was collected.

Diagnosis and description:

Shell moderately large (19–31 mm), fusiform, with last whorl displaying light brown and pink hues on a white ground. Median white band with brown flammules. Protoconch pink, globular; spire white, ornamented with 13–18 brown marks. Height/width ratio ≈ 1.85 .

Comparative remarks:

Similar to *P. archetypus* (Crosse, 1865), which is larger (25–45 mm), broader (height/width ≈ 1.7), and predominantly white with brown spotting. The range of *P. archetypus* extends from Salvador (Bahia) to the mouth of the Rio Doce but does not reach Guarapari. *P. brasiliensis* (Clench, 1942) is brown, smaller, and occurs intertidally to 5 m. *P. guarapari* Crabos, Pomponet, Queiroz & Passos, 2022, is orange-brown-white, with a duller, rougher texture, broader last whorl (height/width ≈ 1.7), and flatter spire; it is restricted to Ilhas Rasas near Guarapari (8–20 m).

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Plate 1



Jaspidiconus sabulorum Holotype,
14 mm, off Recife de Areia,
Alcobaça, Bahia, Brazil

Jaspidiconus sabulorum, Paratype 3,
16 mm, off Alcobaça



Jaspidiconus sabulorum, Paratype 1,
15 mm, off Alcobaça



Plate 2.



Poremskiconus sanctusspiritus Holotype,
27 mm, off Guarapari, Espirito Santo



Poremskiconus sanctusspiritus Paratype 3,
23 mm, off Guarapari, Espirito Santo.
Ex collection André Poremski



Poremskiconus sanctusspiritus Paratype 1,
19 mm, off Guarapari, Espirito Santo.
Ex collection André Poremski



Poremskiconus sanctusspiritus Paratype 7,
30 mm, off Guarapari, Espirito Santo.

**FIRST RECORD OF *CLATHROMANGELIA FATAMORGANAE* SCUDERI, REITANO & VILLARI, 2025 (RAPHITOMIDAE)
AND SOME SECOND RECORDS FOR THE HELLENIC SEAS.**

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KEYWORDS

Biodiversity, Greece, Mollusca, New Records

ABSTRACT

The Hellenic marine malacofauna is affected by current environmental changes, ongoing research, and the introduction of alien species. We report here the first presence of the indigenous mollusc *Clathromangelia fatamorganae* Scuderi, Reitano & Villari, 2025 together with several second records from the Hellenic Seas. Taxonomy is followed by discussion.

INTRODUCTION

The recent faunistic works on the Hellenic marine malacofauna has been recently presented in Galinou-Mitsoudi *et al.* (2023) and the relevant biodiversity was last presented in an annotated catalogue by Manousis (2025). Attentive search based on material management and multifaceted research activity in the field continues to produce and present new records for the area, while international efforts supply the scientific community with new information on species taxonomy and ecology.

METHODS

Sampling, handling and species recognition were conducted according to Manousis & Galinou-Mitsoudi (2013) and Mbazios *et al.* (2020) in certain locations of the Hellenic Seas. All 1st and 2nd documented records for the Mediterranean and the Hellenic Seas are listed below with collection data. Findings are presented in Figures 1 and 2. Specimens are deposited in the premises of C. Kontadakis and G. Mbazios. Scientists are welcome to access the biological material for inspection by appointment.

RESULTS

Abbreviations: **G1, G2** - First or second record for Greece;
MB - Mixed Bottom;

The records

Bivalvia

Lutraria magna (da Costa, 1778) (Fig. 1a). 4 fresh shells, MB, 5 m, Mytikas, Aitolokarnania (38°63'51N, 20°99'76E), Ionian Sea, October 2024; 1 fresh shell, MB, 8 m, Kiato, Corinthian Gulf (38°00'52N, 22°45'02E), G1 (Manousis, 2021), G2, description

in Gofas *et al.* (2011).

Gastropoda

Alvania aff. *esmes* Manousis, J. D. Oliver & Zaminos, 2023 (Fig. 1b). One shell, MB, 3 m, Mytikas, Preveza, Ionian Sea (38°59'57N, 20°41'52E), August 2024. Description of *A. esmes* in Manousis *et al.* (2023).

