

New species and new records of Calliostomatidae (Gastropoda: Trochoidea) from Madagascar

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ABSTRACT. New records of 4 known Calliostomatidae species from Madagascar area are listed, extending the distribution area of some of them. 9 new species are described and compared with similar species: *Calliostoma madatechnema* n. sp., *C. textor* n. sp., *C. parvajuba* n. sp., *C. hematomenon* n. sp., *C. subalboroseum* n. sp., *C. tumidosolidum* n. sp., *C. pyrron* n. sp., *C. herberti* n. sp. and *Carinastele wareni* n. sp.

RESUME. De nouveaux relevés de 4 espèces connues de Calliostomatidae provenant de la région de Madagascar sont listés, étendant ainsi l'aire de distribution d'un certain nombre d'entre elles. 9 nouvelles espèces sont décrites et comparées avec des espèces similaires : *Calliostoma madatechnema* n. sp., *C. textor* n. sp., *C. parvajuba* n. sp., *C. hematomenon* n. sp., *C. subalboroseum* n. sp., *C. tumidosolidum* n. sp., *C. pyrron* n. sp., *C. herberti* n. sp. et *Carinastele wareni* n. sp.

INTRODUCTION

Up these last years, the fauna of the western and south-western parts of the Indian Ocean remained poorly known, except the malacofauna of South Africa, for which rather numerous, more or less recent books (e.g. Kensley, 1973; Kilburn & Rippey, 1982 ; Steyn & Lussi, 1998) and numerous papers are available, especially for Trochoidea (e.g. Herbert, 1987; 1990; 1992; 1993; 1995).

With the aim to perform a large survey of the biodiversity of some of these unexplored areas, and more generally around the indo-pacific area, a campaigns program called "La Planète Revisitée" (French sentence meaning "Our planet reviewed"), with special attention to invertebrates, was built based upon a partnership between the Muséum national d'Histoire naturelle of Paris, the non-governmental organization Pro-Natura International (PNI) and the International Union for Conservation of Nature (IUCN).

The present paper is based on material from the Madagascar region brought by three of these biodiversity surveys conducted in southwestern Indian

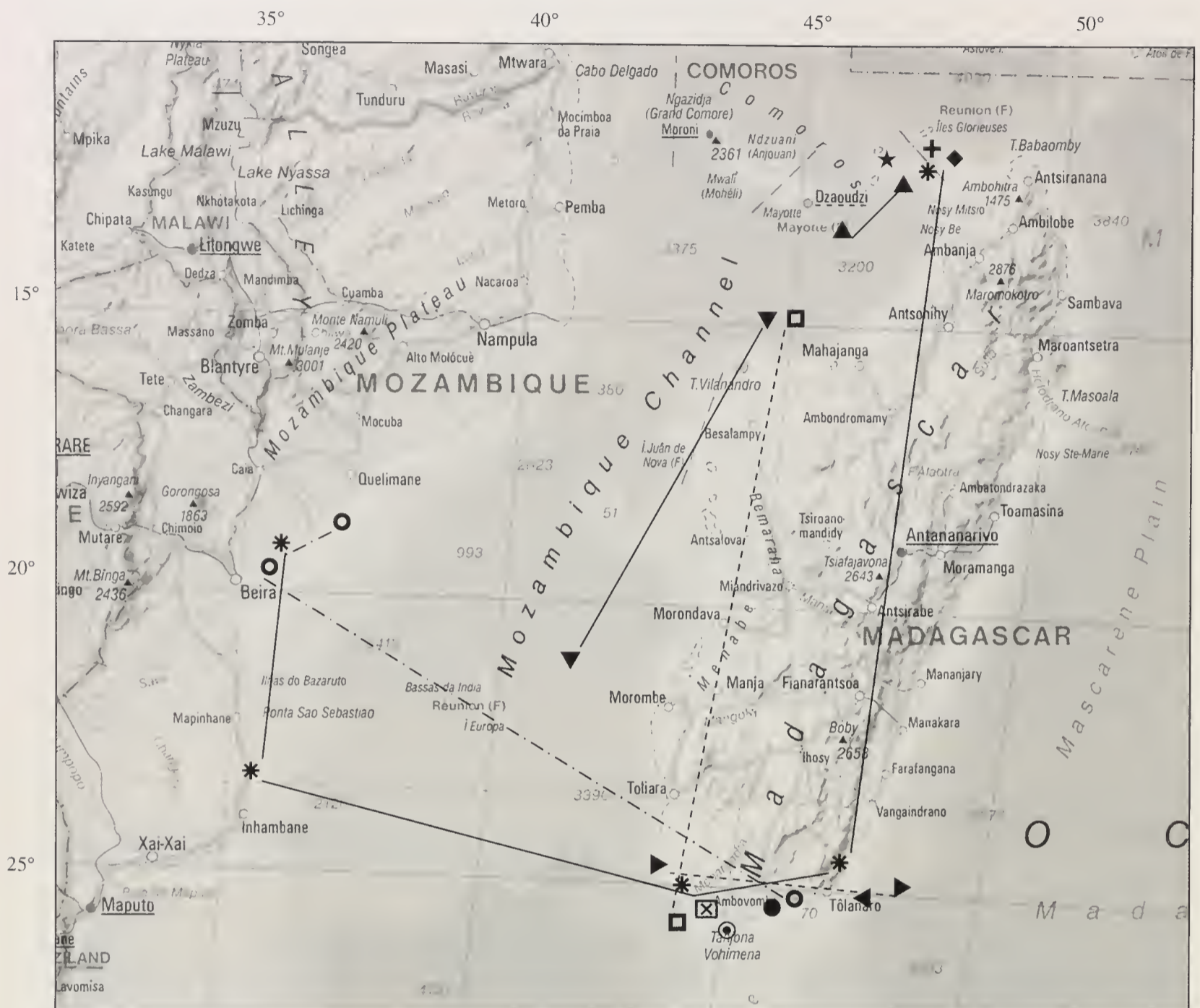
Ocean, especially along Mozambique Channel and Madagascar : MAINBAZA, MIRIKY and ATIMO



VATAE. These campaigns conducted from April 2009 to June 2010, with the collaboration of additional local partners as the Institut Halieutique et des Sciences Marines (IHSM) and the Madagascar Office of the Wildlife Conservation Society (see www.laplaneterevisitee.org).

This paper focus on Calliostomatidae species. Among the studied material, 9 species are new to

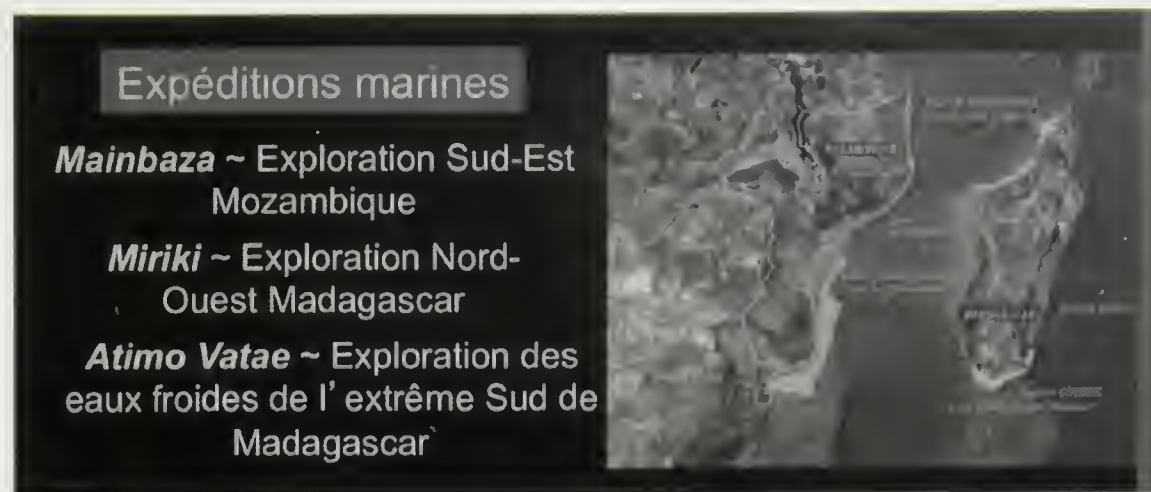
science whereas 4 other ones are known species but with some extension of their distribution.



Map 1 : Records of cited Calliostomatidae species in Madagascar area :

- * *Calliostoma madatechnema* n. sp. (MIRIKY, ATIMO VATAE, MAINBAZA)
- + *C. textor* n. sp. (MIRIKY)
- *C. parvajuba* n. sp. (ATIMO VATAE)
- ★ *C. hematomenomn.* sp. (MIRIKY)
- ◎ *C. subalboroseum* n. sp. (ATIMO VATAE)
- ◆ *C. tumidosolidum* n. sp. (MIRIKY)
- *C. pyrron* n. sp. (MIRIKY, ATIMO VATAE)
- *C. herberti* n. sp. (ATIMO VATAE)
- ⊠ *Carinastele wareni* n. sp. (ATIMO VATAE)

- ▲ *Calliostoma madagascarensis* Vilvens, Nolf & Verstraeten, 2004 (MIRIKY)
- ◄ *C. crossleyae* E.A.Smith, 1910 (ATIMO VATAE)
- ▼ *C. muriellae* Vilvens, 2001 (MIRIKY)
- ▶ *Dactylastele burnupi* (E.A. Smith, 1899) (ATIMO VATAE)



Material and methods

The material studied in the present paper was brought mainly by two IRD-MNHN expeditions: MIRIKY (6-7/2009) and ATIMO VATAE (5/2010). Additional material used for comparison was brought mostly by the MAINBAZA (4/2009) campaign, but also by P 1, P 2, P 3, P 4 (1971) and BENTHEDI (1977) ORSTOM-MNHN trawlings.

Other additional material was provided by the Natal Museum (courtesy D.G. Herbert) : it was mainly dredged by R.V. Meiring Naudé (RVMN, 6/1987) and NMDP (6/1990) campaigns, some specimens coming from legged old collections.

Regarding the distribution of the new species and the extension of the distribution of known species, the known bathymetric range is given as the interval between the two extreme values of all the recorded depth ranges (i.e. MIN depth is the largest value of the minimum values of all the recorded ranges and MAX depth is the lowest value of the maximum values of all the recorded ranges, thus the final bathymetric distribution interval is the highest value MIN depth – MAX depth). This range of the known and new species is provided for all the available specimens and also for the only living specimens if they have been found; when these ranges are the same, the common range is cited once with the "(living)" annotation; if all the specimens are dead collected, the range is cited with the "(dead)" annotation.

Regarding the description methodology, the main conchological features used are (see Figure 1 below):

- ◆ general shape of the shell : conical, cyrtocoidal, coeloconoidal;
- ◆ relative height of the spire : spire depressed or depressed;
- ◆ size and shape of the protoconch;
- ◆ shape of the whorls : convex, concave, straight; with or without shoulder or keel;
- ◆ spiral cords of the whorls : ontogeny, number, granular (beaded) or smooth, distance between cords;
- ◆ shape of the aperture, features of the outer and the inner lip.
- ◆ shape of the base and its spiral cords : number,

- granular (beaded) or smooth, distance between cords;
- ◆ features of the umbilicus : open or covered with a callus, relative size, with a rounded or carinate edge, with a smooth or granular carina, spiral cords around or inside umbilicus;
- ◆ columella : thickened or not;
- ◆ colour pattern of the protoconch, of the whorls, of the base.

Abbreviations

Repositories

IMT: Institute of Malacology of Tokyo, Tokyo, Japan.
MNHN: Muséum national d'Histoire naturelle, Paris, France.

NHMUK: Natural History Museum of United Kingdom, London, England.

NMSA: KwaZulu-Natal Museum, Pietermaritzburg, South Africa.

SMNH: Swedish Museum of Natural History, Stockholm, Sweden.

Shell features and dimensions

H: height

HA: height of the aperture

P1, P2,: primary cords (P1 is the most adapical)

Pi: group of the three first primary cords (i=1,2,3)

S1, S2,: secondary cords (S1 is the most adapical)

Si: group of the secondary cords

T1, T2,: tertiary cords (numbered following appearing order)

TW: number of teleoconch whorls

W: width

Other abbreviations

stn: station

lv: live-taken specimens present in sample

dd: no live-taken specimens present in sample

sub: subadult specimen

juv: juvenile specimen

o.d.: original designation

s.d.: subsequent designation

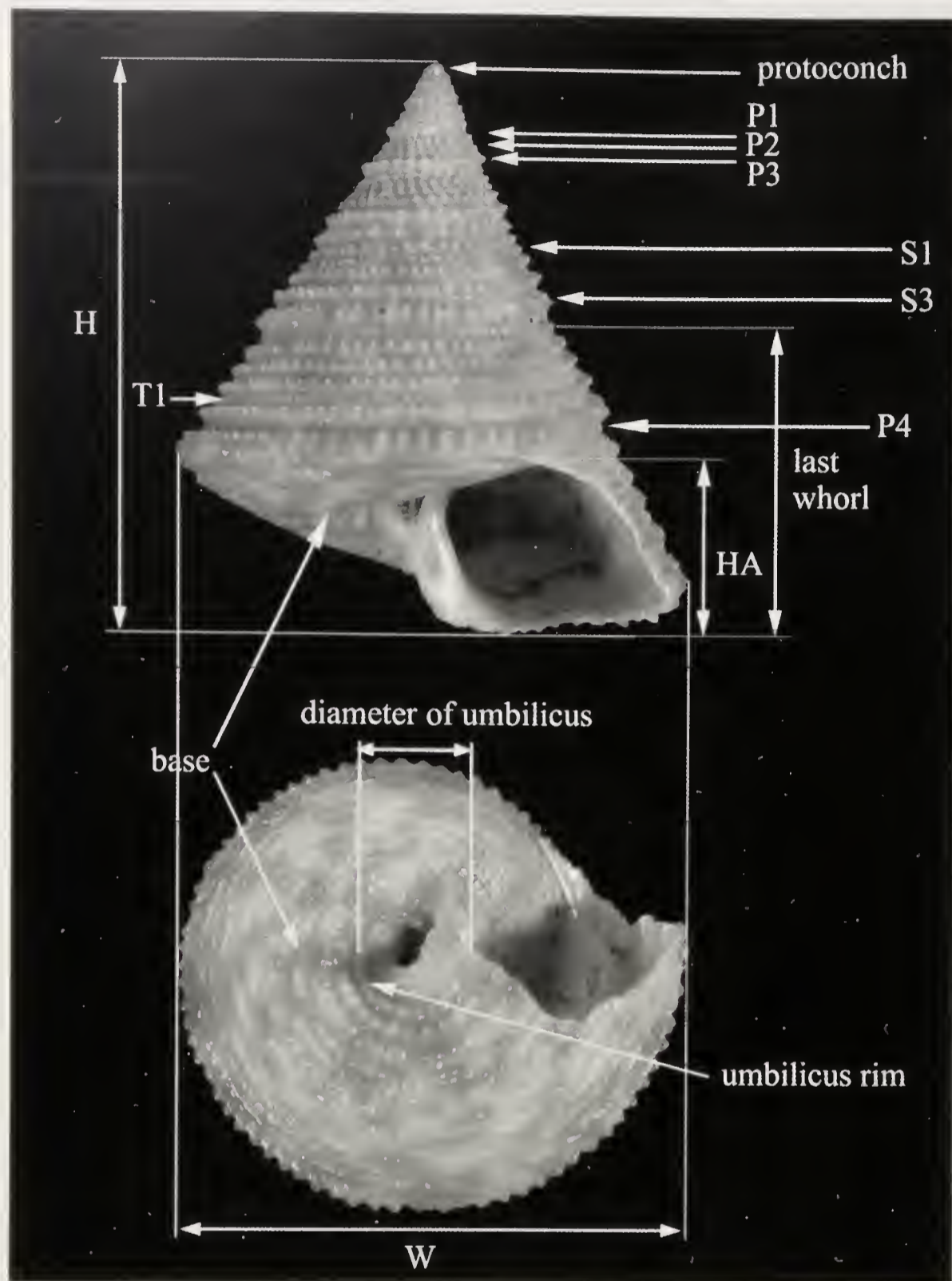


Figure 1. Principal conchological features of Calliostomatidae shells; H : height; W : width; HA : height of the aperture; P1, P2, P3, ... : primary cords; S1, S2, S3, ... : secondary cords; T1, T2, ... : tertiary cords (shell : *Calliostoma pyrron* n. sp., 11.8 x 10.5 mm).

