New species of Muricidae Rafinesque, 1815 (Mollusca: Gastropoda) from the Western Indian Ocean

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ABSTRACT
Ten new species of Muricidae Rafinesque, 1815 are described from material collected during expeditions in Madagascar. Five species are described from the Extreme South: Vokesimurex rectaspira n. sp., Timbellus goniodes n. sp., Flexopteron akainakares n. sp., Murexsul mananteninaensis n. sp. and Typhinellus constrictus n. sp.; four from the Northwest: Vokesimurex aliquantulus n. sp., Timbellus pannuceus n. sp., Typhinellus laminatus n. sp. and Siphonochelus (Siphonochelus) aethomorpha n. sp.; and a single species, Bouchetia wareni n. sp., is described from both the Extreme South and the Northwest and is also reported from Mayotte. Similar species from Madagascar, Mozambique and from other regions of the Indo-West Pacific are compared. The radulae of Vokesimurex rectaspira n. sp., Flexopteron akainakares n. sp., Flexopteron primanova (Houart, 1985) and Bouchetia vaubanensis Houart, 1986 are illustrated.

KEY WORDS
Mollusca, Gastropoda, Muricidae, Western Indian Ocean, new species.

MOTS CLÉS
Mollusques, Gastéropodes, Muricidés, Océan Indien occidental, espèces nouvelles.

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RÉSUMÉ
INTRODUCTION

Our knowledge of the marine biodiversity of Madagascar is to a very large extent based on research carried in the regions of Nosy-Be and Tulear (Toliara), both located in the “Western and Northern Madagascar” marine ecoregion (Spalding et al. 2007) and characterized by extensive coral reefs ecosystems. By contrast, the “Deep South” of Madagascar is an oceanic region of exposed promontories, open bays and extensive algal belts. The lack of infrastructures has arguably made it the least visited and least known coastline in the country. The marine hydroclimate is characterized by a coastal upwelling with cold surface water and high concentrations of chlorophyll-a (Lutjeharms & Machu 2000), with winter sea surface temperatures as low as 21.5°C, vs 24-25°C or more elsewhere around Madagascar (Piton & Laroche 1993). From the late 1990’s, new species of molluscs started to be discovered on the coastline of the Nosy and Androy regions, first serendipitously as a by-product of the local lobster fishery (e.g., Bouchet 1999), and later specifically attracting shell collectors and amateur taxonomists (e.g., Bozzetti 2001, 2006, 2011). These scattered findings and the unique oceanographic background, together suggested that the “Deep South” of Madagascar had a potential for more discoveries, and this was what motivated a large-scale exploring expedition by the Muséum national d’Histoire naturelle (Paris, France) that sampled the benthos of the region in April-June 2010. The name of the Expedition, ATIMO VATAE, means “Deep South” in the Antandroy language. For baseline information on the project, see http://laplaneterevisitee.org/en/87/accueil. Beside ATIMO VATAE, the MIRIKY expedition, using a local trawler, surveyed the benthic fauna off NW Madagascar between Cap d’Ambre and Cap Saint-André.

The results of the ATIMO VATAE and MIRIKY expeditions are now starting to be published and confirm the “Deep South” of Madagascar as a site of high endemism, with many new species. For instance, 39 of the 70 species of Cerithiopsideidae H. Adams & A. Adams, 1854, and six of the eight species of Calliostomatidae Thiele, 1924, collected were new to science (Cecalupo & Perugia 2014; Vilvens 2014). With over 120 species, the family Muricidae Rafinesque, 1815 is well represented in the expeditions material. Houart & Héros (2013) described six new species, and ten more are described in the present paper — five from the “Deep South” and five from the North-West, with no overlap between the two regions. A forthcoming regional monograph will cover the family in its entirety, presenting new regional records, revising the nominal species with a Madagascar Deep South type locality, including molecular barcodes for many species, and discussing endemism (in collaboration with Marco Oliverio University La Spienza, Roma).

MATERIAL AND METHODS

The material studied in the present paper originates mainly from two recent, ATIMO VATAE and MIRIKY expeditions. The ATIMO VATAE expedition was organized by the Muséum national d’Histoire naturelle (MNHN, Paris), the Institut d’Haliutique et des Sciences marines, University of Toliara (IH.SM), and the Wildlife Conservation Society (WCS) Madagascar Programme to explore the coastal marine fauna and flora in a cold oceanic region of rugged promontories, open bays and extensive algal belts. The ATIMO VATAE cruise collected 118 species of Muricidae (excluding Coralliophilinae Chenu, 1858) during April-June 2010. Tissue samples were clipped from many of them for DNA sequencing.

The MIRIKY expedition formed part of a cluster of Mozambique-Madagascar expeditions funded by the Total Foundation, the Prince Albert II of Monaco Foundation, and the Stavros Niarchos Foundation, and conducted by MNHN and Pro-Natura International (PNI).

The Madagascan trawler Mirky explored the Northwest of Madagascar, between Cap d’Ambre, in the North, and Cap Saint André, in the West. In 20 days during June and July 2009, the MIRIKY made 140 dredgings and trawlings. The objective of this expedition was to explore a less studied zone, the North of the Mozambique Channel, near Madagascar, in depths between 100 and 1200 m.

Other material described was collected by A. Crosnier, off NW Madagascar, in 1972-73, aboard R.V. Vauban and during the BENTHEDI expedition in 1977, aboard R.V. Suroit (northern Mozambique Channel).

Empty shells reported here were collected in depths from 21 to 600 m, live collected specimens from 13 to 492 m.

METHODS FOR MORPHOLOGICAL TAXONOMY

The characters used here to describe shell morphology are the general aspect of the shell, shape and size, colour, shape of the spire and number of protoconch and teleoconch whorls, features of the protoconch, shape of the teleoconch whorls and features of the suture and of the subsutural band, axial and spiral sculpture, aperture and siphonal canal. When known, the characters of the operculum and radula are also used.

The morphology of the radula is described starting from the rachidian tooth followed by the lateral teeth.

Unless otherwise mentioned, the species descriptions are based on all the examined specimens or on a representative selection of them, including the holotype and the other specimens of the type material.

All the material studied is deposited in the MNHN unless otherwise indicated.

ABBREVIATIONS

Repositories

Coll. RH Collection Roland Houart, Ezemaal, Belgium;
IRD Institut de Recherche pour le Développement (formerly ORSTOM);
MNHN Muséum national d’Histoire naturelle, Paris;
ORSTOM Office de la Recherche scientifique et technique d’OutreMer (now IRD).

Field work

CP chalut à perche (Beam trawl);
DW drague Warén (Warén dredge).
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**Specimens**
ad adult;
dd empty shell(s);
juv juvenile;
lv live collected specimen(s).

Terminology used to describe the spiral cords and the apertural denticles (after Merle 2001 and 2005) (Fig. 2A-E). Terminology in parentheses: variable feature.

Convex part of teleoconch whorl and siphonal canal
ab abapical;
abis abapical infrasutural secondary cord (on subsutural ramp);
ABP abapertural primary cord on the siphonal canal;
abs abapertural secondary cord on the siphonal canal;
ad adapical;
adis adapical infrasutural secondary cord (on subsutural ramp);
ADP adapertural primary cord on the siphonal canal;
ads adapertural secondary cord on the siphonal canal;
IP infraparietal primary cord (primary cord on subsutural ramp);
MP median primary cord on the siphonal canal;
ms median secondary cord on the siphonal canal;
P primary cord;
P1 shoulder cord;
P2-P7 primary cords of the convex part of the teleoconch whorl;
s secondary cord;
s1-s7 secondary cords of the convex part of the teleoconch whorl (example: s1 = secondary cord between P1 and P2; s2 = secondary cord between P2 and P3, etc.);
SP subapertural cord;
t tertiary cord.