Clathromangelia fatamorganae Scuderi, Reitano & Villari, 2025 (Fig. 1c and 1d). One fresh shell (Fig. 1c), MB, 8 m, Amooopi, Karpathos Island (35°28'40N, 27°11'53E), August 2024, and 1 fresh shell (Fig. 1d), MB, 5 m, Pantocratoras, Preveza (38°56'38N, 20°44'21E), August 2024, G1, description in Scuderi *et al.* (2025). Our fresh specimen (Fig. 1c) is small, 4.3 mm high and 2.1 mm wide, w/h = 0.48, fusiform, outlook elongated and turriculate, with moderately scaled spire, solid, reticulated in sculpture, uniformly chestnut-brown, with surface covered with dense microgranules. It bears a light chestnut-brown paucispiral protoconch, h: 616 µm (606 µm in holotype description), w: 450 µm (420 µm in holotype), diameter 500 µm (510 µm in holotype), subcylindrical, with a whitish nucleus, constituted of 2.2 (2.2 in holotype) rounded whorls slightly shouldered by a thin keel just over the middle of the first whorl. This keel gives rise to a strong upper (adsutural) carina on the last quarter of the whorl. A second lower (absutural) carina appears later on the last portion of the last whorl. These two carinas give rise to the first two spirals of the first teleoconch whorl. Large nucleus with fused papillae forming wick spiral treads and riblets on the following whorls. Teleoconch of 4.5 slightly rounded whorls, with angular shoulder, and deep undulated suture, body w/h ratio 0.67 (0.63 in holotype). Aperture narrowly oval, with sloping outer lip, aperture l/h ratio 0.46 (0.45 in holotype), inner lip with 4 denticles, columella nearly straight, with faint columellar callus, parietal callus weak, connected with a narrow and curved anal sinus, siphonal canal short, slender and straight, sinus short and wide, siphonal fasciole with 4 thin cords, space between primary cords and siphonal fasciole wide and well delimited. Axial sculpture of 11 (12 in holotype) strong, nearly orthocline and straight ribs on the body whorl, slightly narrower than the interspaces, spirals and axials form a reticulate sculpture, with rounded, with wick tubercles at the intersections and square pits in the interspaces. Our specimen (Fig. 1c) has been erroneously identified as *C. granum* in Manousis *et al.* (2018, Fig. 1a). Our second specimen (Fig. 1d) bears the characteristic for the species fine spiral striae on its protoconch above the suture.

Turbonilla cangeyrani Ovalis & Mifsud, 2017 (Fig. 2a). One live individual, MB, 30 m, Lavrio, Attica, Aegean Sea (37°41'N - 24°05'E), October 2024, G1 (Micali *et al.*, 2022), G2, description in Ovalis & Mifsud (2017).

Philinopsis speciosa Pease, 1860 (Fig. 2b). One live individual, *Cymodocea nodosa* thin bed and sand, 2 m, Kalamitsi, Chalkidiki (39°59'26N - 23°59'29E), 8 September 2014, G1 (Winkel *et al.*, 2025), G2, description in Rudmann (1972).

DISCUSSION

Lutraria magna is an uncommon bivalve in the Mediterranean Sea (Repetto *et al.*, 2005), and seems to be rather rare for Greece as the present 2nd records come after nearly 50 years of extensive search by members of our group.

Alvania aff. *esmes* shell bears all the expected characters of the species but the 3rd cord (its onset indicated in yellow, Fig. 1b) over the suture appears between the 1st and 2nd cord from the middle of the body whorl, perhaps representing merely an aberrant form of the species.

Clathromangelia fatamorganae is a very recently described species together with its sibling species *C. martinastellae* Scuderi, Reitano & Villari, 2025 (Scuderi *et al.*, 2025). The two species' morphological characters of the teleoconch are very similar to those of the congeneric and sympatric species of *C. granum* (R. A. Philippi, 1844) (Scuderi *et al.*, 2025) with minor differences in the sculpture of their protoconch which is paucispiral in all three of them but differs in the width and the number of the whorls e.g. 2.2 rounded in *C. fatamorganae*, 1.8 rounded in *C. granum*, and 2.0 rounded in *C. martinastellae*. Our specimens exhibit the same protoconch characters as the holotype and also very similar those of the teleoconch but is slightly wider. We are of the opinion that further search and more available intact specimens from different areas of the Mediterranean will shed light on the pending issue of poecilogony which is under investigation in the family of Raphitomidae (Manousis *et al.*, 2019; Russini *et al.*, 2020).