SYSTEMATICS

We follow here Marshall (1995a), Bouchet & Rocroi (2005) and Williams et al. (2008, 2010) where Calliostomatidae, earlier treated as a subfamily of Trochidae (Hickman & McLean, 1990), are now ranked as a family of superfamily Trochoidea, with the two subfamilies Calliostomatinae and Thysanodontinae.

Regarding subgenera of the genus *Calliostoma*, it has been decided to not use them here, because they seem today rather artificial considering the information brought by DNA studies. One can however refer to

Marshall (1995b) regarding Indo-Pacific subgenera and to Clench & Turner (1960) regarding Atlantic subgenera.

Superfamily **TROCHOIDEA** Rafinesque, 1815
 Family **CALLIOSTOMATIDAE** Thiele, 1924
 Subfamily **CALLIOSTOMATINAE** Thiele, 1924
 Tribe **Calliostomatini** Thiele, 1924 [= Ziziphinae Gray, 1847]

Genus *Calliostoma* Swainson, 1840

Type species: *Trochus comulus* Linnaeus, 1758 (by s.d. Herrmannsen, 1846) – Recent, Mediterranean Sea.

Calliostoma madagascarense
Vilvens, Nolf & Verstraeten, 2004
Figs 2–6

Calliostoma (*Kombologion*) *madagascarensis*
Vilvens, Nolf & Verstraeten, 2004: 49-55, figs 1-6.
Type locality: North-western Madagascar, 400-410 m.

Material examined. Western Madagascar.
MIRIKY: stn CP3183, 12°38'S, 48°14'E, 420-436 m, 1 dd, 4 lv sub. – Stn CP3184, 12°40'S, 48°12'E, 492-524 m, 5 lv, 2 lv sub. – Stn CP3200, 12°06'S, 48°54'E, 560-653 m, 1 lv. – Stn CP3210, 12°44'S, 48°12'E, 442-491 m, 5 lv, 1 dd sub. – Stn CP3223, 12°46'S, 48°11'E, 430-488 m, 6 lv, 4 dd sub, 1 dd juv. – Stn CP3284, 14°51'S, 46°59'E, 236-297 m, 1 lv. – Stn CP3285, 14°47'S, 46°58'E, 512-680 m, 1 lv. – Stn CP3289, 14°29'S, 47°26'E, 332-379 m, 1 lv. – Stn CP3290, 14°29'S, 47°26'E, 409-425 m, 2 dd.

Distribution. Western Madagascar (integrating data for the same area of Vilvens et al., 2004), living at 297-560 m.

Remarks. The main characteristics of this species are:

- height up to 30 mm, width up to 40 mm;
- shell rather thin and light relative to its size,
- moderately high spire, coeloconoidal shape, angular periphery, with up to 8 whorls;
- protoconch about 500 μ m wide, of 1 whorl;
- teleoconch with granular spiral cords; P2 and P3 appearing first while P1 appears half a whorl later, S1 and S2 appearing on fourth whorl and additional tertiary cords appearing on next whorls; about 16-20 cords on last whorls
- an almost flat base, concave in its peripheral quarter, weakly convex for inner part, with about 30 granular spiral cords, all smooth except the 4 or 5 inner cords which are granular;
- anomphalous;
- pink-apricot colour, P4, S4 and base paler.

This handsome species seems to be often confused with *C. scotti* Kilburn, 1973 (Figs 7-11) but this species is mainly heavier with a much thicker shell and has a fully convex base.

Calliostoma madatechnema n. sp.
Figs A, 16–24, Table 1

Type material. Holotype (17.8 x 21.0 mm) MNHN IM-2000-27738. Paratypes: 7 MNHN IM-2000-27739, 1 coll. C.Vilvens CV2014- CP3189.

Type locality. Western Madagascar, MIRIKY, stn CP3189, 12°30'S, 48°18'E, 346-376 m.

Material examined. Western Madagascar. P 1: chalutage 1, 12°53'S, 48°09'E, 480-520 m, 1 dd. –

Chalutage 2, 12°53'S, 48°09'E, 480-520 m, 1 dd. – Chalutage 5, 12°45'S, 48°11'E, 563-570 m, 1 dd. – P 2: chalutage 10, 12°45'S, 48°15'E, 300-340 m, 6 lv. – Chalutage 12, 12°42'S, 48°14'E, 395-405 m, 1 lv. – Chalutage 13, 12°41'S, 48°16'E, 308-314 m, 1 dd. – P 3: chalutage 17, 12°38'S, 48°16'E, 335-370 m, 1 lv. – Chalutage 28, 12°43'S, 48°12'E, 445-455 m, 3 lv. – Chalutage 41, 12°43'S, 48°13'E, 350-360 m, 1 dd. – P 4: chalutage 43, 15°24'S, 46°02'E, 250-265 m, 1 dd. – MIRIKY: stn CP3182, 12°36'S, 48°16'E, 331-364 m, 10 lv, 3 lv juv. – Stn CP3188, 12°31'S, 48°22'E, 298-301 m, 4 lv, 1 dd sub. – Stn CP3189, 12°30'S, 48°18'E, 346-376 m, 50 lv, 1 dd juv (with holotype, 7 paratypes MNHN IM-2000-27739, 1 paratype CV2014- CP3189). – Stn CP3197, 12°07'S, 48°58'E, 362-431 m, 1 dd, 1 dd juv. – Stn CP3198, 12°05'S, 48°59'E, 440-447 m, 1 dd. – Stn CP3215, 12°32'S, 47°54'E, 316-433 m, 1 dd. – Stn CP3217, 12°33'S, 48°56'E, 391-438 m, 3 lv. – ORSTOM, 12°43'S, 48°15'E, 300-340 m, 2 lv.

Southern Madagascar. ATIMO VATAE: stn DW3515, 24°53'S, 47°28'E, 184-203 m, 2 dd sub. – Stn DW3527, 24°23'S, 47°32'E, 305-313 m, 1 dd juv. – Stn DW3586, 25°33'S, 44°18'E, 155-156 m, 1 dd juv.

Mozambique Channel. MAINBAZA: stn CC3131, 25°56'S, 33°07'E, 193-194 m, 1 dd juv. – Stn CC3143, 23°32'S, 35°46'E, 264-277 m, 6 dd, 4 dd sub, 1 dd juv. – Stn CC3151, 19°34'S, 36°45'E, 352-357 m, 4 dd juv.

Distribution. Western Madagascar, 265-563 m, living at 301-445 m; Mozambique Channel, 194-352 (dead); Southern Madagascar, 156-305 (dead).

Diagnosis. A rather tall *Calliostoma* species, with a moderately elevated, coeloconoidal spire, up to 14 granular, close spiral cords, the most abapical cord the strongest, an almost flat base with up to 15 granular spiral cords, without umbilicus; light brownish orange with irregular brown patches and beads of cords white.

Description. *Shell* of medium size for the genus (height up to 18.7 mm, width up to 21.8 mm), wider than high, conical to weakly coeloconoidal in shape; spire elevated, height 0.8 x to 0.9 x width, 3.3x to 3.8x aperture height; angulate periphery; widely umbilicate.

Protoconch about 320 to 350 μ m wide, of 1 whorl, rounded, covered by a network of ridges producing large polygonal areas; thin, poorly visible terminal varix.

Teleoconch of up to 7.9 almost flat to weakly convex whorls, except more convex last whorl.

Suture poorly visible, not canaliculate.

First whorl convex, sculptured by rather thick, axial, almost orthocline ribs and 3 spiral cords P1, P2 and P3 appearing almost simultaneously; P3 quickly slightly stronger than other cords; distance between cords

similar in size to cords; axial ribs making the cords granular; distance between ribs 1.5 times larger than width of ribs; suture visible, not canaliculate. Second whorl only weakly convex, with P3 stronger than other cords, P4 partly visible, almost completely hidden by succeeding whorl; distance between P1 and P2 smaller than other distances between cords; axial ribs prosocline; suture poorly visible. Third whorl almost flat with P3 much stronger with sharp beads, producing keel between middle and 2nd third of whorl; P1 weaker, but slightly stronger than P2; P4 fully or partially visible, as strong as P1; axial ribs still strong, distance between ribs 2 times larger than width of ribs. On fourth whorl, beads of all cords pointed; axial ribs between P3 and P4 thicker than other cords. On fifth whorl, P4 as strong as P3; keel weakening and finally disappearing; axial ribs much weaker, except between P3 and P4. On sixth whorl, P4 the strongest, S1 and S2 appearing, S2 about half a whorl later, all quickly granular; S3 absent; T1 appearing between suture and P1, quickly similar to S1 and S2. On last whorls, additional thin, smooth Ti appearing

between P3 and P4; all spiral cords less pointed, but still granular. On last whorl, P4 peripheral; angular periphery.

Aperture subquadrangular; outer lip rather thin, curved, with a basal part rounded, meeting inner lip with rounded angle.

Columella slightly oblique, curved, thickened in abapical part.

Base weakly convex to almost flat, with about 15 spiral cords; outer cords smooth, distance between cord similar to thickness of cords; median and inner cords thicker, closer, made granular by fine axial threads; cord bordering umbilicus nearly smooth.

Umbilicus wide (about 20 to 25% of shell width), funnel shaped, with angulate rim; neither threads nor cords inside.

Colour of teleoconch globally light brownish orange; whitish ground colour with irregular brown patches; beads of cords white; P4 with regular brown patches covering two or three beads and separated by four or five brownish orange coloured beads; base nacreous white; protoconch white.

	TW	H	W	HA	H/W	H/HA
holotype	7.8	17.8	21.0	5.1	0.85	3.49
paratype 1	7.9	18.7	21.8	5.1	0.86	3.67
paratype 2	7.7	17.2	20.3	5.1	0.85	3.37
paratype 3	7.8	16.7	20.2	4.9	0.83	3.41
paratype 4	7.8	17.1	19.4	4.5	0.88	3.80
paratype 5	7.7	17.3	20.0	5.2	0.87	3.33
paratype 6	7.8	17.2	19.8	4.9	0.87	3.51
paratype 7	7.7	17.0	20.2	5.1	0.84	3.33
paratype CV	7.8	17.4	20.6	4.8	0.84	3.63
<i>means</i>	7.8	17.4	20.4	5.0	0.9	3.5

Table 1. - *Calliostoma madatechnema* n. sp. : Shells measurements in mm for types.

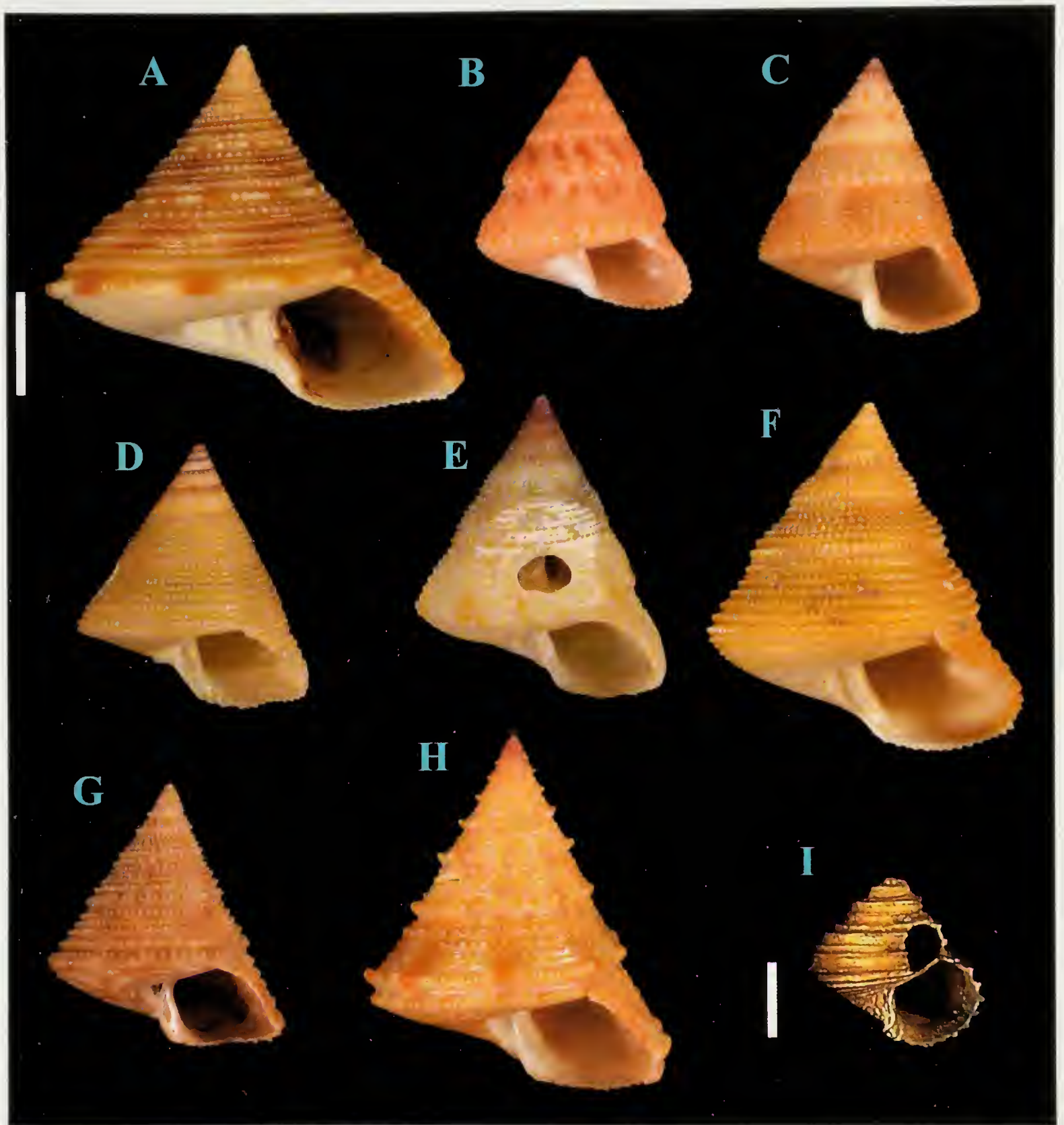
Discussion. *Calliostoma madatechnema* n. sp. seems to be rather variable regarding the height and the concavity of the spire. This handsome new species is rather close to *C. iridescens* Sowerby, 1903 (Figs 12-15) from South Africa, but the latter species has a different secondary spiral cords ontogeny, with S1 and S2 appearing much earlier at the end of the fourth whorl and much more numerous tertiary cords appearing on the last whorls; moreover, the cords of the South African species are smooth except P1 and the tertiary above it, and all the cords between P1 and

P4 are much thinner than those of the new species; finally, *C. iridescens* has always a light brown base (not uniformly nacreous white), with irregular brownish flames and spiral segments on the cords.

Etymology. Work of art (Ancient Greek: τεχνημα) – referring to the fine granular sculpture of the spiral cords, used as a noun in apposition with a prefix referring to the type locality.

Figures A-I [(scale bars: 5 mm (A-H); 1 mm (I))]

Calliostoma new species from Madagascar area, all MNHN holotypes. **A.** *C. madatechnema* n. sp.; **B.** *C. textor* n. sp.; **C.** *C. parvajuba* n. sp.; **D.** *C. hematomenon* n. sp.; **E.** *C. subalboroseum* n. sp.; **F.** *C. tumidosolidum* n. sp.; **G.** *C. pyrron* n. sp.; **H.** *C. herberti* n. sp.; **I.** *Carinastele wareni* n. sp.