Aperture
D1 to D6 abapical denticles;
ID infrasutural denticle.

Morphology of the radula (Fig. 1)
cc central cusp;
ild inner lateral denticle;
lc lateral cusp;
Id lateral denticle;
LT lateral tooth;
ma marginal area;
mc marginal cusp;
md marginal denticles;
old outer lateral denticle;
RT rachidian tooth.

SYSTEMATICS

Family MURICIDAE Rafinesque, 1815
Genus Vokesimurex Petuch, 1994

**Type species.** — *Murex messorius* Sowerby II, 1841, Western Atlantic (by original designation).

Vokesimurex rectaspira n. sp. (Figs 3A-G; 5A; 14A)

**Type material.** — Holotype (lv) MNHN-IM-2009-14501 BOLD ID BOMGA022-15, GenBank accession number KP697995 for COI gene KC860506; 3 (lv) & 3 (dd) IM-2000-30001; 1 paratype coll. RH (all from type locality).

**Type locality.** — Southern Madagascar, Southwest of Pointe Barrow, 25°03’S, 44°00’E, 132-153 m [ATIMO VATAE: stn CP3589].

**Material examined.** — Known only from the type material.

**Distribution.** — Southern Madagascar, taken alive at 132-153 m.

**Etymology.** — Latin, *rectaspira*, *rectus* (straight) and *spira* (spire). This species is named for its flattened spire outline.

**Description.** Shell small for the genus, up to 41.2 mm in height at maturity (holotype MNHN). Height/width ratio 2.9 (holotype MNHN). Slender, lanceolate, weakly spinose, lightly built. Shoulder ramp strongly sloping, weakly concave. Beige or light tan with brown or dark brown spiral cords. Aperture glossy white.

Spire high with 2.10 protoconch whorls and teleoconch with up to six weakly convex and weakly shouldered whors. Suture slightly impressed. Protoconch moderately broad, weakly conical, whors rounded, last whorl minutely punctate, glossy, maximum width of last whorl 1000 μm and first whorl 700 μm (holotype). Terminal lip heavy, narrow, erect and curved.

Axial sculpture of teleoconch whors consisting of high, rounded varices and ribs, each varix with a single, short, acute, narrow, narrowly open primary shoulder spine (P1). First whorl with 11 or 12 ribs, second with 9-12, third with 8-10, fourth to last whorl with three narrow, rounded, high varices and two intervarical, high, narrow ribs. Spiral sculpture of narrow, smooth, primary, secondary and tertiary cords. First and second teleoconch whors with IP, P1, P2, (S2), P3, P4, third whorl with (abis), IP, P1, (s1), P2, s2, P3, (s3), P4, fourth and fifth with adis, IP, abis, P1, S1, P2, s2, P3, s3, P4, last whorl with adis, IP, abis, P1, s1, P2, s2, P3, s3, P4, s4, P, s5, P6, s6, P7, s7, ADP, ads, MP, ms, ABP, abs, EAB1, eabs1, EAB2, eabs2, EAB3, eabs3, followed by several shallower spiral cords. Only P1 ending as short, acute, narrow varicelar shoulder spine.

Operculum dark brown, roundly-ovate with subapical nucleus. Attached with about four growth lines and broad, callused rim.

Radula (Fig. 14A) typical for the genus, with a rachidian bearing a long, triangular central cusp, a small lateral denticle and a broad, triangular, medium sized lateral cusp, marginal area smooth. Lateral tooth sickle shaped, broad.

**Remarks**

*Vokesimurex rectaspina* n. sp. differs from the superficially similar *V. gallinago fernandesii* Houart, 1990 from Mozambique (Fig. 3H, I) by having a more regularly-shaped protoconch, with a narrower, more strongly curved terminal lip with slightly more numerous whorls, 2.10-2.15 as opposed to 1.75-2.0 in *V. gallinago fernandesii* and with a narrower first whorl (width 700 μm vs 900-1100 μm). *Vokesimurex rectaspina* n. sp. is also more slender with a higher spire consisting of more numerous teleoconch whorls for a similar shell height and also differs by having a flatter as opposed to a more rounded or occasionally weakly concave spire outline in *V. gallinago fernandesii*, and by having narrower primary spiral cords on the siphonal canal.

Another *Vokesimurex* species occurring in northern Madagascar, namely *V. dolichorbus* (Ponder & Vokes, 1988) (Fig. 3J-L) differs also in many ways in its protoconch and teleoconch characters.

### Vokesimurex aliquantulus n. sp.

**(Figs 3M, N; 4A-E; 5B)**


**Type locality.** — Madagascar, between Nosy Be and Banc du Leven, 12°39’S, 48°22’E, 70-74 m [MIRIKY: stn CP3206].

**Material examined.** — Known only from the type material.

**Distribution.** — Northern Madagascar, taken alive at 70-74 m.

**Etymology.** — Latin, *aliquantulus*, little, small. This species is named for its small size relative to the other *Murex s.s.* species.

**Description.**

Shell small for the genus, up to 33.1 mm in height. Height/width ratio 2.3 (holotype). Slender, lanceolate, narrowly-ovate, nodose, lightly built. Shoulder ramp strongly sloping, weakly convex.

White with occasionally a very light brown darker band on P1 and P2, more obvious on P2 and on axial varices, and between P6 and P7. Aperture white.

Spire high with 1.75-2.00 protoconch whorls and teleoconch up to 6.25, convex, narrow, weakly shouldered, nodose whorls. Suture impressed. Protoconch small, whorls rounded, smooth, occasionally with a narrow keel abapically, width 700 μm. Terminal lip heavy, broad, erect, weakly curved.

Axial sculpture of teleoconch whorls consisting of low, narrow, rounded ribs and high, rounded, weakly spinose varices. First whorl with 11 or 12 ribs, second with 11-13, third with 10-12, early varices on fourth whorl with two or three intervaricetal ribs. Last whorl with three high, narrow, rounded varices and two broad intervaricetal ribs, occasionally with a third narrow one. Spiral sculpture of moderately high, narrow, weakly nodose primary, secondary and tertiary cords. First whorl with P1-P4, P4 partially covered by the following teleoconch whorl, second and third whorls with IP, P1-P4, fourth with adis, IP, P1, P2, P3, s3, P4, fifth with adis, IP, abis, P1, P2, P3, s3, P4, sixth and seventh with t, adis, (t), IP, abis, P1, s1, P2, P2, P3, s3, P4, P4, s4, P5, s5, P6, s6, P7, s7, ADP, ads, MP, ms, ADP, ads. Other spiral cords decreasing in strength and height abapically. Intersection of axial varices and P1 giving rise to a short, narrow, narrowly open, acute shoulder spinelet from fourth or fifth to last teleoconch whorl.


Operculum and radula not examined.

**Remarks**

*Vokesimurex aliquantulus* n. sp. differs from *V. gallinago fernandesii* (Fig. 3H, I) in being more lightly-built, in having a narrower and more acute spire, a narrower siphonal canal and a comparatively narrower aperture. The protoconch is also much smaller, 700 μm wide × 750 μm high as opposed to 1000-1200 μm wide × 1000-1100 μm high. It also has a very narrow spiral keel abapically, not observed in *V. gallinago fernandesii*.