Turbonilla cangeyrani originally described for Greece from Lefkada Island seems to have a more extended territory.

Philinopsis speciosa of this work was originally identified by its photographer as *Philinopsis cyanea* (E. von Martens, 1879) and photographed 10 years before (8 September 2014) its official first report (24/10/2024, Winkel *et al.*, 2025) an indication that the species may have been established in the Hellenic waters even much earlier.

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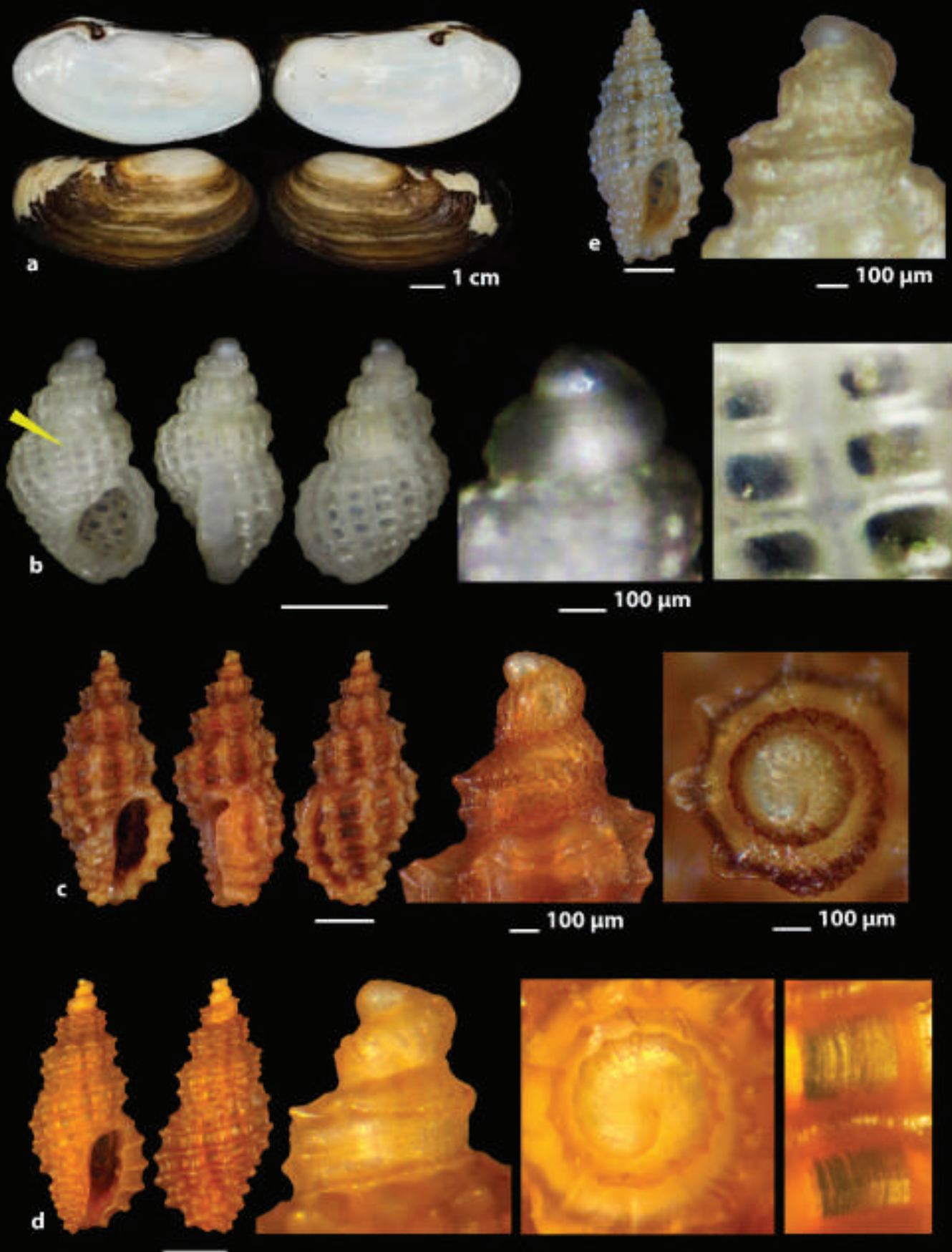
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Plate 1



a. *Lutraria magna* (da Costa, 1778); b. *Alvania* aff. *esmes* Manousis, J. D. Oliver & Zaminos, 2023; c and d. *Clathromangelia fatamorganae* Scuderi, Reitano & Villari, 2025; e. *C. granum* (R. A. Philippi, 1844) for comparison with *C. fatamorganae* protoconches. Barr = 1 mm unless otherwise indicated.