Calliostoma textor n. sp.
Figs B, 25–32, Table 2

Type material. Holotype (11.5 x 9.7 mm) MNHN IM-2000-27740. Paratypes: 2 MNHN MNHN IM-2000-27741, 1 MNHN IM-2000-27742, 1 coll. C.Vilvens CV2014-CP3285.

Type locality. Western Madagascar, MIRIKY, stn CP3204, 12°37'S, 48°30'E, 59-60 m.

Material examined. Western Madagascar. MIRIKY: stn CP3204, 12°37'S, 48°30'E, 59-60 m, 3 lv (holotype MNHN IM-2000-27740 and 2 paratypes MNHN IM-2000-27741). – Stn CP3205, 12°38'S, 48°26'E, 60-63 m, 4 dd. – Stn CP3244, 14°55'S, 46°55'E, 58-87 m, 1 dd. – Stn CP3285, 14°47'S, 46°58'E, 512-680 m, 2 dd (paratype MNHN IM-2000-27742 and paratype CV2014-CP3285).

Distribution. Western Madagascar, 60-512 m, living at 59-60 m.

Diagnosis. A typical *Calliostoma* species of moderate size, with an elevated, conical spire, up to 14 granular, closely packed spiral cords, the two most abapical cords stronger, an almost flat base with up to 14 granular spiral cords, without umbilicus; pinkish orange with brown subsutural flames and brown coloured spiral band between the cords, the two peripheral cords with alternating brown and pink segments.

Description. *Shell* of medium size for the genus (height up to 15.6 mm, width up to 12.7 mm), higher than wide, conical to weakly cyrtocoidal in shape; spire elevated, height 1.2x to 1.3x width, 3.5x to 3.8x aperture height; subangulate periphery; anomphalous. *Protoconch* about 200 µm wide, of 1 whorl, rounded, dome-shaped, covered by a reticulate network; apical fold straight with a thin rounded terminal varix. *Teleoconch* of up to 9.6 weakly convex to more or less flat whorls. Suture poorly visible, not canaliculate. First whorl convex, sculptured by thick axial, almost orthocline ribs and 3 spiral cords P1, P2 and P3

appearing immediately, granular by intersection with axial threads; distances between cords smaller than distance between higher or lower cord to nearby suture; interspace between threads 1.5x to 2x larger than threads; P1 slightly stronger than other cords; suture visible, not canaliculate. On second whorl, cords similar in strength; P4 emerging from suture, partly hidden by succeeding whorl; P1 and P3 moving towards suture, making all cords and suture evenly spaced; axial threads broader and more prosocline, connecting beads of cords; suture poorly visible. On third whorl, S1 appearing at beginning of whorl; bead of cords well rounded, not sharp, well separated; axial threads weakening. On fourth whorl, P3 and P4 closer, almost without interspace between them; S2 appearing; beads of cords more rounded and closer packed; axial threads weak but still present. On fifth whorl, tertiary cords appearing by intercalation between Pi and Si; P1 and P3 stronger than other cords, P3 the strongest, peripheral. On last whorls, number of cords growing up to 10 to 14 cords; cords close, granular, more or less similar in size except P3 slightly stronger; distance between cords larger on adapical part than on abapical part; prosocline axial threads more visible, strong between suture and P1.

Aperture subquadrangular, slightly horizontally elongated on large specimens; outer lip rather thin, curved, with a basal part rounded, producing an obtuse angle at meeting point with inner lip.

Columella oblique, nearly straight with a weak median swelling; callus completely covering umbilicus.

Base weakly convex, almost flat, with 11 to 14 granular, close packed spiral cords; cords stronger in area bordering umbilicus.

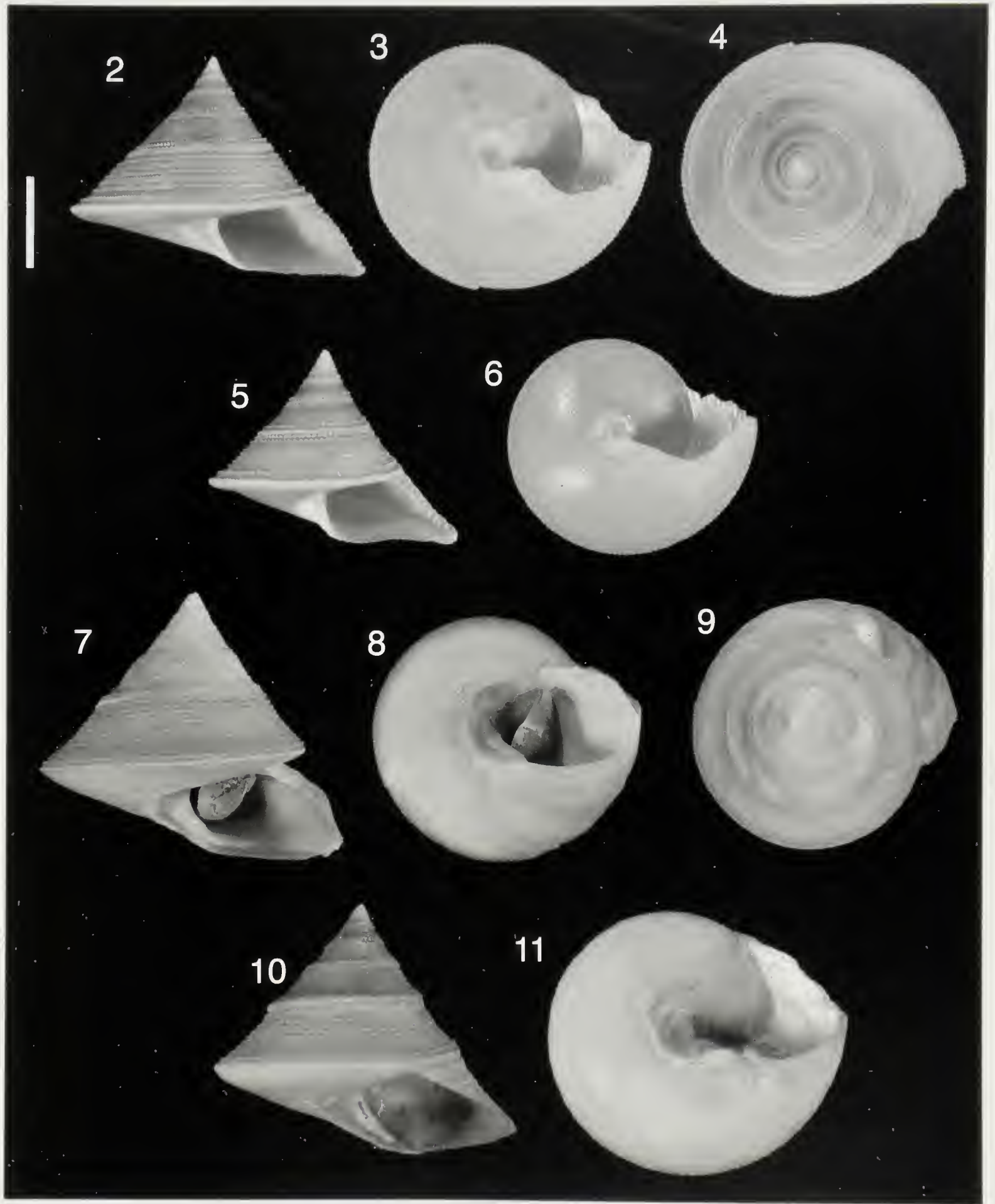
Colour of teleoconch pinkish orange with brown subsutural flames; on second and third whorl, all cords brown coloured, darker than interspaces; on two or three next whorls, cords pink with brown coloured spiral band in interspaces; on last whorls, brown bands possibly replaced by brown axial flames on adapical part; on all whorls except the two early ones, P4 and P3 with regular brown patches covering one to three beads and separated by one to three pink coloured beads; base lighter; first half of protoconch reddish brown, second half light brown.

Figures 2-11 (scale bar: 10 mm)

2-6. *Calliostoma madagascarensis* Vilvens, Nolf & Verstraeten, 2004, Western Madagascar, 406-410 m [MIRIKY, stn CP3223]. **2-4.**, 26.2 x 31.1 mm; **5-6.** 17.6 x 22.8 mm.

7-11. *Calliostoma scotti* Kilburn, 1973.

7-9. Mozambique Channel, 406-410 m [MAINBAZA, stn CC3163], 34.1 x 33.9 mm; **10-11.** South Africa, Natal, off Durban, 35 m, C.Vilvens coll., 30.1 x 37.0 mm.



	TW	H	W	HA	H/W	H/HA
holotype	8.0	11.5	9.7	2.4	1.19	4.79
paratype MNHN IM-2000-27741	8.5	13.4	10.6	3.5	1.26	3.83
paratype MNHN IM-2000-27741	7.9	11.5	9.8	3.3	1.17	3.48
paratype MNHN IM-2000-27742	9.6	15.6	12.7	3.8	1.23	4.11
paratype CV	8.0	12.1	10.1	3.0	1.20	4.03
means	8.4	12.8	10.6	3.2	1.21	4.05

Table 2. - *Calliostoma textor* n. sp. : Shells measurements in mm for types.

Discussion. *Calliostoma textor* n. sp. is rather close to *C. scobinatum* (A. Adams in Reeve, 1863) (Figs 33-34) from eastern Indian Ocean and western Indo-Pacific, but the latter species, although more or less similar in size and colour, has a very different spiral cords ontogeny, with, among others, S3 present and appearing earlier than other secondary cords.

The colour pattern of P3 and P4 of *C. textor* n. sp. resembles *C. africanum* Bartsch, 1915 (Figs 35-37) from South Africa, but the latter species, similar in size, has flat whorls, spiral cords with bigger beads, P3 subgranular and P4 smooth, an open umbilicus partly covered by a columellar callus and a more convex base with smooth or subgranular spiral cords. The new species may be compared to *Dactylastele burnupi* (E.A. Smith, 1899) (Figs 104-114) from South Africa, but this similar in size species has more convex whorls, thicker and less numerous spiral cords on the whorls and on the base, with only P4 (not P3) streaked in brown and white.

The new species may also be compared to *C. alisi* Marshall, 1995 (Figs 38-39) from Loyalty Islands, but this similar in size and shape species has a spiral cord S3 that is the strongest cord, an axial sculpture still visible on last whorls and less numerous, thicker spiral cords on the base.

Etymology. Weaver (Latin: *textor*) used in apposition as a noun – referring to the regular, fine granular sculpture and colour pattern on the whole surface of the whorls and the base.

Calliostoma parvajuba n. sp.
Figs C, 40–42

Type material. Holotype (13.8 x 11.3 mm) MNHN IM-2000-27743.

Type locality. Southern Madagascar, ATIMO VATAE, stn CP3549, 25°17'S, 46°31'E, 53-54 m.

Material examined. Only known from type material.

Distribution. Southern Madagascar, 53-54 m (dead).

Diagnosis. A typical *Calliostoma* species of medium size, with an elevated, conical spire, up to 12 granular spiral cords, a stronger, sharp pointed suprasutural spiral cord on the median whorls, a very weakly convex, almost flat base with 16 granular spiral cords and a very narrow umbilicus; early teleoconch whorls pinkish mauve, other whorls nacreous white with axial brownish flames.

Description. *Shell* of medium size for the genus (height up to 13.8 mm, width up to 11.3 mm), higher than wide, conical; spire elevated, height 1.2x width, 3.4x aperture height; angulate periphery; very narrowly umbilicate. *Protoconch* about 300 µm wide, of 1 whorl, rounded, partly eroded, with spiral and strong axial threads producing reticulate network; apical fold straight without visible varix.

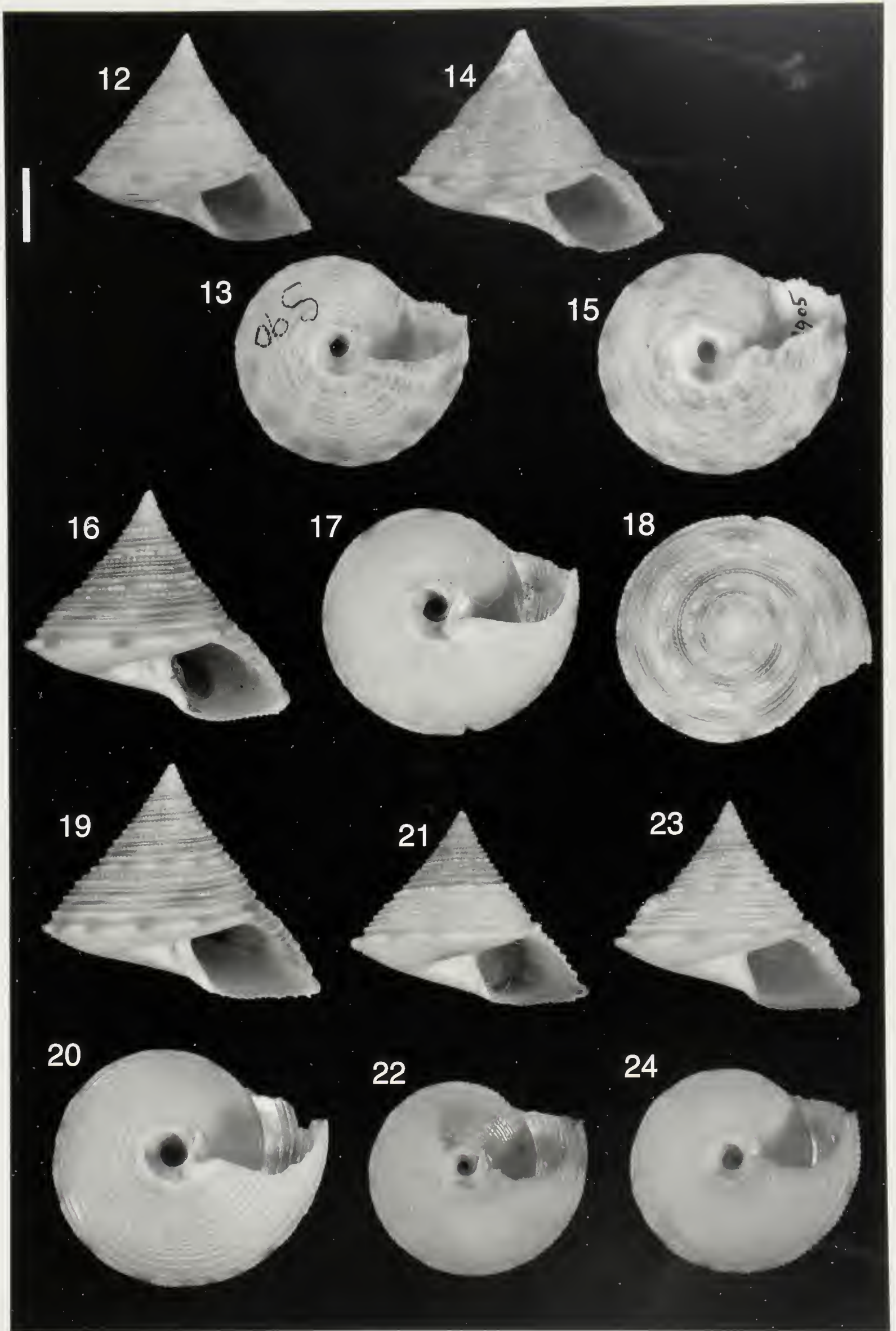
Figures 12-24 (scale bar: 5 mm)

12-15. *Calliostoma iridescens* Sowerby, 1903, Natal.

12-13. 100 m [NMDP, stn ZV10], 15.5 x 17.7 mm (NMSA S90); **14-15.** off Durban, 100 m [RVMN, stn XX112], 17.5 x 21.5 mm (NMSA D3905).

16-24. *Calliostoma madatechnema* n. sp., Western Madagascar.