*Vokesimurex aliquantulus* n. sp. differs from *Vokesimurex rectaspina* n. sp. (Fig. 3A-G) in the same characters and in having a spire that is weakly incurved and not almost straight as in *Vokesimurex aliquantulus* n. sp.

It differs from *Vokesimurex gallinago gallinago* (Sowerby III, 1903) and *V. dentifer* (Watson, 1883), not present in the western Indian Ocean, in also having a smaller protoconch (700 μm wide vs 1100-1200), a narrower aperture and a narrower siphonal canal. From *V. gallinago gallinago* it also differs in having almost spineless varices, rather than the more spinose, occasionally weakly webbed varices of *V. gallinago gallinago*.

*Vokesimurex rectirostris* (Sowerby II, 1841) (Fig. 4F, G) and *V. sobrinus* (A. Adams, 1863) (Fig. 4H, I) both have a rounded protoconch with a strong keel abapically but in *V. aliquantulus* n. sp. the keel is more delicate, narrower and situated more abapically, and the protoconch is also relatively smaller (700 vs 1100-1400 μm wide). Both these species, restricted to the region from Taiwan to southern Japan, are also more spinose.
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Fig. 2. — Spiral cords and apertural denticles morphology: A, *Bouchetia wareni* n. sp. (holotype), 18.1 mm; B, *Bouchetia vaubanensis* (Houart, 1986) (holotype), 10.5 mm; C, *Murex sul mananteninaensis* n. sp. (holotype), 5.2 mm; D, E, *Flexopteron akainakares* n. sp. (holotype), 12.2 mm. Abbreviations: see Material and methods.
Genus Timbellus de Gregorio, 1885

**TYPE SPECIES.** — *Murex latifolius* Bellardi, 1872, Middle Miocene, Italy (by subsequent designation; Vokes 1964: 14).

**REMARKS**

The genus *Timbellus* was reinstated by Merle et al. (2011) for the species generally classified in *Pterynotus* s.s. Swainson, 1833 but usually with a less scabrous shell morphology and with three major axial varices “appearing early during the ontogeny”. This distinction from the *Pterynotus* s.s. group was noted by Barco et al. (2010), with *Pterynotus fulgens* Houart, 1988 in their DNA analysis even falling outside the Muricinae Rafinesque, 1815. The classification used here follows Barco et al. (2010) pending availability of more material for further DNA research and the publication of additional results.

On the other hand, the classification of Merle et al. (2011) mixes the species with a trivaricate axial sculpture starting already on the first teleoconch whorl, such as *Timbellus latifolius*, the type species, and some Recent species like *T. fulgens* (Houart, 1988). In *Timbellus goniodes* n. sp., here described, and a few other species such as *T. bednalli* (Brazil, 1878), *T. phyllopterus* (Lamarck, 1822) and *Pterynotus alatus* (Röding, 1798), the type species of *Pterynotus*, the trivaricate sculpture appears only on the third or fourth teleoconch whorl. Their generic placement awaits confirmation by genetic analysis.

**Timbellus pannuceus** n. sp.

(Figs 4j-O; 7A)

**TYPE MATERIAL.** — Holotype (lv) MNHN-IM-2007-36940 BOLD ID BOMGA025-15, GenBank accession number KP697989 for COI gene KC860506 and 5 paratypes MNHN, 1 paratype coll. RH (as listed below).

**TYPE LOCALITY.** — Madagascar, between Nosy Be and Banc du Leven, 12°40’S, 48°12’E, 492-524 m [MIRIKY: stn CP3184].


**DISTRIBUTION.** — North-western Madagascar, taken alive at 301-492 m, shells at 431-492 m.

**ETYMOLOGY.** — Latin, *pannuceus*, wrinkled. This species is named for the wrinkled surface of the shell.

**DESCRIPTION**

Shell medium sized for the genus, up to 22.6 mm in height at maturity (paratype MNHN). Height/width ratio 1.4 (holotype). Slender, narrowly-ovate, lightly built. Shoulder ramp strongly sloping, weakly concave.

Ivory-white, occasionally with a light tan spiral band between P4 and P5 and occasionally on shoulder ramp. Aperture white.

Spire high with 1.5 protoconch whorls and teleoconch with up to five narrow, very weakly shouldered whorls. Suture weakly adressed. Protoconch small, whorls rounded, smooth, glossy, maximum width 900 µm. Terminal lip narrow, low, weakly curved.

Axial sculpture of teleoconch whorls consisting of very narrow, webbed varices starting from the first whorl. First to last teleoconch whorls with three varices. No intervaricetal sculpture except narrow, low, growth striae. Spiral sculpture of moderately high, narrow, smooth primary and secondary cords. First whorl with very low P1, second and third with P1 and P2, s1 occasionally starting, fourth with P1, (s1), P2, s2, P3, last whorl with P1, (s1), P2, s2, P3, s3, P4, (s4), P5, P6, ADP, MP, ABP, (ads).

Aperture moderately large, roundly-ovate. Columellar lip narrow, more broadly expanded adapically, weakly flaring, rim partially weakly erect, adherent at apical extremity. Anal notch shallow, broad. Outer lip smooth, occasionally with weak or strong denticles within: ID broad, low, D1-D6 narrower; aperture occasionally smooth or with only a few denticles visible, others obsolete. Siphonal canal moderately long, broad, weakly bent dorsally and abaxially, narrowly open, with varicellal webbing extending to 50-60% of its length.

Operculum and radula not examined.

**REMARKS**


Four of these species (*T. Flemingi*, *T. Marshalli*, *T. Crauopterus* and *T. rubidus*) do not need to be compared with *T. pannuceus* n. sp. due to important differences in shell characters. The remaining four differ from *T. pannuceus* n. sp. as follows.

**Timbellus vespertilio** (Fig. 6A, B) differs in having more strongly shouldered teleoconch whorls with a relatively broader shoulder ramp and a more obvious and broader shoulder cord (P1). It also has fewer obvious spiral cords on the teleoconch whorls and on the abapertural face of the varicellal wings. *Timbellus vespertilio* is known only from southern Japan, the East China Sea and Taiwan.

**Timbellus fulgens** (Fig. 4P, Q) was described from New Caledonia and was identified from South Africa by Houart.
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Fig. 3. — A-G, Vokesimurex rectaspira n. sp.; ATIMO VATAE: stn CP3589; A, B, holotype MNHN IM-2009-14495, 41.2 mm; C, D, paratype MNHN IM-2000-30001, 38.2 mm; E, F, paratype MNHN IM-2000-30001, 24.8 mm; G, protoconch. H, I, Vokesimurex gallinago fernandesi (Houart, 1990); Mozambique, 93-112 m, holotype MNHN IM-2000-0089, 63.2 mm; J-L, Vokesimurex dolichourus (Ponder & Vokes, 1988); J, K, MIRIKY, stn CP3288, 46-54 m, 56.2 mm; L, protoconch; M, N, Vokesimurex aliquantulus n. sp.; MIRIKY, stn CP3206, 70-74 m, holotype MNHN IM-2007-36971, 28.3 mm. Scale bars: G, L, 500 μm.
(1991). Similar specimens are now also recorded from Madagascar. However it differs from *T. parnassae* n. sp. in having a much smoother shell and smoother variceal wings with much lesser obvious primary cords and obsolete secondary cords. *Timbellus* *levii*, a species currently only known from New Caledonia and Tonga (Houart & Héros 2008) has a larger shell, reaching 36 mm in height, with smooth teleoconch whorls, almost smooth, broader variceal wings and with a much narrower and higher aperture. *Timbellus* *stenostoma* from New Caledonia has a much smaller and smoother shell, reaching 15 mm in height, with a much smaller aperture and a longer siphonal canal.