Plate 2



a. *Turbonilla cangeyrani* Ovalis & Mifsud, 2017;
 b. *Philinopsis speciosa* Pease, 1860.
 Barr = 1 mm unless otherwise indicated.

NATICA MARCHEI JOUSSEAUME, 1874 (GASTROPODA, NATICIDAE)
STATUS OF THIS FORGOTTEN SPECIES AND DESIGNATION OF A LECTOTYPE FROM THE COLLECTION OF L'ÉCOLE
SUPÉRIEURE DES MINES DE PARIS – UNIVERSITÉ CLAUDE BERNARD LYON

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INTRODUCTION

In 1874, Félix Pierre Jousseume, french doctor and zoologist described the species *Natica marcheï*, from Malacca (Malaysia) in the «*Revue et magasin de zoologie 3^e série Tome 2*».

To the best of my knowledge, the species has never been identified since this description.

Tryon (1886) proposed a synonymy with *Natica marochiensis* var. *lurida*, which at the time encompassed *Natica marochiensis* (from Atlantic) and *Notocochlis gualteriana* (from Indo-Pacific). Neither species had the characteristic pattern described by Jousseume. None of the illustrations proposed by Tryon matches with *Natica marcheï*. Thus this synonymy can't be retained.

Paetel (1888) proposed (without argument) a synonymy with *Natica mancelli* (*Naticarius mancelli* Jousseume, 1874). This proposal will be discussed further. The species *N. marcheï* has never been mentioned since 1888. However some specimens of this species can be found (collections, Museums) but they are erroneously identified. In a study of specimens from «*L'Ecole supérieure des mines de Paris*», which is housed in University Claude Bernard, Lyon, I found a box containing an unusual shell and a hand-written label with mention «*Marcheï JouS.*». The purpose of this paper is to show that the species described by Jousseume is a valid species name (in accordance with articles 10, 11, 12 and 31.1.2 of ICZN). To prevent future identification errors and stabilize nomenclature of *Naticarius* species of Indo-Pacific by fixing a reference for *Natica marcheï*, the specimen curated in University Claude Bernard, is designated as lectotype of *Natica marcheï* Jousseume, 1874 (in accordance with articles 72.5.6, 74.1, 74.3 ad 74.7 of ICZN).

SUMMARY

After studying original description and figures, an additional description is given, based on type specimen from Ecole des mines and specimens collected in Singapore and Taiwan, but improperly identified. Comparison with similar species of the area shows that *Natica marcheï* Jousseume, 1874 is synonym of none of these species. Therefore *Natica marcheï* Jousseume, 1874 is a valid species (with probably reduced distribution area). The study of the specimen from L'Ecole Supérieure des Mines permits to designate it as lectotype of the species name *Natica marcheï* Jousseume, 1874. Considering operculum and genetic data available, the species must be named *Naticarius marcheï* (Jousseume, 1874).

RÉSUMÉ

Après l'étude de la description et des figures originales, une description complémentaire est donnée, basée sur l'étude du spécimen type de l'Ecole des Mines et d'échantillons récoltés à Singapour et à Taïwan mais mal identifiés. La comparaison avec des espèces ressemblantes de la même région montre que *Natica marcheï* Jousseume, 1874 n'est synonyme d'aucune de ces espèces et qu'elle est bien une espèce valide (avec une aire de répartition géographique restreinte). L'espèce est peu commune, et les rares exemplaires récoltés et étudiés récemment ont été mal identifiés.

L'étude du spécimen de la collection de l'Ecole supérieure des mines permet de le désigner comme le lectotype du nom d'espèce *Natica marcheï* Jousseume, 1874. Compte tenu de son opercule et des données génétiques disponibles, l'espèce doit être nommée *Naticarius marcheï* (Jousseume, 1874).

ABBREVIATIONS

ESMP UCBL. Collection of Ecole supérieure des mines de Paris – Université Claude Bernard Lyon.