16-20. 346-376 m [MIRIKY, stn CP3189]; **16-18.** Holotype MNHN IM-2000-27738, 17.8 x 21.0 mm; **19-20.** Paratype MNHN IM-2000-27739, 18.7 x 21.8 mm; **21-22.** 300-340 m [P 2, Chalutage 12], 14.3 x 16.9 mm; **23-24.** 563-570 m [P 1, Chalutage 12], 14.9 x 17.6 mm.



Teleoconch of up to 8.1 weakly convex to more or less flat whorls. Suture poorly visible, not canaliculate.

First whorl convex, sculptured by thick axial, almost orthocone ribs and 3 cords P1, P2 and P3 appearing immediately, evenly spaced, nodular by intersection with axial threads; interspace between ribs about 2x larger than ribs; P3 the strongest, with blunt pointed nodules; P2 slightly weaker than P3; P1 much weaker than other cords; suture visible, not canaliculate. On second whorl, P4 emerging from suture, nearly smooth, much weaker than other cords, close to suture; nodules of both P3 and P2 pointed, nodules of P3 stronger than nodules of P2; axial ribs broader and slightly prosocline, connecting beads of cords; thin axial threads appearing between ribs; thin spiral threads appearing between P3 and P4, producing reticulate pattern. On third whorl, P3 the strongest, with pointed beads; S1 appearing, very thin, quickly granular as P1. On fourth whorl, beads of P3 sharply pointed and P3 producing a temporary carina; S2 appearing, smooth, thickening very slowly; S1 slightly thinner than P1 and P2; axial threads weak but still present between all cords; spiral threads between P3 and P4 no more visible. On fifth whorl, nodules of P3 only bluntly pointed; P1, S1, P2 similar in size, P3 slightly stronger, P4 thickening, similar in size to S2. On next whorls, number of cords growing up to 12 cords by intercalation of tertiary cords; P4 peripheral; cords granular, more or less similar in size; beads of cords horizontally elongated; distance between cords similar in size to cords; some weak, prosocline threads visible between cords.

Aperture rounded subquadrangular; outer lip thin, curved, with strong angle, producing an obtuse angle at meeting point with inner lip.

Columella slightly oblique, straight, with a basal thickening.

Base very weakly convex, almost flat, with 16 granular spiral cords; distance between cords smaller than cords.

Umbilicus very narrow (about 7% of shell width), funnel shaped, without angulate rim.

Colour of early teleoconch whorls pinkish mauve; next whorls nacreous white with brownish axial flames, enlarging on last whorls, with small brown spots between beads of spiral cords; base yellowish

brown, umbilical area lighter, almost white; protoconch pink.

Discussion. *Calliostoma parvajuba* n. sp. is rather close to *C. textor* n. sp. (Figs 25–32) from Western Madagascar, but the latter species, similar in size, has a smaller protoconch (200 μ m instead of 300 μ m), more convex whorls, P3 and P2 being always granular (not pointed), spiral cords closer with more rounded beads, a subangulate periphery and lacks the narrow, funnel shaped umbilicus.

Etymology. Small crest (Latin: parvus, a, um; juba), used in apposition as a noun – referring to the spiral cord P3 making a temporary keel on the median whorls.

Calliostoma hematomenon n. sp.

Figs D, 43–48

Type material. Holotype (11.9 x 10.5 mm) MNHN IM-2000-27744. Paratype (13.1 x 12.2 mm) MNHN IM-2000-27745.

Type locality. Western Madagascar, MIRIKY, stn DW3213, 12°31'S, 47°52'E, 262–289 m.

Material examined. Western Madagascar. MIRIKY: stn DW3196, 12°08'S, 48°56'E, 238–249 m, 1 dd sub. – Stn DW3213, 12°31'S, 47°52'E, 262–289 m, 1 lv (holotype IM-2000-?????). – Stn CP3262, 15°34'S, 45°44'E, 227–283 m, 1 dd (paratype IM-2000-?????).

Mozambique Channel. MAINBAZA: stn CC3159, 23°55'S, 35°37'E, 148–152 m, 1 dd sub.

Distribution. Western Madagascar, 249–262 m, living at 262–289 m; Mozambique Channel, 148–152 m (dead).

Diagnosis. A typical nacreous white *Calliostoma* species with dark pink spiral areas on early whorls, of moderate size, with an elevated, conical spire, an angulate periphery, up to 9 main granular, similar in size spiral cords on the last whorl with thin subgranular cords between them, a flat to almost concave base with up to 15 subgranular spiral cords, without umbilicus.

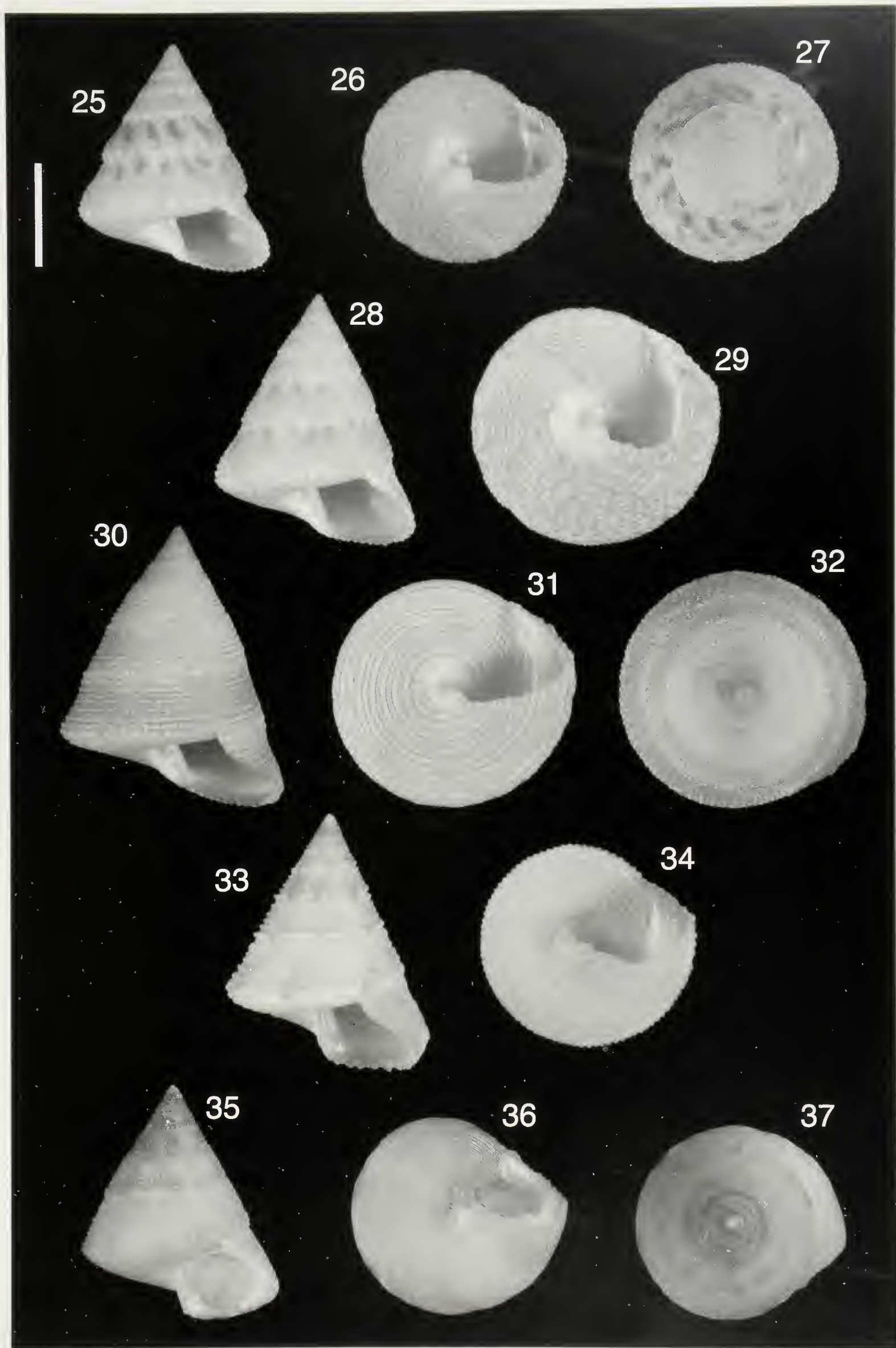
Figures 25–37 (scale bar: 5 mm).

25–32. *Calliostoma textor* n. sp., Western Madagascar.

25–27. Holotype MNHN IM-2000-27740, 59–60 m [MIRIKY: stn CP3204], 11.5 x 9.7 mm; **28–29.** Paratype MNHN IM-2000-27741, 59–60 m [MIRIKY, stn CP3204], 13.4 x 10.6 mm; **30–32.** Paratype MNHN IM-2000-27742, 512–680 m [MIRIKY, stn CP3285], 15.6 x 12.8 mm.

33–34. *Calliostoma scobinatum* (A. Adams in Reeve, 1863), Philippines, Aliquay, 13.7 x 11.4 mm.

35–37. *Calliostoma africanum* Bartsch, 1915, South Africa, Natal, Park Rynie, C. Vilvens coll., 11.6 x 9.7 mm.



Description. *Shell* of medium size for the genus (height up to 13.1 mm, width up to 12.2 mm), higher than wide, conical in shape; spire elevated, height 1.1x width, 3.7x to 4.1x aperture height; angulate periphery; anomphalous.

Protoconch from 250 to 300 μm wide, of 1 whorl, rounded, covered by a strong reticulate network; apical fold straight with a thin, poorly visible, rounded terminal varix.

Teleoconch of up to 7.3 flat whorls. Suture poorly visible, not canaliculate from third whorl.

First whorl convex, sculptured by axial, almost orthocline ribs and 3 evenly spaced cords P1, P2 and P3 appearing immediately, granular by intersection with axial threads; interspace between threads 1.5x larger than threads; P3 stronger than other cords; suture visible, slightly canaliculate. On second whorl, cords and ribs stronger; P3 the strongest, with bluntly pointed beads, producing a weak keel; P1 and P2 granular, with rounded, separate beads. On third whorl, S1 and S2 appearing at beginning of whorl, as strong as P2 at end of whorl; P1 slightly stronger than P2; axial threads more prosocline; P4 partly emerging from suture at end of whorl; suture no more canaliculate. On fourth whorl, P1 and P4 almost as strong as P3; beads of P3 almost rounded, closer to each other; axial ribs weakening. On fifth whorl, all cords similar in size with rounded beads; T1 and T2 appearing respectively between P1 and S1 and between P3 and P4, thin, subgranular; axial sculpture obsolete. On sixth whorl, T1 and T2 almost similar in size to other cords; S4 emerging partially from suture. On last whorls, additional tertiary cords appearing by intercalation, very thin; P4 and S4 peripheral; cords close, granular, more or less similar in size, distance between cords smaller than cords.

Aperture subquadrangular; outer lip rather thin, curved, with a basal part rounded, producing a round angle with outer lip and an obtuse angle with inner lip. Columella oblique, nearly straight with possibly weak median swelling; callus completely covering umbilicus.

Base flat with up to 15 subgranular, low spiral cords, cords in umbilical area stronger; distance between cords similar in size to cords; very weak axial threads between cords.

Colour of teleoconch basically pinkish beige; on the four early whorls, P1 and abapical area below P3 dark pink; last whorls and base uniformly coloured; base nacreous white, without dots; protoconch pink.

Discussion. *Calliostoma hematomenon* n. sp. is close to *C. textor* n. sp. (Figs 25–32) from the same area, but the latter species, similar in size, has a different colour pattern (brown lines between cords, P3 and P4 streaked in pink and light brown), a P3 cord similar to the other primary cords on the first whorls but becoming stronger and peripheral on the next whorls (it is the contrary of the here described species) and a more convex base (it is strictly flat to almost concave for the here described species) with higher, closer, more granular spiral cords and a larger umbilical area.

Etymology. Bloody (Ancient Greek : $\eta\mu\alpha\tau\omega\mu\epsilon\nu\omicron\varsigma$, η , $\omicron\nu$) - with reference to dark pink spiral bands on the first whorls.

Calliostoma subalboroseum n. sp.

Figs E, 49–51

Type material. Holotype (13.3 x 11.2 mm) MNHN IM-2009-13637.

Type locality. Southern Madagascar, south of Faux-Cap, ATIMO VATAE, stn DW3553, 26°08'S, 45°39'E, 280–333 m.

Material examined. Only known from type material (living, molecular sample performed MNHN-2009-13637).

Distribution. Southern Madagascar, living at 280–333 m.

Diagnosis. A typical, medium in size, nacreous white *Calliostoma* species with first whorls dark pink, with an elevated, conical spire, an angulate periphery, up to 8 main granular on the last whorl, similar in size except the suprasutural one always stronger, a weakly convex base with 12 subgranular spiral cords, without umbilicus.

Figures 38-51 (scale bar: 5 mm)

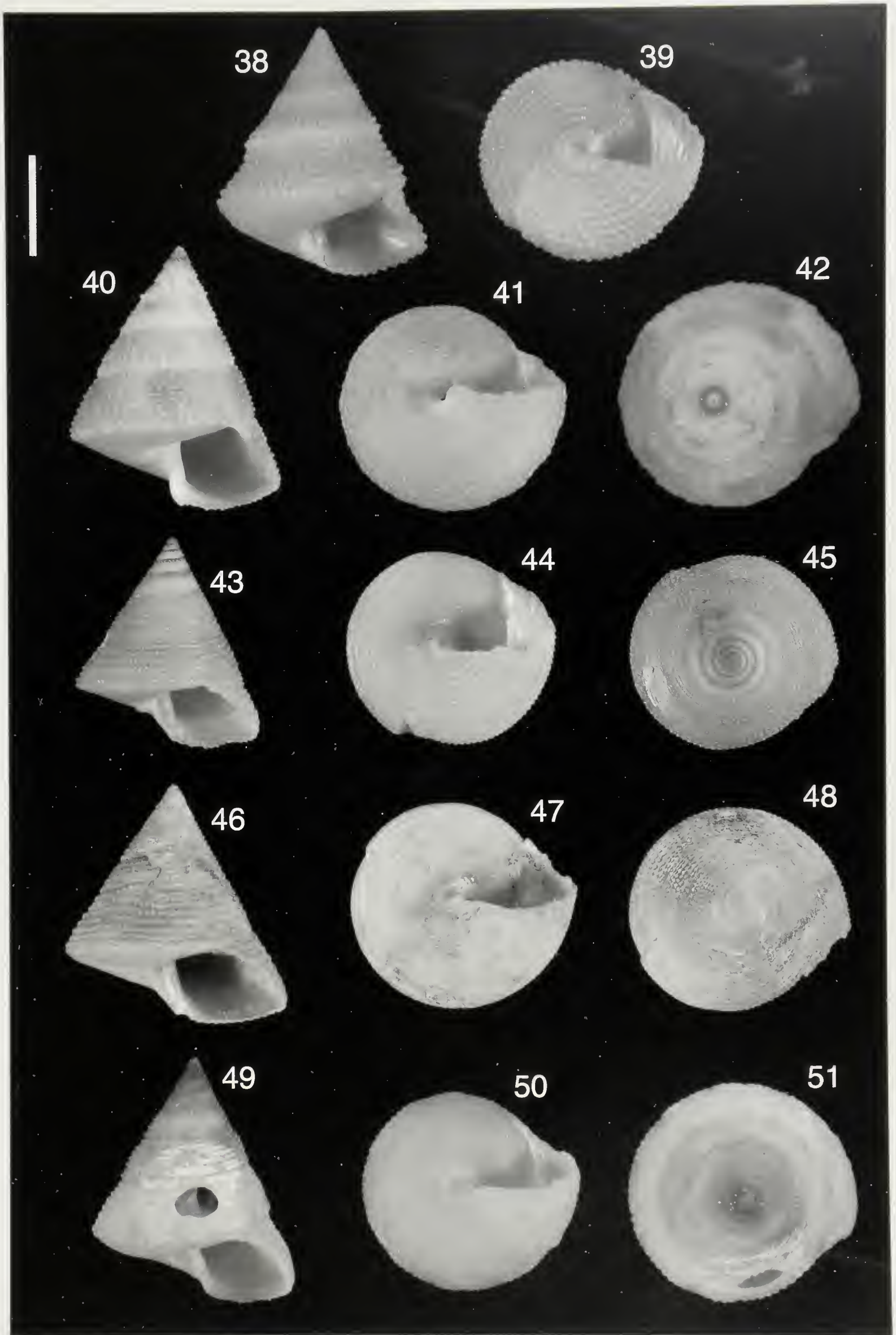
38-39. *Calliostoma alisi* Marshall, 1995, paratype MNHN, Loyalty Islands, 430 m [MUSORSTOM 6, stn CP464], 13.7x12.0 mm.