*Timbellus goniodes* n. sp.

(Figs 6C-G; 7B)

**Type material.** — Holotype (dd) MNHN-IM-2000-30006, 3 paratypes MNHN, 1 paratype coll. RH (as listed below).

**Type locality.** — South Madagascar, South of Cap Sainte-Marie, 26°14’S, 45°09’E, 284–286 m [ATIMO VATE: stn CP3615].


**Distribution.** — Southern Madagascar, 280–284 m (shells only).

**Etymology.** — Greek, *goniodes*, angular. This species is named for the angular shape of the teleoconch whorls.

**Description.**

Shell medium sized for the genus, up to 23.7 mm in height at maturity. Height/width ratio 1.6–2.0. Slender, narrowly ovate, spinose, lightly built. Shoulder strongly sloping, weakly concave or straight.

Milky white or pinkish white. Aperture white.

Spire high, acute, with 1.5 protoconch whors and telecoch up to six weakly convex, angular, weakly shouldered whors. Suture impressed. Protoconch small, whors rounded smooth, glossy, width 600–650 μm. Terminal lip delicate, thin, weakly raised, weakly curved.

Axial sculpture of teleoconch whors consisting of high, narrow, lamellose varices, each with a long, narrow, open shoulder spine. First whorl with six or seven varices, second with five or six, third with four. From fourth to last teleoconch whorl, three narrow, high, lamellose, webbed varices. Spiral sculpture of low and high, narrow, rounded primary cords. First whorl with P1–P3 of approximately the same strength, second with P1–P3, P2 becoming broader and higher. Third and fourth whorls with shallow, almost obsolete P1, P2 and P3 similar in strength and height. P3 partially covered by following whorl, fifth whorl with very shallow P1 and broad, high, rounded P2 and P3, last whorl with weak P1, more obvious on lamelllose, webbed varices, P2 and P3 higher and broader, P4–P6 weak, decreasing in strength abapically, broader on webbed apertural varix. P1 ending as a short, narrow, adapically bent shoulder spine. P2–P6 ending as a shorter, backward recurved, narrowly open spine.

Aperture ovate, angular. Columellar lip narrow, flaring, smooth or with two weak knobs abapically, rim partially erect, adherent at adapical extremity. Anal notch moderately deep, broad. Outer lip strongly erect, smooth with six weak or strong denticles within: ID, D1-D5. ID very low, broad, D1-D5 variable in strength and height. Siphonal canal moderately short, broad, weakly abaxially bent and dorsally recurved at tip, narrowly open, with varicelwebbing extending to 80–90% of its length.

Operculum and radula unknown.

**Remarks**

*Timbellus goniodes* n. sp. differs in many ways from the other Indo-West Pacific *Timbellus* species. From *T. fulgens* (Fig. 4P, Q) living in the same geographical area, *T. goniodes* n. sp. differs in having a narrower shell with a higher spine, a smaller protoconch (600–650 μm wide vs 1000 μm), a narrower subsutural ramp, strong and relatively broader spiral cords with higher P2 and P3, a more angular aperture and more strongly adapically bent shoulder spines, and chiefly in having four to seven varices on the three adapical teleoconch whors as opposed to three in *T. fulgens*.

From *T. crauroptera* (Fig. 6H) from New Caledonia, a species that also has upward bent shoulder spines and a more angular aperture, *T. goniodes* n. sp. differs in having somewhat narrower shoulder spines, more strongly obvious spiral cords, less convex teleoconch whors without intervaricel varices, a higher spine and varicel webbing extending to almost 80% of the length of the siphonal canal rather than extending to 10 or 20% of its length in *T. crauroptera* with the additional presence of ADP and MP. Moreover *T. crauroptera* also has three variceal wings starting at the first teleoconch whorl.

Genus *Bouchetia* Houart & Héros, 2008

**Type species.** — *Poirieria (Paziella) vaubanensis* Houart, 1986, New Caledonia (by original designation).

**Remarks**

Although molecular phylogenetic research is improving our understanding of the classification of supraspecific taxa in the Muricidae (Barco et al. 2010), based on shell morphology, *Bouchetia* and *Flexopteron* Shuto, 1969 (see below) were treated by Merle et al. (2011) as subgenera of *Paziella* Joussseau, 1880. Pending the result of DNA analyses we feel it premature to adopt this new classification based only on shell characters. We will therefore continue to treat *Bouchetia* as a full genus as used by Houart & Héros (2008: 450).
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**FIG. 4.** — A-E, Vokesimurex aliquantulus n. sp., MIRIKY, stn CP3206, 70-74 m; A, B, paratype MNHN IM-2000-30002, 33.1 mm; C, D, paratype MNHN IM-2000-30002, 22.6 mm; E, protoconch; F, G, Vokesimurex rectirostris (Sowerby, 1881), Taiwan Strait, Coll. RH, 68 mm; H, I, Vokesimurex sobrinus (A. Adams, 1863); Tosa, Japan, Coll. RH, 51.3 mm; J-O, Timbellus pannuceus n. sp.; J, K, MIRIKY, stn CP3184, 492-524 m, holotype MNHN IM-2007-36940, 18.9 mm; L, M, paratype MNHN IM-2007-38031, 20.6 mm; N, detail of the aperture; O, protoconch; P, Q, Timbellus fulgens (Houart, 1988); MIRIKY, stn DW3215, 316-433 m, 22.5 mm. Abbreviations: See Material and methods. Scale bars: E, O, 500 μm.
**Houart R. & Héros V.**

*Bouchetia wareni* n. sp.  
(Figs 2A; 6I-M; 9A)


**TYPE MATERIAL.** — Holotype (lv) MNHN-IM-2007-36941 and 3 paratypes MNHN, 1 paratype coll. RH (listed as below).

**TYPE LOCALITY.** — Madagascar, between Nosy Be and Banc du Leven, 12°30’S, 48°18’E, 346-376 m [MIRIKY: stn CP3189].

**MATERIAL EXAMINED.** — Mozambique Channel. BENTHEDI: stn DS72, Mayotte, NNE du Récif Nord, 12°32’S, 45°02’E, 300-350 m, 2 dd.  
Northwest of Madagascar. MIRIKY: stn CP3183, between Nosy Be and Banc du Leven, 12°30’S, 48°14’E, 420-436 m, 1 lv (paratype MNHN-IM-2007-36941 and 3 paratypes MNHN, 1 paratype coll. RH) (listed as below).  
**South Madagascar.** ATIMO VATAE: stn DW3524, sector of Manantenina, 24°23’S, 47°32’E, 307-319 m, 1 dd, juv. — Stn DW3534, sector of Sainte Luce, 24°43’S, 47°32’E, 296-307 m, 1 lv, juv. — Stn DW3552, South of Faux-Cap, 26°07’S, 45°39’E, 264-280 m, 2 dd, juv. — R.V. *Vauban*, 1972-73, 22°17’S, 43°03’E, 600-605 m, 1 dd.

**DISTRIBUTION.** — Madagascar and Mayotte, live in 307-492 m, shells in 280-600 m.

**ETYMOLOGY.** — This species is named after Anders Warén, in recognition of his help in extracting, mounting and imaging numerous radulae for the senior author. He also has participated in many expeditions organized by MNHN, including ATIMO VATAE.