MNHN. Collection of Muséum national d'Histoire naturelle de Paris.

NMR. Natuurhistorisch Museum Rotterdam.

ZMB. Museum für Naturkunde. Berlin.

CNP. Collection Nicolas Paquien : Author's collection.

ORIGINAL DESCRIPTION

«*Natica marcheï*. Pl II, fig. 9, 10.

- Coquille ombiliquée, ovoïde, épaisse, solide et à tours de spire plus moins déprimés près de la suture. On aperçoit, à sa surface, des stries longitudinales très fines, serrées et irrégulières, et, près de la suture, des côtes obliques, très fortes et irrégulières, sur lesquelles se prolongent les stries de la surface.

- Sa couleur est d'un blanc grisâtre, maculé de jaune sale. Sur le dernier tour, la teinte jaunâtre forme deux bandes mouchetées de blanc ; ces mouchetures, sur la bande inférieure, affectent la forme de petits carrés, qui constituent, par leur réunion, une bandelette assez étroite, qui n'existe pas sur tous les individus. Les deux bandes jaunes sont séparées par une zone blanche, interrompue, de distance en distance, par des flammules longitudinales ; en arrière de la bande postérieure, on aperçoit également des flammules jaunâtres, assez larges et assez espacées, se dirigeant du côté de la suture. En avant de la bande antérieure, de petits quadrilatères jaunâtres, assez

espacés, se dessinent sur la partie blanche qui entoure l'ombilic, dans une assez large étendue. Sur les tours précédents, on ne retrouve plus que la bande jaune postérieure et les flammules qui la couronnent.

- La spire est composée de cinq tours et demi, convexes et arrondis chez certains sujets, mais qui d'autres, présentent, près de la suture, un aplatissement très marqué. Ces tours, séparés par une suture étroite, canaliculée et légèrement crénelée, se développent d'une manière régulière et rapide, le dernier, formant à lui seul la majeure partie de la coquille, alors que le premier est blanc, lisse, et si petit qu'on ne peut guère le voir sans le secours d'un verre grossissant.

- L'ombilic, largement ouvert en dehors, est très étroit et très profond au niveau de l'avant dernier tour ; il est entouré d'une marge carénée, bordée en dehors d'un petit sillon superficiel, qui la sépare du reste de la coquille. Dans sa partie interne, il est obturé par un funicule semi-cylindrique, assez robuste, contourné en spirale, et séparé de la marge de l'ombilic par un sillon très profond en arrière, et qui devient plus large, plus évasé, moins profond et presque superficiel près de la partie antérieure.

- L'ouverture est semi-lunaire et blanche, avec une tache violacée dans le fond. Elle occupe un plan très peu oblique à l'axe, son péristome est continu, et son bord externe, mince, droit et tranchant, décrit une courbe en arc de cercle. Le bord columellaire, plus épais que le précédent, présente une légère courbure à concavité tournée du côté de l'ouverture, et au niveau du funicule, une dépression visible lorsqu'on l'examine horizontalement ; ce bord se relie en arrière à l'externe, par l'intermédiaire d'une large et épaisse callosité, soudée à l'avant dernier tour, et séparée du funicule par une échancrure profonde et anguleuse. Le bord columellaire, assez épais en avant, s'unit à la marge de l'ombilic, qui semble se continuer pour s'unir au bord externe, en constituant, en avant de la coquille, un prolongement un peu anguleux.

Dimensions : long. 21 mill. ; larg. 20 mill. ; épais. 13 mill. ; ouverture : long. 15 mill. ; larg. 9 mill.

Habitat : Cette espèce a été recueillie à Malacca, par M. Marche, dont nous devons lui donner le nom. L'exemplaire que nous avons fait figurer appartient à la collection de l'Ecole des mines. »

AUTHOR TRANSLATION

Shell umbilicated, ovoid, thick, solid, whorls more or less depressed near the suture. Surface sculpted with very thin irregular and narrowly spaced longitudinal striae, extending in strong oblique irregular subsutural folds.

Colour greyish-white, splashed with dirty-yellow. Last whorl with two yellowish bands speckled with white ; rather narrow strip of small white squarish dots on the lower band ; some specimen do not share this feature. The two yellowish bands are separated by a white area, interrupted by longitudinal sinuous elongated spots. Behind the posterior band, broad spaced yellowish sinuous elongated dots are directed toward suture. In front of anterior band, umbilicus is surrounded by small yellowish spaced quadrangles. Previous whorls only have posterior yellowish band and broad spaced yellowish sinuous elongated blotches.