40-42. *Calliostoma parvajuba* n. sp., Southern Madagascar, holotype MNHN IM-2000-27743, 53-54 m [ATIMO VATAE: stn CP3549], 13.8 x 11.3 mm.

43-48. *Calliostoma hematomenon* n. sp., Western Madagascar.

43-45. Holotype MNHN IM-2000-27744, 262-289 m [MIRIKY, stn DW3213], 11.9 x 10.5 mm; **46-48.** Paratype MNHN IM-2000-27745, 227-283 m [MIRIKY, stn CP3262], 13.1 x 12.2 mm.

49-51. *Calliostoma subalboroseum* n. sp., holotype MNHN IM-2009-13637, 280-333 m [ATIMO VATAE, stn DW3553], 13.3 x 11.2 mm.



Description. *Shell* of medium size for the genus (height up to 13.3 mm, width up to 11.2 mm), higher than wide, conical in shape; spire elevated, height 1.2x width, 4.0x aperture height; angulate periphery; anomphalous.

Protoconch about 300 μ m wide, of 1 whorl, rounded, covered by a strong reticulate network; apical fold straight with a rounded terminal varix.

Teleoconch of up to 7.8 slightly convex whorls. Suture hard to distinguish, not canaliculate.

First whorl convex, sculptured by axial, rather thin, almost orthocone ribs; P3 and P2 appearing immediately, P1 a quarter of whorl later; cords evenly spaced, granular by intersection with axial threads; interspace between threads 2x larger than threads; P3 quickly stronger than other cords. On second whorl, cords and ribs stronger; P3 still the strongest; all cords with rounded beads; area between P3 and suture concave in shape. On third whorl, S1 and S3 appearing; axial ribs more prosocline. On fourth whorl, P3 still the strongest but P1 and S3 almost as strong as P3, stronger than other cords; beads of P1, P2, P3 and S3 blunt pointed; S2 appearing; axial sculpture obsolete. On fifth whorl, S3 the strongest, filling the concave in shape suprasutural area; T1 and T2 appearing respectively between P1 and S1 and between P3 and S3, thin, subgranular; P4 emerging from suture, thin, nearly smooth. On last whorls, all these cords becoming similar in size, except S3 the strongest and P4 very weaker; distance between cords similar in size to cords; additional tertiary cords appearing by intercalation.

Aperture subelliptical; outer lip rather thin, curved, with a basal part rounded, producing a round angle with outer lip and an obtuse angle with inner lip.

Columella oblique, nearly straight with weak median swelling, completely covering umbilicus but leaving an umbilical depression.

Base very weakly convex, with about 12 subgranular, low spiral cords; distance between cords similar in size to cords; very weak axial threads between cords.

Colour of teleoconch basically nacreous white : 3 early whorls dark pink, 4th red, other whorls white with red or orange blotches; base completely white; protoconch pink.

Discussion. *Calliostoma subalboroseum* n. sp. is highly characterized by its spiral cord S3 always stronger than all other cords. It may be compared to *C. lematomenon* n. sp. (Figs 43–48) from western Madagascar, but the latter species, similar in size, has flat whorls, a slightly lower height/width ratio, the beads of the spiral cords much more rounded, no prominent S3 and a clearly flat base without umbilical depression.

Etymology. Pink and whitish (Latin : albus, a, um; roseus, a, um; sub as prefix) - with reference to the colour of the shell, with pink first whorls and whitish last whorls.

Calliostoma tumidosolidum n. sp.

Figs F, 52–54

Type material. Holotype (17.5 x 16.1 mm) MNHN - 2000-27746.

Type locality. Western Madagascar, MIRIKY, stn CP3231, 12°24'S, 47°57'E, 435-600 m.

Material examined. Only known from type material (living).

Distribution. Western Madagascar, living at 435-600 m.

Diagnosis. A typical yellowish *Calliostoma* species of rather great size, with an elevated, conical spire, the last whorls swollen at 2nd third, up to 10 granular, uneven spiral cords, the peripheral cord the strongest, an almost flat base with about 15 subgranular spiral cords, without umbilicus.

Description. *Shell* of medium size for the genus (height up to 17.5 mm, width up to 16.1 mm), slightly higher than wide, conical in shape; spire rather elevated, height 1.1x width, 4.2x aperture height; subangulate periphery; anomphalous.

Protoconch about 300 μ m wide, of 1 whorl, rounded, covered by a network of ridges producing polygonal areas; apical fold straight without distinct terminal varix.

Figures 52-65 (scale bars: 5 mm).

52-54. *Calliostoma tumidosolidum* n. sp., holotype MNHN IM-2000-27746, Western Madagascar, 435-600 m [MIRIKY, stn CP3231], 17.5 x 16.1 mm.

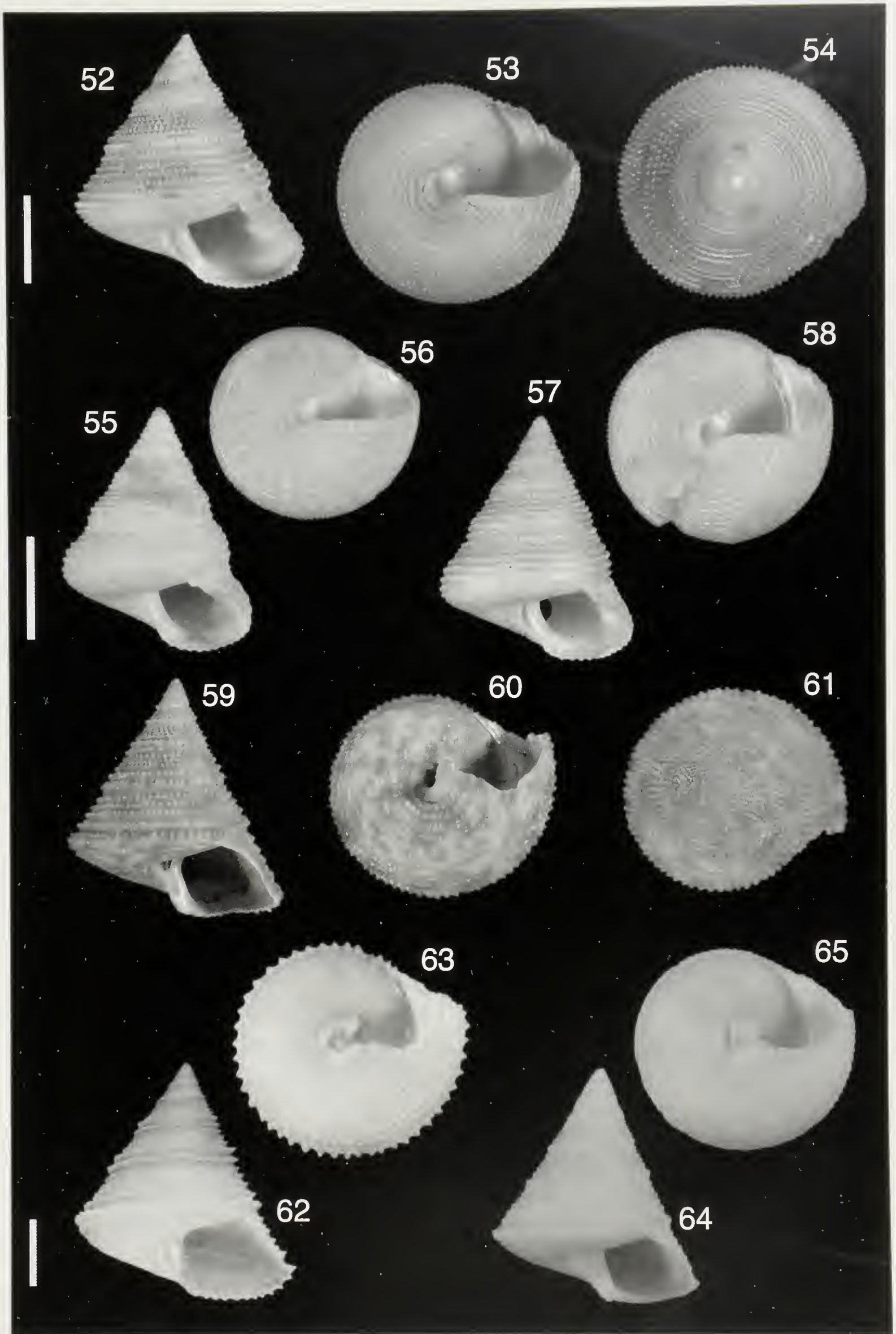
55-56. *C. paradigmatum* Marshall, 1995, 422-495 m [NORFOLK 2, stn DW2109], 12.0 x 9.8 mm.

57-58. *C. metivieri* Marshall, 1995, 430-450 m [NORFOLK 2, stn DW2033], 13.4 x 10.5 mm.

59-61. *C. pyrron* n. sp., Western Madagascar, holotype MNHN IM-2000-27747, 200-288 m [MIRIKY: stn DW3258], 11.8 x 10.5 mm.

62-63. *C. paucicostatum* Kosuge, 1984, Philippines, Cebu, Mactan, Punta Engano, holotype IMT, 19.2 x 18 mm.

64-65. *C. caledonicum* Marshall, 1995, 735-755 [BATHUS 3, stn DW795], 17.7 x 15.7 mm.



Teleoconch of up to 8 convex whorls, 4 last whorls with a bulge at 2nd third. Suture very poorly visible, not canaliculate.

First whorl convex, sculptured by axial, almost orthocone ribs, interspace between 1.5x to 2x larger than ribs; P1, P2 and P3 appearing almost immediately, thin, granular by intersection with axial threads; P3 slightly stronger than other cords. On second whorl, all cords stronger; axial ribs more prosocline; suture still visible. On third whorl, P4 emerging, almost as strong as P3; S1 appearing; beads of P3 weakly pointed; axial ribs thicker, distance between similar in size to ribs; suture hard to distinguish; S2 and S3 absent. On fourth whorl, all cords similar in strength, except S1 slightly weaker and P3 stronger with clearly pointed beads. On fifth whorl, T1 appearing between P1 and S1; axial ribs weakening; whorl more convex, with an abapical bulge; axial sculpture weakening and vanishing at end of whorl. On sixth whorl, beads of all cords pointed; S4 partially emerging, covered by succeeding whorl. On next whorls, few thin additional subgranular cords appearing (first one between P1 and T1). On last whorl, up to 10 uneven cords; S4 fully visible.

Aperture subquadrangular to subelliptical; outer lip rather thin, curved; basal part rounded, producing a weak rounded angle with outer lip and inner lip.

Columella weakly arcuate, oblique, without tooth; callus completely covering umbilicus.

Base weakly convex, with very weak, thin axial threads and 15 subgranular spiral cords, the cords in inner part stronger.

Colour of teleoconch first whorls nacreous pink, next whorls greenish yellow; base lighter; protoconch white.

Discussion. *C. tumidosolidum* n. sp. is rather close to *C. paradigmatum* Marshall, 1995 (Figs 55-56) from southern New Caledonia but this smaller species has a slightly larger protoconch (400-430 μm), a different cords ontogeny with 3 secondary cords, and S2 appearing first and less numerous, thicker spiral cords on the base.

The new species resembles *C. metivieri* Marshall, 1995 (Figs 57-58) from New Caledonia, but this similar in size species has a slightly larger protoconch

(about 400 μm), a different cords ontogeny with 3 secondary cords and S2 appearing first and smooth cords on the base except the 3 or 4 inner granular cords.

C. tumidosolidum n. sp. may also be compared to *C. grobi* Stratmann & Stahlschmidt, 2007 from Saya de Malha Bank (south-western Indian Ocean), but this bigger species (height up to 30 mm) is almost as wide as low, has almost flat last whorls, more numerous spiral and thinner cords with a different ontogeny with 3 secondary cords.

Etymology. Swollen and solid (Latin: tumidus, a, um; solidus, a, um) - with reference to the swollen last whorls and the massive shape of the shell.

Calliostoma pyrron n. sp.

Figs G, 59-61, Table 3

Type material. Holotype (11.8 x 10.5 mm) MNHN IM-2000-27747. Paratypes: 2 MNHN IM-2000-27748, IM-2000-27749.

Type locality. Western Madagascar, MIRIKY, stn DW3258, 15°34'S, 45°44'E, 200-288 m.

Material examined. Western Madagascar. MIRIKY: stn DW3208, 12°41'S, 48°17'E, 231-237 m, 1 dd (paratype IM-2000-27748). - Stn DW3209, 12°43'S, 48°14'E, 291-353 m, 1 dd (paratype IM-2000-27749). - Stn DW3258, 15°34'S, 45°44'E, 200-288 m, 1 dd (holotype IM-2000-27747). - Stn DW3261, 15°35'S, 45°43'E, 197-217 m, 1 dd.

Southern Madagascar. ATIMO VATAE: stn DW3584, 25°28'S, 44°25'E, 203-210 m, 1 dd, 1 dd juv.

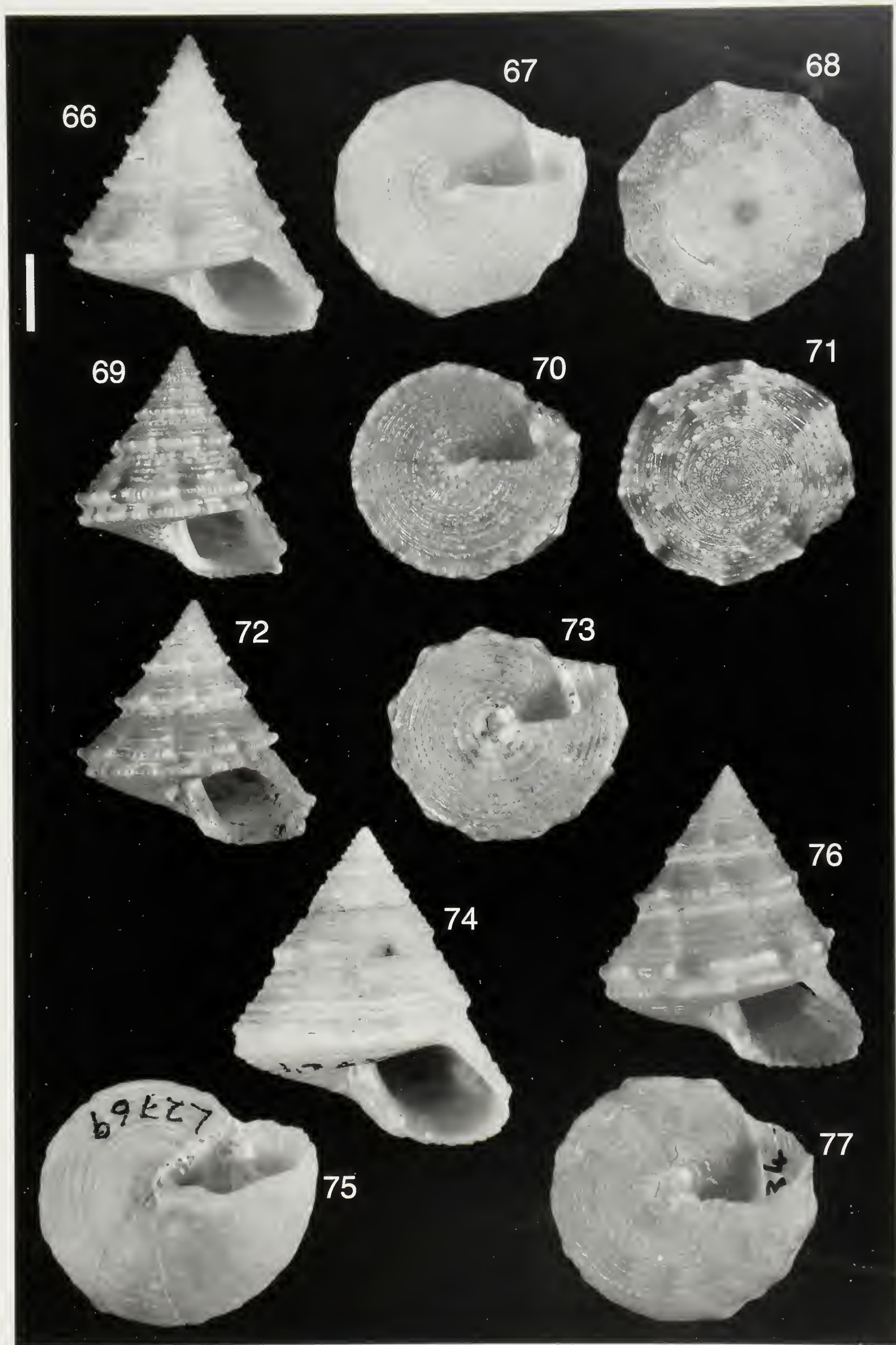
Distribution. Western Madagascar, 217-291 m (dead), Southern Madagascar, 203-210 m (dead).