**DESCRIPTION**

Shell medium sized for the genus, with up to 18.5 mm in height at maturity (paratype MNHN). Height/width ratio 1.4-1.7. Broad, spinose, lightly built. Subsutural band narrow, weakly sloping, weakly concave. White or very light tan.  
Spire high with 1.60-1.75 protoconch whorls and teleoconch up to six broad, weakly convex, strongly shouldered, spinose whorls. Suture impressed, partially obscured by small axial lamellae of following whorl. Protoconch small, whorls rounded, smooth. Maximum width 700-800 μm. Terminal lip delicate, thin, very weakly curved.
Description of new muricids (Mollusca: Gastropoda) from Madagascar

FIG. 6. — A, B, Timbellus vespertilio (Kuroda, 1959), East China Sea, Coll. RH, 28 mm; C-G, Timbellus goniodes n. sp., C, D, ATIMO VATAE, stn CP3615, 284-286 m, holotype MNHN IM-2000-30006, 23.7 mm; E, F, ATIMO VATAE, stn DW3552, 264-280 m, paratype MNHN IM-2000-30007, 14.8 mm; G, protoconch; H, Timbellus crauroptera (Houart, 1991); New Caledonia, BIOCAL, stn DW64, 250 m, holotype MNHN IM-2000-0132, 11.4 mm; I-M, Bouchetia wareni n. sp., Madagascar, MIRIKY, stn CP3189, 346-376 m; I, J, holotype MNHN IM-2007-36941, 10.5 mm; K, L, MIRIKY, stn CP3183, paratype MNHN IM-2007-36941, 12.8 mm; M, protoconch; N, O, Bouchetia vaubanensis Houart, 1986; South of New Caledonia, VAUBAN 1976-1978, stn DR01, 480-500 m, holotype MNHN IM-2000-0885, 10.5 mm; P, Q, Flexopteron akainakares n. sp., ATIMO VATAE, stn DW3524, 307-319 m, holotype MNHN IM-2000-30012, 12.2 mm. Scale bars: G, M, 500 μm.
Axial sculpture of teleoconch whorls consisting of low, narrow lamellae, more strongly developed at intersection of axial lamellae and spiral cords, producing short or long, narrow, spine-like projections. Shoulder spine longest. Axial sculpture of first whorl with 8-10 lamellae, second with 11-13, third with 13 or 14, fourth 12-15, fifth 15 and last whorl with 10-13. Spiral sculpture of moderately high, rounded, narrow, smooth primary cords. First to penultimate teleoconch whorl with P1-P3, P3 partially covered by following whorl. Last whorl with P1-P6, ADP, (MP). Secondary cords s1 or s2 rarely present. Primary cords decreasing in strength abapically. P1 broadest with long shoulder spine. Other spiral sculpture consisting of numerous lirae.

Aperture moderately small, broad, rounded. Columellar lip broad, flaring, smooth. Rim partially strongly erect, adherent at adapical extremity. Anal notch shallow, broad. Outer lip weakly erect, smooth with 4-6 weak, elongate, narrow denticles within: D1 (occasionally split), D2, D3, D4, D5 (D4 and D5 occasionally fused), rarely with low, weak, narrow ID. Siphonal canal moderately long or long, up to 33% of total shell height, narrow, weakly dorsally recurved, open.

**REMARKS**

*Bouchetia vaubanensis* (Houart, 1986) (Figs 2B; 6N, O) described from New Caledonia and also known from Fiji (Houart & Héros 2008: 452) resembles the new species, but *Bouchetia wareni* n. sp. is distinct in having a comparatively higher spire, a longer siphonal canal, a broader aperture and also in having a different spiral sculpture morphology. *Bouchetia wareni* n. sp. possesses six spiral cords on the convex part of the teleoconch whorl (P1-P6) and two cords on the siphonal canal (ADP and MP), while *B. vaubanensis* clearly has five spiral cords on the convex part of the last teleoconch whorl (P1-P5) and a single one on the siphonal canal (ADP) (Fig. 2A, B). Merle et al. (2011: 174) illustrated the canal cord as P6 but this cord is clearly separated from the whorl, as in *Paziella*, for example *Paziella pazi* (Crosse, 1869) as shown by Merle et al. (2011: 162). This cord is here considered as a true siphonal canal spiral cord, here ADP.

Merle et al. (2011: 174, text fig. 60D) wrongly illustrated the radula of *Pazinotus falciformis* as *Bouchetia vaubanensis*. The radula of *Bouchetia* is peculiar in having a broad, long central cusp and long lateral cusps, but lacking lateral denticles (Fig. 14G).

*Bouchetia wareni* n. sp. was first illustrated by Houart (1985: 246, fig. 10) as *Trophonopsis polycyma* Kuroda, 1953,
Description of new muricids (Mollusca: Gastropoda) from Madagascar

Figure 8. — A-E, *Flexopteron akainakares* n. sp.: A, B, ATIMO VATAE, stn DW3515, 184-203 m, paratype MNHN IM-2000-30013, 10.2 mm (radula illustrated Fig. 14 B, C); C, D, ATIMO VATAE, stn DW3524, 307-319 m, 6.2 mm; E, protoconch; F-I, *Flexopteron primanova* (Houart, 1985): F, G, MIRIKY, stn CP3289, 332-379 m, 20.7 mm; H, MIRIKY, stn CP3192, 578-580 m, 16.9 mm; I, protoconch; J-N, *Murexsul mananteninaensis* n. sp.: J, K, ATIMO VATAE, stn DW3524, 307-319 m, holotype MNHN IM-2000-30015, 5.2 mm; L, M, ATIMO VATAE, stn DW3523, 200-220 m, paratype MNHN IM-2000-30016, 4.5 mm; N, protoconch; O, P, *Murexsul queenslandicus* Houart, 2004, Australia, Queensland, Southeast of Swain Reefs, 22°26.27'-22°20.2', 153°17.13'-152°17.6'E, 167 m, paratype RH, 4.5 mm; Q, R, *Murexsul charcoti* (Houart, 1991), New Caledonia, BIOCAL, stn DW44, 440-450 m, holotype MNHN IM-2000-0067, 7.2 mm; S, *Murexsul micro* (Houart, 2001), New Caledonia, LAGON, stn 1374, 20-35 m, holotype MNHN IM-2000-0356, 3.7 mm. Scale bars: E, I, N, 500 μm.
a species known only from the western Pacific. This juvenile specimen (8.9 mm high, with only 3.75 teleoconch whorls: BENTHEDI, stn DS72) differs from *T. polycyma* in having a broader teleoconch whorl, a broader aperture with a wide, flared, columellar lip and a narrower, abapically tapered siphonal canal. Typical specimens from *T. polycyma* have been examined since then from Japan and from Fiji (Houart & Héros 2008).

Genus *Flexopteron* Shuto, 1969

**Type species.** — *Flexopteron philippinensis* Shuto, 1969, Late Miocene, Philippines (by original designation).

**Remarks**

There are currently two known Recent species of *Flexopteron*: *F. primanova* (Houart, 1985) from Madagascar and *F. poppei* (Houart, 1993) from the Philippines. Two other Recent species were included in *Flexopteron* by Merle et al. (2011): *Poirieria* (*Paziella*) tanaoa Houart & Tröndle, 2008 from the Marquesas and *Paziella* (*Flexopteron*) sp. from the Philippines. *Paziella* (*Flexopteron*) sp. (Merle et al. 2011: pl. 141, figs 12a, b) is a species of Coralliophiliinae, probably in the genus *Lamellatiaxis* Habe & Kosuge, 1970.