Spire consisting of 5 ½ whorls, rapidly increasing, convex and rounded in some specimens ; others have a flat subsutural area. Suture narrow, canaliculated and slightly serrated. First

whorl white, smooth, inconspicuous without magnifying glass. Umbilicus open, very deep and narrow ; surrounded by a carinated margin, bordered outside by a small and shallow furrow. Spiral rather thick semi-cylindrical funicle filling anterior part of umbilicus. Funicle separated from umbilical margin by a very deep posterior furrow, becoming wider and shallower anteriorly.

Aperture semi-lunar, white, stained with purplish at the back, slightly oblique. Peristome continuous, outer margin thin, straight, sharp. Columellar lip thicker, slightly concave, funicle area depressed. Broad thick parietal callus, separated from funicle by a deep angular notch. Columellar edge rather thick anteriorly, merging with umbilical margin, which continues and merges with outer edge, creating a rather angular anterior extension.

Dimensions : length 21 mill. ; width 20 mill. ; thickness 13 mill. ; aperture : length 15 mill. ; width 9 mill.

Habitat : This species is named after Mr. Marche, who collected specimens in Malacca.

The specimen drawn belongs to the « Ecole des mines » Collection.

Two figures illustrate the description. (Figure 1).

Original color drawing (9) is a dorsal view, showing a well-marked suture and subsutural folds. The different whitish and yellowish spiral bands precisely described are harder to identify. Original black-and-white drawing (10) is a ventral view, showing aperture and umbilical area fully compliant with the text. A spiral band with quadrangular blotches is recognisable in the upper part.

STUDY OF *N. MARCHEI* SPECIMENS FROM SINGAPORE AND TAIWAN (WITH INITIAL WRONG IDENTIFICATION)

Rare specimens from Singapore (figure 2, erroneously identified as *Natica seychellium*, figure 3, erroneously identified as *Naticarius sertatus* and figure 13 erroneously identified as *Naticarius zonalis*) and from Taiwan (figure 4, erroneously identified as *Naticarius zonalis*.) have been collected.

These specimens share following features :

Size : 18 – 20 mm.

Shell rather thick, globose to globose elongate. Spire rather high and pointed. Whorls rounded, upper part sometimes flattened. Deep subsutural folds extended into thin transversal striae.

Colour : alternation of six spiral white and light brown bands. The pattern is constant :

From top to bottom : a- thin white subsutural band ; b- wider white band marked with light brown sinuous elongated blotches ; c- light brown band ; d- white band bordered with two rows (sometimes merged) of regularly spaced brown square blotches ; e- light brown band ; f- thin band of brown square to rectangular blotches on a white background. Base and umbilical area white.

Aperture : white, brown tinged at the back. Oblique inner lip, slightly concave.

Umbilicus : open, deep.

Callus : Parietal callus rather thick, filling posterior angle of aperture. Umbilical callus white, rounded, extended by a broad spiral funicle. Funicle and umbilical wall folded.

Protoconch : brownish. Nucleus whitish, about 275 µm. 1st embryonic whorl about 880 µm. (Figure 14).

Operculum : calcareous, white. Nucleus area brownish. Thin inner corneous layer. Operculum marked with 9 to 12 grooves. Such operculum is characteristic of the genus *Naticarius* Duméril, 1805.

Animal : (after Kang & al. 2018) foot translucent white. Tight orange-red spots on the propodium. Metapodium with thin radiating shining white lines and more widely spaced orange spots.

LOCATION

Malaysia (Malacca, type locality), I also include Singapore and Taiwan, in view of the errors in identification previously demonstrated. The species should be endemic of this geographic area (Malacca straight and South China Sea).

COMPARISON WITH RELATED SPECIES FROM INDO-PACIFIC

Naticarius sertatus (Menke, 1843), *Natica seychellium* R. B. Watson, 1886 and *Naticarius zonalis* (Récluz, 1850) have been confused with *N. marche*, therefore it is necessary to compare the 4 species.