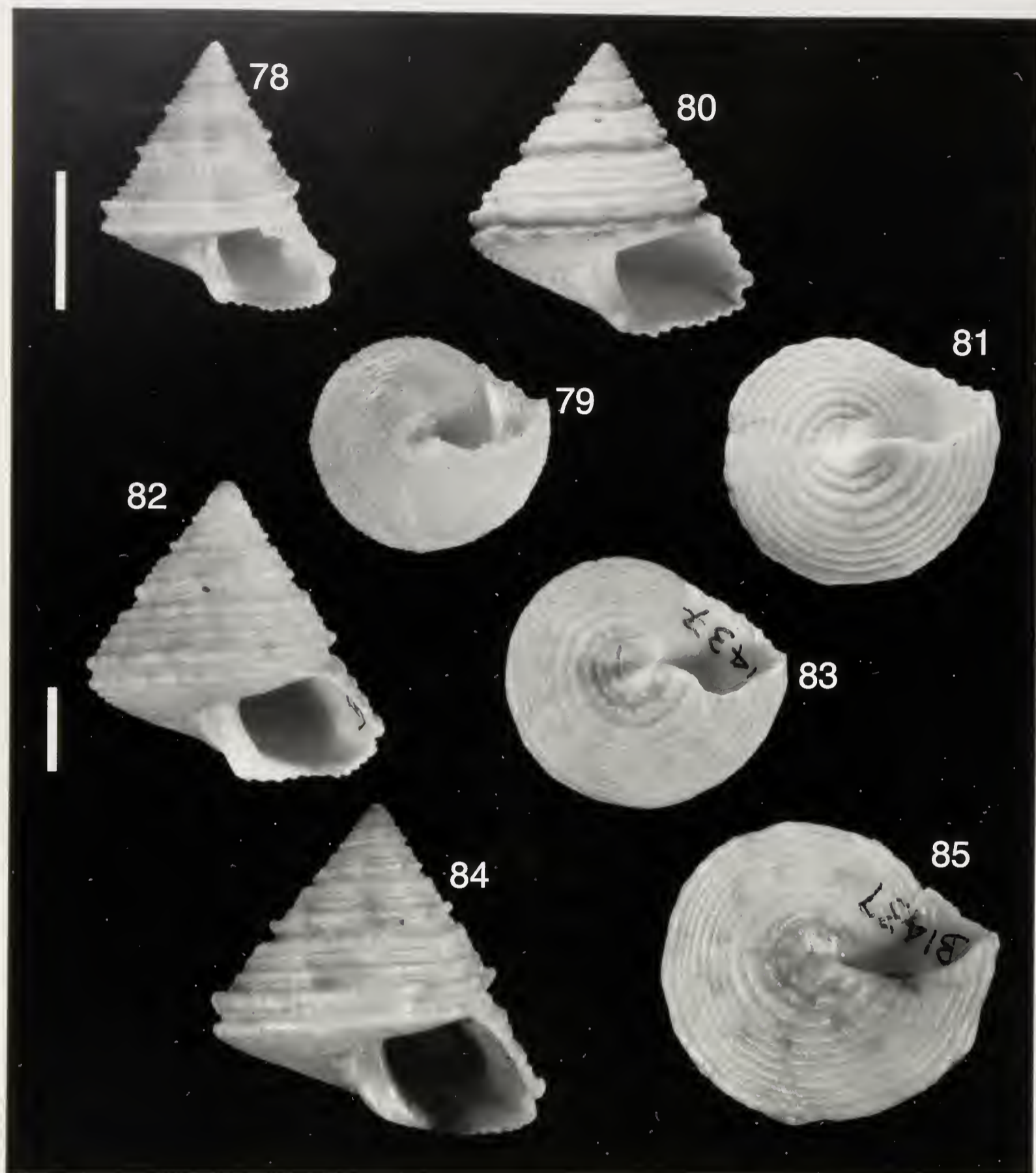
Diagnosis. A typical brown *Calliostoma* species of medium size, with an elevated, conical spire, up to 12 granular, uneven spiral cords, the peripheral cord the strongest with pointed beads, an almost flat base with about 12-14 granular spiral cords and a narrow umbilicus.

Figures 66-77 (scale bar: 5 mm)

66-77. *Calliostoma herberti* n. sp., Southern Madagascar.

66-68. Holotype MNHN IM-2000-27750, south-west of Andavaka Cape, 53-54 m [ATIMO VATAE, stn DW3549], 18.1 x 15.5 mm; **69-71.** Paratype MNHN IM-2000-27751, Cap Sainte Marie, 32 m [ATIMO VATAE, stn DW3609], 12.1 x 11.0 mm; **72-73.** Paratype MNHN IM-2000-27752, Lavanono area, by local fishermans, 13.1 x 12.7 mm; **74-77.** Mozambique; **74-75.** Off Beira (19°50'S, 34°51'E), Sofala Bank, 40-50 m, 25.2 x 22.2 mm (NMSA L2769); **76-77.** Off Quelimane (17°52'S, 36°53'E), 42 m, 20.2 x 17.2 mm (NMSA G8234).





Figures 78-85 (scale bars : 5 mm)

78-79. *Calliostoma thrincoma* Melvill & Standen, 1903, syntype NHMUK (1903.12.15.122), Persian Gulf, depth unknown, 10.0 x 8.8 mm (Image courtesy of Harry Taylor, NHMUK Photographic Unit).

80-85. *Calliostoma layardi* Sowerby, 1897.

80-81. Holotype NHMUK (1899.4.14.3670), eastern South Africa, Pondoland, depth unknown, 13.0 x 14.0 mm (Image courtesy of Harry Taylor, NHMUK Photographic Unit); 82-85. Transkei, Nthlonyane beach (between East London and Durban), beach drift (NMSA B1737). 82-83. 16.6 x 16.3 mm; 84-85. 20.0 x 15.8 mm.

Description. *Shell* of medium size for the genus (height up to 14.7 mm, width up to 12.9 mm), slightly higher than wide, conical in shape; spire rather elevated, height 1.1x width, 3.2x to 4.3x aperture height; angulate periphery; narrowly umbilicate.

Protoconch about 350 μ m wide, of 1 to 1.25 whorl, rounded, covered by a network of ridges giving a reticulate pattern; apical fold straight with a rounded terminal varix.

Teleoconch of up to 7.9 whorls; first whorl convex, other whorls flat, P3 and S3 producing keel. Suture visible, not eanalieulate.

First whorl convex, sculptured by axial, almost orthoelne ribs, interspace between 1.5x larger than ribs; P2 and P3 appearing almost immediately, P1 slightly later, granular by intersection with axial threads; P3 slightly stronger than other cords; P4 almost completely covered by suture. On second whorl, P3 much stronger than other cords, with bluntly pointed beads. On third whorl, beads of P3 sharp pointed; axial ribs more prosocline, thicker, distance 2x larger than ribs. On fourth whorl, P4 emerging at beginning of whorl, quickly as strong as P1 and P2; S1 appearing half a whorl later; S2 and S3 absent. On fifth whorl, P4 almost as strong as P3, both much

stronger than other cords, with sharp pointed beads; S1 almost similar in strength to P1 and P2. On sixth whorl, beads of P1, S1 and P2 bluntly pointed; P4 stronger than P3, dividing into two cords, both with sharp pointed beads; axial ribs weakening and vanishing at end of whorl. On last whorls, tertiary cord T1 appearing first between P2 and P3, about 4-5 additional Ti appearing between Pi and Si, all subgranular to granular; S4 emerging at end of penultimate whorl, thin, weakly subgranular.

Aperture quadrangular; outer lip rather strong, without thickening, straight; basal part almost straight, producing a sharp angle with outer lip and an obtuse angle with inner lip.

Columella more or less straight, oblique, without tooth; thin callus partially covering umbilicus.

Base weakly convex, with 12 to 14 spiral cords and weak axial threads making cords subgranular in outer quarter, granular elsewhere; distance between cords similar in size to cords; cords in inner part stronger.

Umbilicus narrow (diameter measuring about 10% of shell width), funnel shaped, without angulate rim.

Colour of teleoconch whorls and base brown with irregular axial chestnut flames; protoconch pinkish white.

	TW	H	W	HA	H/W	H/HA
holotype	7.6	11.8	10.5	3.7	1.12	3.19
paratype IM-2000-27748	7.9	14.7	12.9	3.4	1.14	4.32
paratype IM-2000-27749	7.1	12.5	11.7	3.8	1.07	3.29
<i>means</i>	7.5	13.0	11.7	3.6	1.11	3.60

Table 3. - *Calliostoma pyrron* n. sp. : Shells measurements in mm for types.

Discussion. *Calliostoma pyrron* n. sp. is rather close to *C. paucicostatum* Kosuge, 1984 (Figs 62-63) from Philippines but the latter species, slightly greater, is yellowish brown coloured, lacks an open umbilicus, has an ontogeny of cords somewhat different, with S1 appearing much earlier (on 2nd whorl) and P4 not divided into two parts, less numerous and stronger spiral cords on the whorls and on the base (respectively 6-7 and 11 cords) with much sharper nodules.

The new species also resembles *C. caledonicum* Marshall, 1995 (Figs 64-65) from New Caledonia, but this smaller species has a different ontogeny of primary cords (P1 and P2 commencing not before the 2nd whorl, S2 present) and roundly conical, not pointed, beads on the spiral cords of whorls.

Etymology. Chestnut (Ancient Greek : πυρρος, α , $\sigma\nu$) - with reference to the colour of the flames on the whorls and on the base.

***Calliostoma herberti* n. sp.**

Figs H, 66-77, Table 4

Type material. Holotype (18.1 x 15.5 mm) MNHN IM-2000-27750. Paratypes: 1 MNHN IM-2000-27751, 3 MNHN IM-2000-27752.

Type locality. Southern Madagascar, south-west of Andavaka Cape, ATIMO VATAE, stn DW3549, 25°17'S, 46°31'E, 53-54 m.

Material examined. Southern Madagascar. ATIMO VATAE: stn BB02, 25°36'S, 45°08'E, 11 m, 2 dd juv. - Stn BP22, 25°23'S, 44°52'E, 20-22 m, 1 dd. - Stn TA49, 25°00'S, 47°06'E, 19 m, 1 dd. - Stn DW3519, 24°52'S, 47°28'E, 80-83 m, 2 dd juv. - Stn DW3549, 25°17'S, 46°31'E, 53-54 m, 1 lv, 2 dd sub (lv holotype MNHN IM-2000-27750, molecular sample performed MNHN-2009-13605). - Stn DW3606, 25°49'S, 44°51'E, 44-46 m, 1 dd sub, 5 dd juv. - Stn DW3609, 25°34'S, 44°55'E, 32 m, 1 dd (1 paratype MNHN IM-2000-27751). - Stn s/n, Lavanono area, by local fishermen, 3 dd (3 paratypes MNHN IM-2000-27752).

Mozambique. Off Quelimane (17°52'S, 36°53'E), 42 m, 1 dd (NMSA G8234). – Off Beira (19°50'S, 34°51'E), Sofala Bank, 40-50 m, 1 dd (NMSA L2769).

Distribution. Southern Madagascar, 11-80 m, living at 53-54 m; Mozambique, 42 m (dead).

Diagnosis. A typical brightly coloured *Calliostoma* species of medium to rather big size, with an elevated, conical spire, usually with 5 spiral cords (an additional cord on large samples); cords granular on first whorls and nearly smooth on last whorls; one very strong abapical cord making keel; peripheral cord making a second keel on last whorl; flat base with about 8-11 granular spiral cords; umbilicus absent or reduced to a narrow chink.

Description. *Shell* of medium size for the genus (height up to 20.1 mm, width up to 16.9 mm), slightly higher than wide, conical in shape; spire rather elevated, height 1.0x to 1.2x width, 3.2x to 3.8x aperture height; angulate periphery; anomphalous (umbilicus reduced to small chink on subadult samples).

Protoconch about 250-300 μ m wide, of 1 whorl, rounded, covered by a weak network of ridges giving a reticulate pattern; apical fold straight with a thin rounded terminal varix.

Teleoconch of up to 8.5 slightly convex whorls; P3 and P4 producing keel. Suture poorly visible, not canaliculate.

First whorl convex, P2 and P3 appearing immediately, P1 a quarter of whorl later, subgranular, evenly spaced; axial, almost orthocline ribs, visible ad mid

whorl, interspace between 1.5x larger than ribs; P3 stronger than other cords. On second whorl, P3 much stronger than other cords, with bluntly pointed beads; axial ribs much stronger, making all cords granular by intersection. On third whorl, beads of P3 twice stronger than on preceding whorl, sharp pointed; each 2nd or 3rd bead much stronger; P3 making keel. On fourth whorl, P2 weaker than P1, with small beads, poorly rounded; beads of P1 strong, rounded; P4 partially emerging from suture, subgranular; axial ribs weakening, thin prosocline threads between them; S1 appearing at end of whorl, thin, subgranular; S2 and S3 absent. On fifth and sixth whorl, P2 and P3 subgranular, each 3rd bead of P3 still stronger; P1 and P4 still granular. On last whorls, all cords becoming weakly subgranular to nearly smooth, P1 the last to be still granular; P3 making strong, smooth keel; tertiary cord T1 appearing between P2 and P3 on large specimens.

Aperture subquadrangular; outer lip rather thin, rounded; basal part rounded, producing a rounded angle with outer lip and an obtuse angle with inner lip. Columella more or less straight, oblique, without tooth; callus covering umbilical area.

Base almost flat, with 8 to 11 spiral cords irregular in size, smooth; distance between cords similar in size to cords in outer part, twice larger in inner part; very weak axial threads between cords in inner part.

Colour of teleoconch whorls basically cream white; brownish axial flames; P1 and P2 (also S1 on some samples) with regular brown spots; P3 and P4 streaked white and light brown between brown areas made by flames; base pinkish white, spiral cords with regular brown dashes; protoconch white translucent.

	TW	H	W	HA	H/W	H/HA
holotype	8.5	18.1	15.5	4.9	1.17	3.69
paratype IM-2000-27751	7.9	12.1	11.0	3.8	1.10	3.18
paratype IM-2000-27752/1	7.8	13.3	12.3	4.2	1.08	3.17
paratype IM-2000-27752/2	8.5	20.1	16.9	5.4	1.19	3.72
paratype IM-2000-27752/3	7.5	10.7	10.7	2.8	1.00	3.82
<i>means</i>	8.0	14.9	13.3	4.2	1.11	3.52

Table 4. - *Calliostoma herberti* n. sp. : Shells measurements in mm for types.