We do not accept the classification of *Poirieria* (*Paziella*) tanaoa in *Flexopteron* by Merle et al. (2011). The radula characters are not known for *P. tanaoa* but its shell is quite different from that of species of *Flexopteron*, being more elongate with fewer spiral cords, a relatively smaller aperture and a longer siphonal canal, shell characters that are closer to *Paziella* than to *Flexopteron*. In fact, *P. tanaoa* strongly resembles the specimen illustrated by Merle et al. (2011: pl. 144, figs 4a, b) as *Crassimurex* (*Eopaziella*) capita (Philippi, 1844) from the Late Oligocene of Europe. Currently we do not see any reason to remove *P. tanaoa* from *Paziella*.

The shell morphology of *Flexopteron akainakares* n. sp. is close to *F. primanova* Houart, 1985 but the species has different radula characters and is here only tentatively assigned to this genus.

We have now used *Flexopteron* as a full genus since its radular morphology (Fig. 14D-F) is different from *Poirieria* (Marshall & Houart, 1995).

**Flexopteron akainakares** n. sp.  
(Figs 2D, E; 6P, Q; 8A-E; 9B; 14B, C)

**Type material.** — Holotype (dd) MNHN-IM-2000-30012 and 4 paratypes MNHN, 1 paratype coll. RH (as listed below).
Description of new muricids (Mollusca: Gastropoda) from Madagascar

FIG. 10. — A-F, Typhinellus laminatus n. sp.; MIRIKY, stn DW3245, 90-257 m; A-C, holotype MNHN IM-2000-30019, 16.3 mm; D, E, paratype MNHN IM-2000-30020, 14.8 mm; F, protoconch ; G, H, Typhinellus bicolor Bozzetti, 2007; South Madagascar, Lavanono, holotype MNHN IM-2000-20652, 21.2 mm; I, J Typhinellus amoenus (Houart, 1994), Umhlanga Rocks, Natal, South Africa, holotype NMSA S436, 21 mm, photo courtesy A. Marais; K, Typhinellus androyensis Bozzetti, 2007; ATIMO VATAE, BB04, 14-18 m, 14.9 mm; L-P, Typhinellus constrictus n. sp.; L-N, ATIMO VATAE, BS09, 11-13 m, holotype MNHN IM-2009-14446, 15.4 mm; O, P, ATIMO VATAE, stn CP3511, 97-98 m, paratype MNHN IM-2000-30022 20.7 mm. Scale bar: F, 500 μm.
Houart R. & Héros V.

**Type Locality.** — South Madagascar, Manantenina sector, 24°23’S, 47°32’E, 307-319 m [ATIMO VATAE: stn DW3524].


**Distribution.** — South Madagascar, taken alive at 184-203 m, shells at 203-424 m.

**Etymology.** — Greek, akaina, spine and akares, short, small. This species is named for the small and short spines on the axial lamellae.

**Description**

Shell medium sized for the subgenus, up to 12.2 mm in height at maturity. Height/width ratio 1.5-1.7. Broadly ovate, weakly spinose, lightly built. Subsutural ramp narrow, weakly sloping on spire whorls, broader, strongly sloping on last teleoconch whorl, weakly concave. Shell entirely white.

Spire high with 1.5 protoconch whorls and up to 4.15 broad, convex, angular, strongly shouldered, weakly spinose whorls. Suture impressed. Protoconch large, broad, whorls rounded, smooth, maximum width 900-1000 μm. Terminal lip weakly raised, narrow, prosocline.

Axial sculpture of teleoconch whorls consisting of low, narrow, weakly webbed lamellae, more strongly developed at shoulder, producing short, narrow, broadly open spines at intersection of lamellae and primary spiral cords. First whorl with 6 or 7 lamellae, second with 7 or 8, third 7-9, fourth 6-9, last (apertural) with 6-7. Spiral sculpture of high, rounded, narrow, weakly squamous, primary cords, low, narrow secondary cords and numerous, narrow, low threads. First teleoconch whorl with P1 and P2, broadly separated by a large gap, second whorl with P1 and P2, starting weak s1 and one or two threads, third whorl with P1 and P2, weak s1 and narrow, weak threads of various strength, fourth and last whorls with P1, s1, P2, P3, P4, (s4), P5, (s5), P6, s6, adp and several threads of different magnitude.

Aperture small, ovate. Columellar lip broad, flaring, smooth or occasionally with one or two weak knobs abapically, rim partially erect, adherent at adapical extremity. Occasionally with weak, very low parietal tooth at adapical extremity. Anal notch shallow, broad. Outer lip weakly erect, smooth with four weak or moderately strong, broad denticles within: D1, D2, D3, D4-D5 fused. Siphonal canal short, broad, weakly dorsally recurved, broadly open.
Operculum ovate, light brown with apical nucleus.

Radula (Fig. 14B, C) muricine with broad rachidian bearing long, narrow, central cusp; short, triangular lateral denticles, almost half the size of central cusp; broad, long, triangular lateral cusps. Marginal area short, occasionally with small marginal denticle, almost indistinct when present. Marginal cusp short, outwardly bent. 

Lateral teeth sickle shaped, long, with broad base.

REMARKS

*Flexopteron akainakares* n. sp. differs in many ways from *F. poppei* and does not need to be compared here.

*Flexopteron primanova* (Fig. 8F–I) was described from northern Madagascar but *F. akainakares* n. sp. is not sympatric, living more to the South. *Flexopteron akainakares* n. sp. differs in having a relatively smaller shell, a higher and larger protoconch (900–1000 wide and 900 μm high vs 850–900 wide and 700–800 μm high) with rounded first whorl vs flat in *F. primanova*, markedly shorter shoulder spines on the last teleoconch whorl in adult specimens, a shorter siphonal canal, a different morphology of the primary spiral cords of the last teleoconch whorl in adults, a different morphology of the primary spiral cords of the last teleoconch whorl in adult specimens, a shorter siphonal canal, a different morphology of the primary spiral cords of the last teleoconch whorl in adult specimens, a shorter siphonal canal, a different morphology of the primary spiral cords of the last teleoconch whorl in adult specimens, a shorter siphonal canal, a different morphology of the primary spiral cords of the last teleoconch whorl in adult specimens, a shorter siphonal canal, a different morphology of the primary spiral cords of the last teleoconch whorl in adult specimens, a shorter siphonal canal, a different morphology of the primary spiral cords of the last teleoconch whorl in adult specimens, a shorter siphonal canal, a different morphology of the primary spiral cords of the last teleoconch whorl in adult specimens, a shorter siphonal canal.

The radula of *F. primanova* (Fig. 14D–F) is also different in having a very long, narrow central cusp, narrow lateral denticles approximately half the size of the central cusp, long, narrow, lateral cusps even longer than the central cusp, a smooth marginal area and acute, moderately long, marginal cusps. 

The operculum is similar, being ovate with an apical nucleus.

**Genus Murexsul** Iredale, 1915

**Type species.** — *Murex octogonus* Quoy & Gaimard, 1832, New Zealand (by original designation).

*Murexsul mananteninaensis* n. sp.  

_Figs 2C; 8J-N; 11A_

**Type material.** — Holotype (lv) MNHN-IM-2000-30015 and 3 paratypes MNHN, 1 paratype coll. RH (as listed below).

**Type locality.** — South Madagascar, Manantenina sector, 24°23’S, 47°32’E, 307-319 m [ATIMO VATAE: stn DW3524].


**Distribution.** — Southern Madagascar, taken alive at 87-307 m, shells at 220-307 m.

**Etymology.** — Named after the type locality.

**Description.**

Shell very small for the genus, up to 5.3 mm in height at maturity. Height/width ratio 1.9 (holotype). Slender, lanceolate, biconical, narrow, very weakly spinose, lightly built. Substural ramp narrow, weakly sloping, very slightly convex. Entirely white, translucent white or orange (paratype MNHN).