Naticarius concinnus (Dunker, 1860), *Naticarius colliei* (Récluz, 1844), and *Naticarius manceli* (Jousseaume, 1874) have folded subsutural area, open umbilicus with rounded callus and spiral funicle, spiral rows of blotches or spiral bands, they will also be compared with *N. marche* to prevent future identification mistakes.

Naticarius sertatus (Menke, 1843) (unfigured, from “litore occidentali” 16 – 30 mm) and *Natica seychellium* R. B. Watson, 1886 (from Seychelles, described as *Natica maheensis* Reeve, 1855 not Dufo, 1840, renamed *Natica seychellium* Watson, 1881. 25 – 28 mm. Figure 5) have a shell with white background and two wide broken brown spiral bands.

Operculum of *N. seychellium* is not known, that of *N. sertatus* has a white small nucleus and 7 grooves.

The pattern is also completely different from that of *Naticarius marche*.

Protoconch of *N. seychellium* is white, nucleus white, about 200 µm, 1st embryonic whorl about 950 µm. Protoconch of *N. sertatus* is brownish, nucleus about 170 µm, 1st embryonic whorl about 550 µm.

Pattern, protoconch and operculum clearly show that the two species can't be synonymised with *Naticarius marche*.

Naticarius zonalis (Récluz, 1850) (from Fidji Island. 10 – 20 mm. Figure 6) have a shell with whitish background and 2 spiral brownish-red bands, sometimes confluent. Brownish periostracum. Operculum calcareous, white, with 6 - 9 grooves. Pattern is completely different from that of *Naticarius marche*. Protoconch is whitish, nucleus about 70 µm, 1st embryonic whorl about 200 µm (Huelsen & al. 2011).

Kang & al. (2018) sequenced mitochondrial genes COI and RNA16S for some twenty species of Naticidae. The Taiwanese species identified as *Naticarius zonalis* Récluz, 1850 (figure 4) shows all specific conchylological and geographical characteristics of *Naticarius marche*. For me this Taiwanese specimen is a *N. marche*, thus this genetic study does concern *N. marche* and not *N. zonalis*.

The comparison of COI gene of Australian *N. zonalis* and

Taiwanese *N. marche* specimen shows they are very close together without being identical. This supports two different species. 16S RNA of Australian and Taiwanese specimens are identical. This genetic proximity is consistent with their grouping in *Naticarius* genus.

Naticarius concinnus (from Japan. Figures 7, 8). The species is often mistaken for *Naticarius colliei* from Australia.

Shell rather small, background greyish light brown, with 2 spiral rows of brown blotches. Blotches of the 2 rows are sometimes confluent. Protoconch is brownish, nucleus whitish, about 350 µm, 1st embryonic whorl about 900 µm. Operculum calcareous with 7 grooves. These shell features are clearly different from that of *N. marche*.

Naticarius colliei (Récluz, 1844) (from Australia. 12 – 19 mm. Figure 9) have a shell with white background and 4 - 5 spiral rows of rather rectangular orange-brown blotches. Protoconch is white, nucleus white, about 150 µm, 1st embryonic whorl about 400 µm. Operculum with 7 – 8 grooves. These shell features are clearly different from that of *N. marche*.

Naticarius manceli (Jousseaume, 1874) (From Mauritius Island. 16 – 25 mm. Figure 10) is the species with the most similar pattern, without, however, being identical. Background whitish brown. Four spiral white bands with brown blotches. Protoconch is brownish, nucleus brownish, about 350 µm, 1st embryonic whorl about 470 µm. Operculum of *Naticarius manceli* have 9-10 grooves. Umbilical callus is often stained with a brown blotch. These characteristics are different from that of *N. marche*.

None of these species shares shell and operculum features with *N. marche*. Thus *N. marche* is a distinct species.

DESIGNATION OF THE LECTOTYPE FROM ÉCOLE DES MINES

A first point is the storage location of the specimen. The end of the original description states : « *The specimen drawn belongs to the Ecole des mines Collection.* ». After examining the entire Naticidae collection of the Ecole supérieure des mines, no other specimen was found.

The second point is the specimen (Figure 12, H : 19 mm). It is quite eroded, with scars on the last whorl. It presents the shell characteristics described by Jousseaume. Dimensions (length and width) are similar but not identical to the description, but Jousseaume used several specimen for his text.

The hand-written label is the third point (Figure 11). The name « *Marchei* » is written, associated with the name Jousseaume (« *JouSs* ») as well as the location « *Malacca* », which corresponds to the type locality.