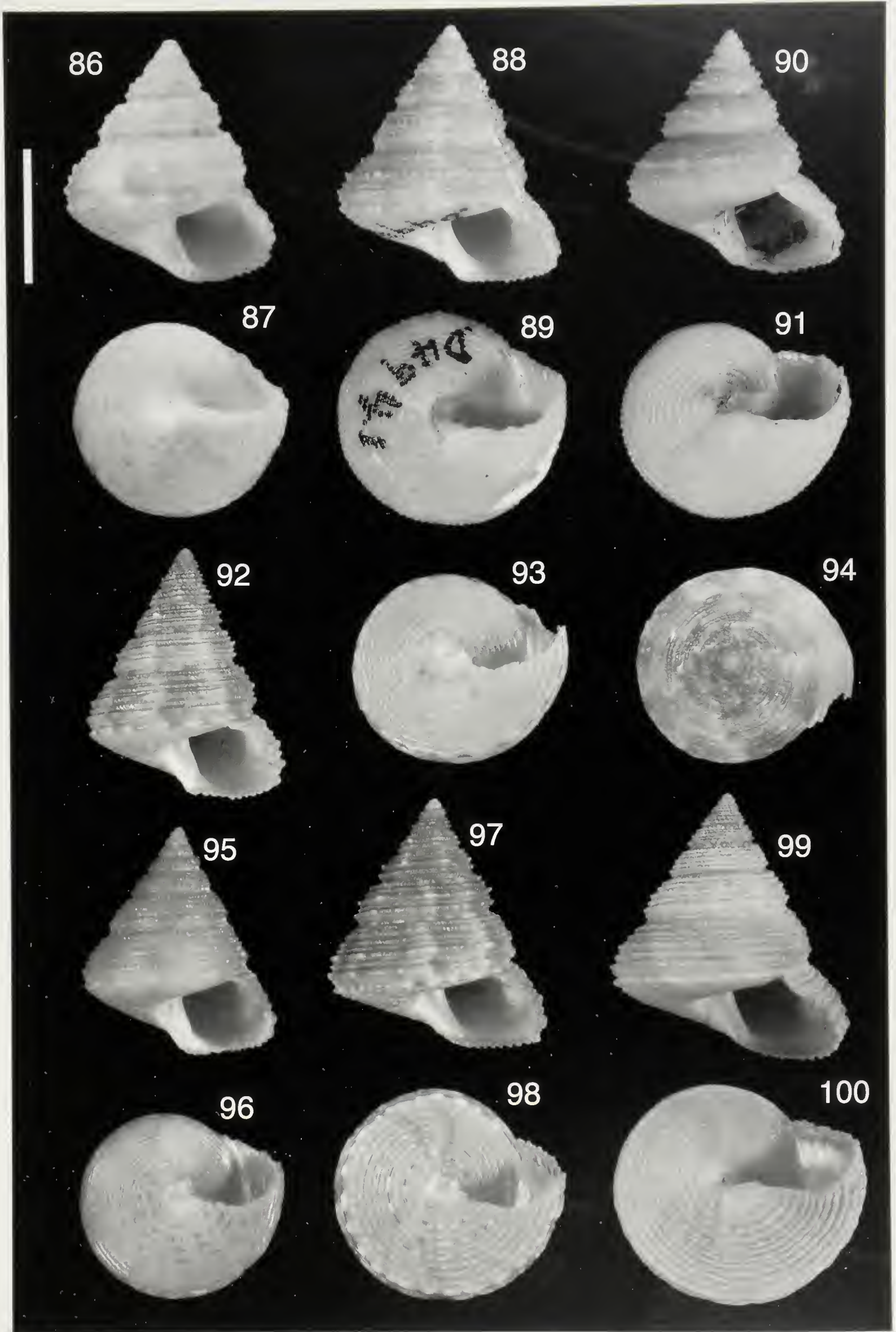
Figures 86-100 (scale bar: 5 mm)

86-100. *Calliostoma crossleyae* E.A.Smith, 1910.

86-87. Paralectotype NHMUK (1911.8.30.14), South Africa, Natal, Isezela, depth unknown, 10.0 x 9.0 mm - Image courtesy of Harry Taylor, NHMUK Photographic Unit.

88-91. Zululand. **88-89.** Sodwana Bay (NM D4941), 20-22 m, 11.3 x 10.0 mm; **90-91.** South-east of Port Durnford (NM E8424), 95 m [NMDP, stn ZQ8], 9.8 x 8.9 mm.

92-100. Southern Madagascar. **92-94.** 14-26 m [ATIMO VATAE, stn TA51], 12.8 x 10.3 mm; **95-96.** South-east of Faux-Cap, 63 m [ATIMO VATAE, stn CP3624], 11.4 x 9.7 mm; **97-98.** 18-20 m [ATIMO VATAE, stn TA26], 12.6 x 10.7 mm; **99-100.** 37-38 m [ATIMO VATAE, stn DW3608], 13.6 x 12.2 mm.



Discussion. *Calliostoma herberti* n. sp. is rather close to *C. thrincoma* Melvill & Standen, 1903 (Fig 78-79) from Persian Gulf, but the latter species has an early appearing spiral cord S3 and a very different P3 on the last whorl, stronger than on penultimate whorl but thinner than on the new species.

The new species is weakly similar to *C. layardi* Sowerby, 1897 (Figs 80-85) from South Africa, but the latter species, similar in size, has a less elevated spire being more or less as wide as high, much coarser, thicker adapical spiral cords on the whorls, especially P1 almost as strong as P3 with much bigger beads, and S1 appearing earlier (at the beginning of the third whorl).

Etymology. Named after David "Dai" G. Herbert (NMSA) whose the numerous malacological works have brought great advances in systematics, especially for Trochoidea.

Calliostoma crossleyae E.A. Smith, 1910
Figs 86–100

Calliostoma crossleyae E.A. Smith, 1910: 205. Type locality: Isezela, Natal, South Africa, depth unknown.

Calliostoma crossleyae – Kaicher: card # 2088.

Calliostoma crossleyae – Steyn & Lussi: 22, fig. 69.

Material examined. Southern Madagascar. ATIMO VATAE: stn TA10, 25°28'S, 44°56'E, 23 m, 1 dd. – Stn TV12, 25°02'S, 47°01'E, 27 m, 1 lv (molecular sample performed - IM-2009-13656). – Stn TP17, 25°01'S, 47°01'E, 33-34 m, 1 dd sub. – Stn BP22, 25°23'S, 44°52'E, 20-22 m, 1 dd sub. – Stn TA26, 25°34'S, 45°07'E, 18-20 m, 1 lv. – Stn TA51, 25°00'S, 47°06'E, 14-26 m, 1 dd. – Stn TA54, 25°00'S, 47°09'E, 15-25 m, 1 dd. – Stn TA57, 24°59'S, 47°03'E, 8-16 m, 1 lv. – Stn DW3519, 24°52'S, 47°28'E, 80-83 m, 1 dd sub. – Stn DW3547, 25°18'S, 46°40'E, 69-70 m, 1 dd juv. – Stn DW3508, 25°16'S, 47°06'E, 77-78 m, 1 dd, 3 dd sub. – Stn CP3572, 25°12'S, 47°12'E, 75-77 m, 1 lv. – Stn CP3573, 25°14'S, 47°14'E, 87-88 m, 2 lv sub. – Stn DW3605, 24°55'S, 44°51'E, 56-57 m, 1 dd sub. – Stn DW3606, 25°48'S, 44°51'E, 14-26 m, 3 lv (molecular sample performed - IM-2009-13658 & IM-2009-13665). – Stn DW3607, 25°46'S, 44°52'E, 40-41 m, 1 dd, 1 dd

sub. – Stn DW3608, 25°39'S, 44°53'E, 37-38 m, 1 dd. – Stn DW3623, 25°41'S, 45°59'E, 74-80 m, 2 dd sub, 3 dd juv. – Stn CP3624, 25°38'S, 45°57'E, 63 m, 2 lv (molecular sample performed - IM-2009-13636). – Stn s/n, Lavanono area, by local fishermen, 1 dd.

Zululand. Sodwana Bay, 20-22 m, 1 dd (NMSA D4941). – South-east of Port Durnford, NMDP: stn ZQ8, 29°05'S, 32°08'E, 95 m, 1 dd (NMSA E8424). – Stn ZQ10, 29°07'S, 32°07'E, 95 m, 1 dd (NMSA E8580). – Off Cappe Vidal, R.V. Neiring Naude: stn 2M3, 28°08'S, 32°36'E, 50 m, 1 dd (NMSA E4980). – Off Park Rynie, R.V. Neiring Naude: stn X7, 30°23'S, 30°51'E, 140 m, 2 dd (NMSA E4932).

Distribution. Eastern South Africa, Zululand, 22-140 m (dead); Southern Madagascar, 16-87 m, living at 16-75 m.

Remarks. The main characteristics of this species are:

- height up to 18 mm, width up to 14 mm;
- rather high spire, higher than wide, conical to slightly coeloconoidal shape, angulate periphery with up to 8-9 slightly convex whorls, with an excavated-like suprasutural area;
- protoconch about 300 μ m wide, of 1 whorl;
- teleoconch with granular spiral cords; P1, P2 and P3 appearing immediately, S1 appearing on fourth whorl, P4, S2 and S3 on fifth whorl and additional tertiary cords possibly appearing on next whorls; about 10 cords on last whorls;
- a convex to almost flat base with 10-11 smooth spiral cords;
- anomphalous;
- orange brown colour or basically cream white with brownish axial flames, P4 always streaked white and brown.

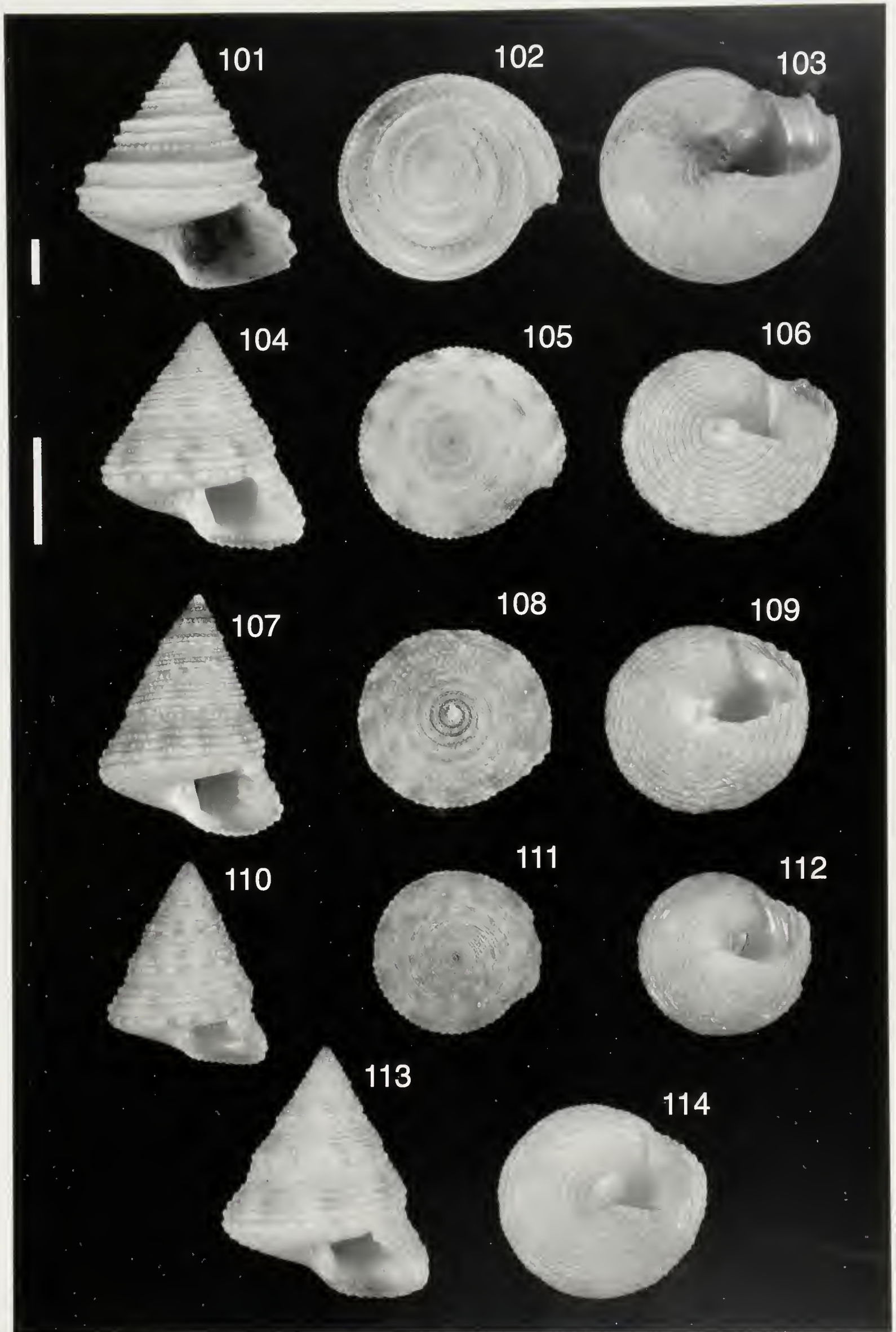
Compared to specimens from Natal, some specimens from southern Madagascar may have a slightly more elevated spire, whorls not so convex and, more specifically, sharp, regularly located pointed beads on P2 and P3 of intermediate whorls (one pointed bead per three rounded beads). The ontogeny of the spiral cords is the same on all specimens, wherever they are coming from.

Figures 101-114 (scale bars: 5 mm)

101-103. *Calliostoma muriellae*, Western Madagascar, 243-950 m [MIRIKY, stn CP3253], 26.1 x 24.1 mm.

104-114. *Dactylastele burnupi* (E.A. Smith, 1899).

104-106. Zululand, shore, 10.9 x 9.9 mm (NMSA W2189). **107-112.** Southern Madagascar. **107-109.** 14-18 m [ATIMO VATAE, stn BV06], 11.4 x 8.5 mm. **110-112.** Recorded sample (MNHN 200913653), 29 m [ATIMO VATAE, stn TA45], 7.8 x 5.9 mm. **113-114.** South africa, Natal Park Rynie, depth unknown, 12.2 x 10.0 mm, coll. C.Vilvens.



Calliostoma muriellae Vilvens, 2001

Figs 101-103

Calliostoma muriellae Vilvens, 2001: 175-178, figs 1-4. Type locality: Madagascar, off Majenga, 800 m.

Material examined. Western Madagascar. Chalutage 109, 22°17'S, 42°56'E, 1200 m, 1 dd. – MIRIKY: stn CP3253, 15°25'S, 45°55'E, 243-950 m, 1 dd.

Remarks. The main characteristics of this species are:

- height up to 30 mm, width up to 27 mm;
- rather high spire, higher than wide, conical shape, angulate periphery, with up to 8 slightly convex to almost flat whorls;
- protoconch about 300 μ m wide, of 1.25 whorl;
- teleoconch with granular spiral cords; P1, P2 and P3 appearing immediately, granular; P4 appearing on second whorl; P2 and P3 making keel, much stronger than other cords; smooth weak secondary cords S1, S2 and S3 occasionally appearing on some specimens;
- flat or weakly convex base, with one or two smooth external strong cords and 3 or 4 large subgranular cords around umbilical area;
- anomphalous;
- white or pinkish white, slightly iridescent.

Genus : *Dactylastele* Marshall, 1995

Type species : *Trochus (Zizyphinus) poupineli* Montrouzier, 1875 (by o.d.) – Recent, tropical western Pacific.

Dactylastele burnupi (E.A. Smith, 1899)

Figs 104–114

Calliostoma burnupi E.A. Smith, 1899: 250, pl. 5, fig. 11. Type locality: off Durban, KwaZulu-Natal.

Calliostoma burnupi – Kensley: 22, fig 65.

Calliostoma burnupi – Kaicher: card # 2081.