Spire high with 1.5 protoconch whorls and teleoconch of three broadly-convex, elongate, weakly shouldered whorls. Suture impressed. Protoconch large, broad, whorls rounded, smooth, maximum width 600 μm. Terminal lip delicate, narrow, weakly erect, very weakly curved.

Axial sculpture of teleoconch whorls consisting of very low, weak, quite indistinguishable, narrow, lamellose ribs and low, narrow varices. First whorl with eight or nine ribs, second and third with ribs and varices of same strength as each other. Apertural varix high, broad, rounded with five very short, blunt, broadly open spinelets, extending from P1-P5. Spiral sculpture of low, rounded, narrow primary and secondary cords. First teleoconch whorl starting with P3 only, starting P1 and P2 at the end of the whorl, second whorl with P1-P3, occasionally with P4 almost entirely covered by following whorl, last whorl with P1, s1, P2, (s2), P3, P4, s4, P5, s5, P6, ADP (MP). P1-P5 almost similar in strength and height, P6 narrower.


Operculum and radula not examined.

**Remarks**

*Murexsul mananteninaensis* n. sp. is part of a small group of species with only three or four teleoconch whorls but that seem to have reached adult size: *Murex asper* Houart, 2004 from Western Australia, *M. queenslandicus* n. sp. Houart, 2004 from Queensland, Australia, *M. leonardi* (Houart, 1993) from Christmas Island, *M. charcoti* (Houart, 1991) and *M. micra* (Houart, 2001) from New Caledonia. Many specimens have been examined from Australia and New Caledonia and none of these reaches a height of more than 7.5 mm.

Compared to *M. mananteninaensis* n. sp., *M. asper* has a larger shell, reaching 8.6 mm in height, with broader spiral cords and higher IP and abis.

*Murex queenslandicus* (Fig. 8O, P) is broader and heavier with broader spiral cords, no secondary spiral cords and a broader, higher apertural varix.

*Murex leonardi* differs markedly and does not need to be compared here.

*Murex charcoti* (Fig. 8Q, R) is larger, reaching a height of 7.2 mm, and broader with broader, more obvious axial varices, broader spiral cords and small, blunt spinelets on axial varices and on the siphonal canal.

*Murex micra* (Fig. 8S) is smaller, reaching a height of 3.9 mm, with a lower spire, broader spiral cords, more obvious axial varices with short, blunt spinelets and a smaller aperture.
Curiously, *Murexul mananteninaensis* n. sp. also resembles species of *Enatimene* Iredale, 1929, a genus confined to eastern Australia, comprising three species. The shell morphology of *E. lanceolatus* Houart, 2004 is particularly close to *Murexul mananteninaensis* n. sp., but *E. lanceolatus* is twice as large for the same number of teleoconch whorls, has a rounded protoconch and a first teleoconch whorl with P1-P3. The genus *Enatimene* is currently classified in Trophoninae s.l. Cossmann, 1903 and its radula characters are distinct from those of the Muricopsinae Radwin & D’Attilio, 1971.

Genus *Typhinellus* Jousseaume, 1880.

**Type species.** — *Typhis sorebyi* Broderip, 1833 (= *Murex labiatus* Cristofori & Jan, 1832). Mediterranean, eastern Atlantic (by original designation).

*Typhinellus laminatus* n. sp.  
(Figs 10A-F; 11B)

**Type material.** — Holotype (lv) MNHN-IM-2000-30019 and 1 (dd) paratype MNHN-IM-2000-30020.

**Type locality.** — Madagascar, off Baie Mahajamba, 14°53’S, 46°56’E, 90-257 m [MIRIKY: stn DW3245].

**Material examined.** — Only known from the type material.

**Distribution.** — North-western Madagascar, taken alive at 90-257 m.

**Etymology.** — Latin, *lamina*, thin blade. This species is named for its thin axial lamellae.

**Description**

Holotype medium sized for the genus, 16.3 mm in height. Height/width ratio 1.7, narrowly-ovate, smooth, delicate. Subsutural ramp moderately broad, weakly sloping, weakly concave.

Light ochre or light tan, brown on subsutural ramp on third, fourth and last teleoconch whorls, light brown spiral band at periphery. A single brown spot at adapical edge of aperture and three on edge of outer apertural lip. Three additional weak, light brown spots on left part of ventral side of siphonal canal.

Spire high with 1.75 protoconch whorls and five weakly convex, angulate, strongly shouldered teleoconch whorls. Surface of whorls impressed. Protoconch small, whorls rounded, slightly eroded. Terminal lip unknown (eroded).

Axial sculpture of teleoconch whorls consisting of four high, thin, sharp lamellate varices, each with a weakly open, short, inward curved shoulder spine. Apertural varix broad, flange-like, dorsally reflected, with two broadly open, short spinelets at outer edge. Varicelar flange extending to tip of siphonal canal. Shoulder spine broad, triangular, very weakly dorsally curved, connected to last teleoconch whorl by a broad, high, lamellate partition. Spiral sculpture faint, consisting of P1 with the anal tube, P2 (shoulder spine) and probably P3, P4, P5 and P6 with very faint secondary cords. Spiral sculpture more obvious on adapertural part of apertural varix. P1 with long, tapering, ventrally sealed anal tube, forming an angle of approximately 85-90° with axis of shell, only apertural tube hollow and functional, older tubes broken off and closed. P2 with a weakly open, curved shoulder spine, P4 and P5 corresponding to broad, open spinelets at outer apertural margin. Very thin intritacalx consisting of simple axial striae present.

Aperture small, ovate, forming a continuous peristome. Columellar lip narrow, outer lip smooth within. Siphonal canal long, broad, straight, ventrally sealed. Left side of canal weakly overlapping right side.

Ocurpel and radula unknown.

**Remarks**

*Typhinellus laminatus* n. sp. differs from *Typhinellus bicolor* Bozzetti, 2007 (Fig. 10G, H) in having a smooth shell with the exception of a few, rather indistinct spiral cords, whereas *T. bicolor* has a microsculpture of irregular pits, visible even in the worn holotype. *Typhinellus laminatus* n. sp. also has a more fragile shell, sharper axial varices and a slightly smaller aperture, 17.1% of shell height and 19% of shell width as opposed to 17.6% of shell height and 22.6% of shell width in *T. bicolor* (measurements made on the holotype of *T. laminatus* n. sp. and specimens of *T. bicolor* from ATIMO VATAE, stn BP11).

*Typhinellus laminatus* n. sp. differs from *T. androyensis* Bozzetti, 2007 (Fig. 10K) in having a more fragile shell with narrower teleoconch whorls, much thinner and sharper axial varices and a flatter siphonal canal.

*Typhinellus laminatus* n. sp. differs from *T. amoenus* Houart, 1994 (Fig. 10I, J) in the same characters as it differs from *T. androyensis* but also in having a smooth shell as opposed to the strongly spirally sculptured shell in *T. amoenus*.

*Typhinellus constrictus* n. sp.  
(Figs 10L-P; 13A)

**Type material.** — Holotype (lv) MNHN-IM-2009-14446 and 5 paratypes MNHN; 1 paratype coll. RH (as listed below).

**Type locality.** — Madagascar, sector of Fort-Dauphin, 25°15.0’S, 47°14.5’E, 97-98 m. [ATIMO VATAE: stn BS09].


**Distribution.** — South Madagascar, taken alive at 13-20 m, empty shells at 21-102 m.
ETYMOLOGY. — Latin, constrictus, constricted. This species is named for the peculiar form of the teleoconch whorl.