Thus this specimen have been used by Jousseaume, and was drawn to illustrate the original description. It is not an Holotype by monotypy since several specimen were used for description. These arguments allow to designate this specimen (UCBL-EM 33469) as lectotype of *Natica marche* Jousseaume, 1874.

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Plate 1

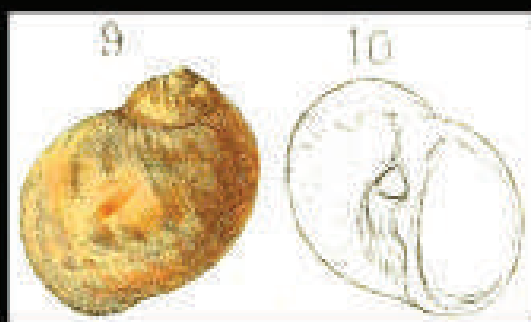


Figure 1. Original figures of *Natica marchei*

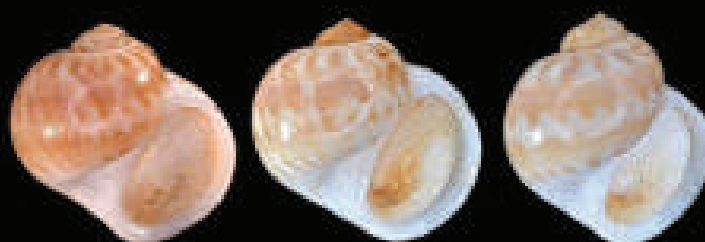


Figure 2. *Naticarius marchei* (Jousseaume, 1874)
Singapore, East Coast Park. © Femorale.com



Figure 3. *Naticarius marchei*
Singapore, East Coast Park
NMR 96343



Figure 4. *Naticarius marchei*
14.4 mm. Taiwan. Tongliang. Kang & al. (2018)



Figure 5. *Natica mahensis* Reeve, 1855
Seychelles Islands. Mahé. Reeve (1855)
Pl. XIV, Sp. 58. Figs. 58a, 58b, 58c.

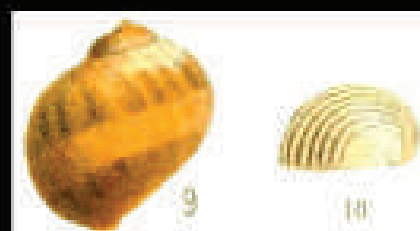


Figure 6. *Natica zonalis* Récluz, 1850
Fidji Island. Récluz (1850). Pl. XIV, Figs. 9, 10.

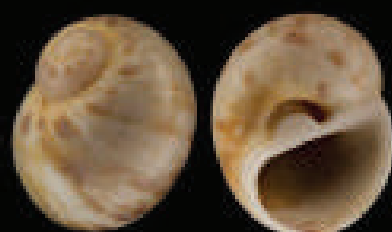


Figure 7. *Natica concinnus* Dunker, 1860
Lectotype. ZMB Moll. 10195
Japan



Figure 8. *Natica concinnus* Dunker, 1860
Dunker (1861) Pl. II, Fig. 21

Plate 2



Figure 9. *Natica collei* Récluz, 1844
Australia. Swan River (1855)
Pl. XXIV. Sp. 112. Figs. 112a, 112b.



Figure 10. *Natica mancelli* Jousseaume, 1874
Muséum national d'Histoire naturelle, Paris, France
Mauritius Island. MNHN-IM-2000-5229

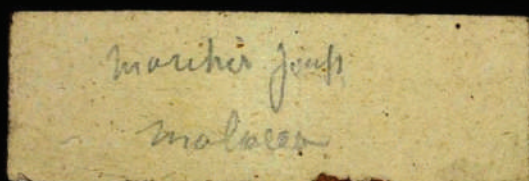


Figure 11. Original hand-written label of
*Natica marche*i specimen from
Ecole des mines. UCBL Lyon, France



Figure 12. Lectotype of *Natica marche*i Jousseaume, 1874. UCBL-EM 33469. Malacca.



Figure 13. *Naticarius marche*i (Jousseaume, 1874)
Singapore. Changi beach. CNP-2023-015



Figure 14. Protoconch of the lectotype
of *N. marche*i. UCBL-EM 33469

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