DESCRIPTION
Shell large for the genus, up to 20.7 mm in height at maturity (holotype), although one incomplete paratype (MNHN) would have been larger. Height/width ratio 1.73 (holotype). Slender, narrowly ovate with expanded shoulder, lightly built. Subsutural ramp broad, almost horizontal, weakly convex.

Tan or light brown, subsutural ramp darker. Abapertural side of apertural flange and ventral part of siphonal canal beige or light tan. Three or four axial, narrow, brown bands on partition. Aperture white.

Spire high with paucispiral, weakly shouldered protoconch (observed in one specimen but partly broken). Teleoconch up to five angulate, strongly shouldered whorls. Abapical part of whorls constricted. Suture impressed.

Axial sculpture of teleoconch whorls consisting of four, low, thin, sharp lamellate varices, each with a weakly open, inward curved shoulder spine. Apertural varix thin, broad, constricted medially, broader at abapical extremity, extending from shoulder spine almost to tip of siphonal canal. Apertural shoulder spine adapically bent, long, narrowly triangular, straight, connected to last teleoconch whorl by a broad, thin, lamellate partition. Partition with two or three backward bent, short, flattened, broad spines. Spiral sculpture very faint, consisting of P1 with the anal tube, P2 (shoulder), P3, P4 and P5 only discernable on variceal flange and only very weakly between axial varices, corresponding to the broad, weakly curved abapertural spines at outer apertural margin. P1 with long, rounded, ventrally sealed anal tube, forming an angle of approximately 85-90° with axis of shell. Only apertural tube hollow and functional, older tubes broken off and closed. Two narrow spiral cords between abapical part of aperture and variceal flange, occasionally obvious in some shells. Other sculpture of few, weak and very thin, low, broad scales, only visible on last teleoconch whorl, between axial varices.

Aperture small, rounded, erect, forming a continuous peristome. Columellar lip narrow, outer lip smooth within. Siphonal canal long, broad, straight, ventrally sealed, dorsally bent at tip. Left side of canal weakly overlapping right side.

Operculum and radula unknown.

REMARKS
typhinellus constrictus n. sp. differs from all the other Typhine
lus species in having a broad, almost straight shoulder ramp, deeply constricted teleoconch whorls with an impressed suture and a rounded aperture.
Genus *Siphonochelus* Jousseaume, 1880

Subgenus *Siphonochelus* Jousseaume, 1880

**Type Species.** — *Typhis arcuatus* Hinds, 1843, South Africa (by original designation).

*Siphonochelus* (*Siphonochelus*) *aethomorpha* n. sp. (Figs 12A-H; 13B)

**Type Material.** — Holotype MNHN-IM-2000-30024, 10 paratypes MNHN-IM-2000-30025, 2 paratypes Coll. RH.

**Type Locality.** — Madagascar, between Majunga and Cap Saint-André, 15°35’S, 45°43’E, 177-199 m [ATIMO VATAE: stn DW3259].

**Material Examined.** — South Madagascar. MIRIKY: stn DW3197, West of Cap d’Ambre, 12°07’S, 48°58’E, 362-431 m, 3 dd, juv. — Stn DW3239, in front of Baie de Nazendry, 14°30’S, 47°27’E, 274-325 m, 1 dd, juv. — Stn DW3258, between Majunga and Cap Saint-André, 15°34’S, 45°44’E, 200-288 m, 7 dd, juv. — Stn DW3259, between Majunga and Cap Saint-André, 15°35’S, 45°43’E, 177-199 m, 30 dd, ad & juv (holotype MNHN-IM-2000-30024, 10 paratypes MNHN-IM-2000-30025, 2 paratypes Coll. RH). — Stn CP3260, between Majunga and Cap Saint-André, 15°35’S, 45°45’E, 179-193 m, 1 dd, juv. — Stn CP3283, off Baie Mahajamba, 14°52’S, 46°56’E, 228-257 m, 5 dd, juv.

**Distribution.** — North-western Madagascar, 193-362 m (shells only).

**Etymology.** — Greek, *morpho*, form, shape and *aethes*, unusual, strange. This species is named for the strange and flattened form of the anal tubes.

**Description.** — Shell medium sized for the subgenus, up to 11.1 mm in height at maturity (holotype). Height/width ratio 1.9-2.1. Slender, lanceolate, narrowly ovate, lightly built. Subsutural ramp narrow, weakly sloping, weakly concave. Shell entirely off white.

Spire high with 1.25-1.5 protoconch whorls and up to 5-25 weakly convex, weakly shouldered, smooth whorls. Suture impressed. Protoconch moderately large, narrow, slightly elongate. Whorls rounded, smooth, maximum width 600 µm. Terminal lip delicate, thin, curved.

Axial sculpture consisting of four, low, narrow, rounded, weakly shouldered varices from first to last whorl. Spiral sculpture of very shallow P1 with anal tube, P2 (shoulder) and very weak, narrow striae and lirae, occasionally extending on abapical part of anal tubes. Anal tubes rounded on first or first two teleoconch whorls, flattened from second or third whorl. Last whorl with very broad, very flattened tubes originating from succeeding varix, filling almost entire space between succeeding and pre-
ceding varix, forming an angle of approximately 30–40° with axis of shell. Last apertural anal tube strongly outward bent, forming an angle of approximately 70° with axis of shell. Only apertural tube hollow and functional, older tubes broken off and closed. Only small portion of last tube open (Fig. 12H). Aperture moderately small, ovate, weakly erect, forming a continuous peristome. Columellar lip narrow, smooth. Outer lip smooth within. Siphonal canal moderately long, narrow, straight, ventrally sealed, weakly dorsally curved, strongly tapered abapically.

![Fig. 14. — Radulae: A, Vokesimurex rectaspira n. sp.; ATIMO VATAE, stn CP3589, paratype MNHN IM-2000-30001; B, C, Flexopteron akainakares n. sp.; ATIMO VATAE, stn DW3515, paratype MNHN IM-2000-30013; D-F, Flexopteron primanova (Houart, 1985); MIRIKY, stn CP3210, scale bar 25 μm; G, Bouchetia vaubanensis (Houart, 1986); New Caledonia, BIOCAL, stn DW44. Scale bars: A, 100 μm; B, C, 20 μm, D-F, 25 μm; G, 10 μm.](image)
**Remarks**

*Siphonochelus aethomorpha* n. sp. differs from all the other *Siphonochelus* species in having very broad and flat anal tubes that originate from the succeeding varix and fill almost all the space between the succeeding and the preceding varix. The five other species occurring in Madagascar, Mozambique and/or southern Africa, i.e. *S. (S.) arcuatus* (Hinds, 1843), *S. (S.) pentaphaissions* (Barnard, 1959), *S. (S.) rosiadou Houart, 1999, S. (S.) stillacandidus* Houart, 1985 and *S. (S.) transcurrents* (Martens, 1903), differ markedly, as do the other Indo-West Pacific species.

*Siphonochelus arcuatus* (Fig. 121, J) has broader teleoconch whorls with sharper axial varices, more strongly backwardly bent, less flattened anal tubes and an almost three times larger protoconch.

*Siphonochelus pentaphaissions* differs in the same characters and in having teleoconch whorls with five varices per whorl instead of four.

*Siphonochelus stillacandidus* also differs in having much narrower anal tubes, slightly more distant from the more strongly shouldered axial varices, and in having a shorter siphonal canal.

The two other Indian Ocean species differ in many shell characters and do not need to be compared here.

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**References**


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