Calliostoma burnupi – Kilburn & Rippey: 39, pl.8-2.

Dactylastele burnupi – Marshall: 424.

Calliostoma burnupi – Steyn & Lussi: 22, fig. 65.

Material examined. Southern Madagascar. ATIMO VATAE: stn BS01, 25°28'S, 44°56'E, 12-14 m, 1 dd sub. – Stn TB01, 25°00'S, 47°06'E, 22 m, 3 dd juv. –

Stns TB02-TB03, 25°01'S, 47°00'E, 18 m, 2 dd juv. – Stn TS02, 25°01'S, 47°00'E, 18 m, 6 dd juv. – Stn BB03, 25°26'S, 44°56'E, 14-18 m, 6 lv juv. – Stn BS03, 25°26'S, 44°56'E, 14-18 m, 1 dd, 2 dd juv. – Stn TS03, 25°01'S, 47°01'E, 24 m, 1 dd sub, 1 dd juv. – Stn TB04, 25°02'S, 47°00'E, 11-12 m, 2 dd juv. – Stn TS04, 25°02'S, 47°00'E, 22-24 m, 2 dd sub, 3 dd juv. – Stn BS05, 25°35'S, 45°08'E, 12 m, 1 dd juv. – Stn TB05, 25°02'S, 47°00'E, 23 m, 2 dd sub, 3 dd juv. – Stn BV06, 25°27'S, 44°56'E, 14-18 m, 1 lv. – Stn TB06, 25°04'S, 46°57'E, 4-5 m, 2 dd sub, 20 dd juv. – Stn TB07, 25°03'S, 47°00'E, 4-5 m, 1 dd sub. – Stn TV07, 25°01'S, 47°00'E, 12-16 m, 4 dd juv. – Stn BS09, 25°29'S, 44°57'E, 11-13 m, 4 dd juv. – Stn TS09, 24°57'S, 47°06'E, 5-6 m, 1 dd, 1 dd sub, 2 dd juv. – Stn BS10, 25°19'S, 44°37'E, 12-14 m, 3 dd juv. – Stn TS10, 24°57'S, 46°07'E, 7 m, 1 lv sub. – Stn TS11, 25°04'S, 46°57'E, 4-5 m, 1 lv juv. – Stn TB12, 25°02'S, 47°00'E, 4-5 m, 1 dd, 1 dd sub, 12 lv juv. – Stn TB13, 25°02'S, 47°00'E, 2-4 m, 1 lv sub, 4 dd juv. – Stn TS13, 25°02'S, 47°00'E, 5-6 m, 1 dd sub. – Stn BS14, 25°36'S, 45°09'E, 16 m, 5 dd juv. – Stn BS15, 25°29'S, 44°57'E, 11-12 m, 1 dd juv. – Stn TS15, 25°09'S, 46°45'E, 13 m, 4 dd juv. – Stn BS16, 25°35'S, 45°08'E, 15 m, 9 dd juv. – Stn TS16, 25°10'S, 46°45'E, 9-10 m, 1 dd juv. – Stn TP21, 25°03'S, 46°59'E, 23-25 m, 1 dd juv. – Stn TS21, 25°02'S, 47°00'E, 2-4 m, 3 dd sub, 1 dd juv. – Stn TP25, 25°04'S, 46°58'E, 7-9 m, 3 dd juv. – Stn BP42, 25°23'S, 44°51'E, 18-21 m, 1 dd sub. – Stn TA45, 24°51'S, 47°13'E, 29 m, 1 lv (molecular sample performed MNHN IM-2009-13653). – Stn TA52, 25°02'S, 47°00'E, 8-14 m, 2 dd sub. – Stn DW3519, 24°52'S, 47°28'E, 80-83 m, 1 dd sub. – Stn DW3530, 24°36'S, 47°32'E, 80-86 m, 1 dd sub, 1 dd juv. – Stn DW3531, 24°38'S, 47°31'E, 54-56 m, 1 dd juv. – Stn DW3550, 26°03'S, 45°32'E, 98 m, 1 dd sub. – Stn CP3572, 25°12'S, 47°12'E, 75-77 m, 1 dd sub.

Mayotte. BENTHEDI: stn 32, 12°45'S, 45°17'E, 15-20 m, 1 dd, 2 dd sub. – Stn 79, 12°33'S, 44°36'E, 25 m, 1 dd.

Mozambique. NE of Inhaca Is., Baixo d'Anane wreck, 10 m, 1 lv (NMSA L3626). – Inhaca Is., intertidal pools, 1 dd (NMSA L1479). – North of Ponta do Ouro, 20 m, 2 dd (NMSA L3392). – North of Bazaruto, 1 lv (NMSA G87). – Pemba, 1 dd (NMSA L2054).

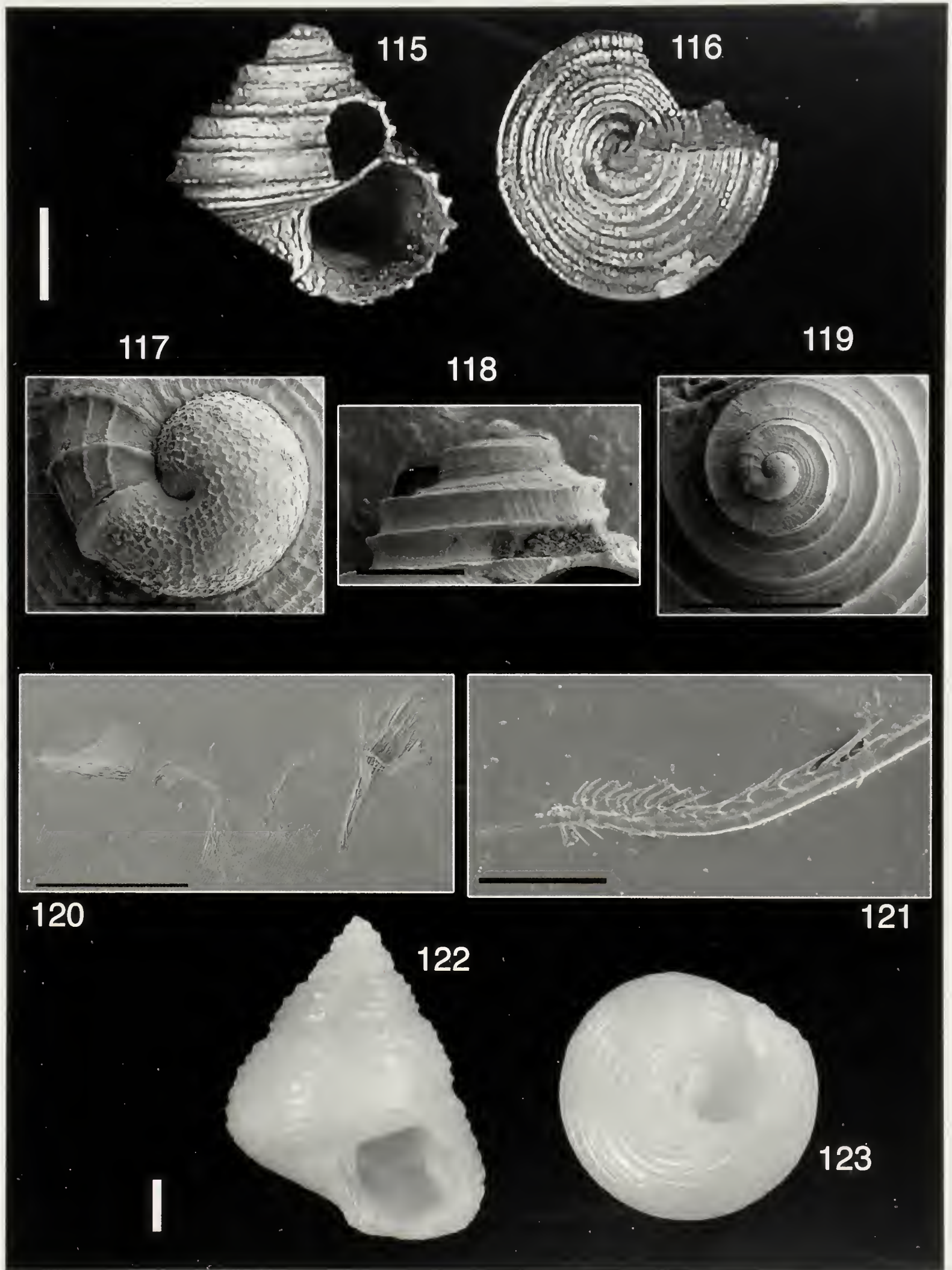
Figures 115-123 (scale bars for shells: 1 mm)

115-121. *Carinastele wareni* n. sp., holotype MNHN IM-2009-13183, Southern Madagascar, 282-333 m [ATIMO VATAE, stn DW 3557].

115-116. 2.5 x 2.7 mm. **117.** Protoconch (scale bar: 200 μ m). **118.** First whorls (scale bar: 0.5 mm). **119.**

First whorls (scale bar: 1 mm) **120.** Radula (scale bar: 1 mm). **121.** Tips of radula tooth (scale bar: 10 μ m)

(Images 9-11 courtesy Anders Warèn, SMNH). **122-123. *Bruceina cognata*** (Marshall, 1988), Mozambique Channel, 228-230 m [MAINBAZA, stn DW 3167], 5.5 x 4.4 mm.



KwaZulu-Natal. Umdloti, 29°41'S, 31°07'E, intertidal pools, 1 dd (NMSA W2189). – Between Bhanga Neck and Kosi Bay, 4-10 m, 4 dd, 1 dd juv (NMSA S962). – Between Bhanga Neck and Kosi Bay, 6-18 m, 1 dd (NMSA D9507). – Off Boteler Point, 27°01'S, 32°55'E, 1 lv (NMSA E2947).

Mauritius. Off Trou aux Biches, 10 m, 1 dd, 2 dd juv (NMSA K8537).

Réunion Island. Possession Bay, 3-6 m, 2 lv, 2 lv sub, 2 lv juv (NMSA K5123).

Distribution. Southern Madagascar, 4-98 m, living at 4-14 m; Mayotte, 15-25 m (dead); Mozambique, 0-20 m, living at 10 m; eastern South Africa (KwaZulu-Natal), 0-6 m (living); Mauritius, 10 m (dead); Réunion Island, 3-6 m (living).

Remarks. The main characteristics of this species are:

- height up to 14 mm, width up to 11 mm;
- high spire, conical in shape, angular periphery, with up to 8 whorls;
- protoconch about 200 μm wide, of 1 whorl;
- teleoconch whorl with granular spiral cords; P1, P2 and P3 appearing immediately, granular; P3 stronger than other cords; P4 emerging from suture on third whorl; S2 appearing first, S1 appearing later; on last whorls, all cords becoming more or less similar in size;
- weakly convex base with about 9 broad, subgranular spiral cords;
- anomphalous;
- first whorls dark violet or red; next whorls orange brown and beads of spiral cords lighter, with darker brown axial flames and a brown line between the cords; P4 white with regular brownish strokes; cords of base light brown with regular darker spots and a brown line in the interspace.

Subfamily **THYSANODONTINAE** Marshall, 1988

Genus *Carinastele* Marshall, 1988

Type species: *Carinastele kristelleae* Marshall, 1988 (by o.d.) – Recent, New Zealand.

Carinastele wareni n. sp.

Figs I, 115–121

Type material. Holotype (2.5 x 2.7 mm) MNHN IM-2009-13183.

Type locality. Southern Madagascar, ATIMO VATAE: stn DW 3557, 26°08'S, 45°39'E, 282-333 m.

Material examined. Only known from the type material (living, molecular sample performed MNHN-2009-13).

Distribution. Southern Madagascar, living at 282-333 m.

Diagnosis. A typical *Carinastele* species of small size, slightly wider than high, with a conical spire and up to 5 spiral cords making strong keel with concave interspaces; convex base with 6 strong, smooth spiral cords; umbilicus deep and wide.

Description. *Shell* of small size for the genus (height up to 2.5 mm, width up to 2.7 mm), slightly wider than high, conical in shape; spire moderately elevated, height 1.2x width, 1.7x aperture height; angulate periphery; narrow, deep umbilicus.

Protoconch about 350 μm wide, of 1.25 whorl, rounded, covered by a reticulate network; apical fold straight with a strong terminal varix.

Teleoconch of up to 3.2 slightly convex whorls; P2 and P3 producing keel. Suture visible, not canaliculate.

First whorl convex at first part, quickly with a strong, oblique shoulder at second part; four Pi appearing immediately; 3 prosocline ribs on first third of whorl, interspace between 4x larger than ribs; P2 quickly stronger, producing a strong keel in second part of the whorl; S1 appearing at first quarter of whorl, with T1 and T2 around it, all very thin. On second whorl, the 3 adapical Pi stronger, P2 the strongest, P1 the weakest, P2 and P3 making keel with concave interspace; P4 sunken under suture; axial threads still visible, weak; S1, T1 and T3 vanishing. S2 appearing at begin of third whorl, quickly as strong as P1, both producing secondary keels. On last whorl, P4 visible, making keel like P3; all spiral interspaces concave.

Aperture subcircular, without angle, with large basal flange near meeting of outer and inner lip.

Columella slightly arcuate, without tooth.

Base moderately convex, with 6 smooth spiral cords; distance between cords irregular, from 1x to 2x width of cords; very weak axial threads between cords.

Umbilicus deep, fairly wide (about 20%), funnel shaped, with 2 strong spiral cords inside.

Radula with thin, hair-like teeth with long slender cusp and backward-directed barbs, 4 barbs spreading out outwards (Figs 120-121).

Discussion. *Carinastele wareni* n. sp. belongs clearly to the genus *Carinastele*, having prominent, strong, carinate spiral cords with an early strong P3 and without S3, and tips of radular teeth with backwardly inclined barbs, 4 barbs splaying outward the other barbs series (Marshall, 1988; Hickman & Mc Lean, 1990). One can compare with *Bruceina cognata* (Marshall, 1988) (Figs 122-123) (ex-*Herbertina cognata* Marshall, 1988 because *Herbertina* Marshall, 1988 is a junior homonym of *Herbertina* Schaus, 1901 [Lepidoptera]; *Bruceina* is a replacement name (Özdikmen, 2013; WoRMS, 2014)).

The small size and the presence of an umbilicus could suggest that the studied specimen has not reached full maturity, although the teleoconch has 3.2 whorls. Maybe should one also adapt the *Carinastele*

definition to include the possibility of an open umbilicus.

The new species is rather close to *Carinastele jugosa* Marshall, 1988 from New Zealand, but this taller, more elevated species has no S2, no umbilicus and has 8-9 (instead of 6 on the new species) spiral cords on the base.

Etymology. Named after Anders Warén (NMSA), one of the head of the European malacology, specialist in gastropod taxonomy and always ready to provide his valuable help.

ACKNOWLEDGEMENTS

We would like to thank P. Bouchet (MNHN) for reading the manuscript, constructive advice and access to the malacological resources of the MNHN, V. Héros (MNHN) for her help in providing locality data and finding various scientific information, D. Herbert (NMSA) for the loan of material from South Africa and Mozambique and Anders Warén (SMNH) for the SEM photographs.

Also, we are very grateful to S. Williams (NHMUK) for her help to search material in the NHMUK collections and A. Salvador (NHMUK) for her help to get photographs of types and information about them.

REFERENCES

[papers and books]

- Bouchet, P. & Rocroi, J.P. 2005. Classification and nomenclator of gastropod families. *Malacologia* 47(1-2): 1-397.
- Clench, W.J. & Turner, R.D. 1960. The genus *Calliostoma* in the western Atlantic. *Johnsonia* 4(40): 1-80.
- Herbert, D.G. 1987. Revision of the Solariellinae in Southern Africa. *Annals of the Natal Museum* 28(2): 283-382.
- Herbert, D.G. 1990. A note on *Calliostoma multiliratum* in South Africa. *Annals of the Natal Museum* 31: 201-205.
- Herbert, D.G. 1992. Revision of the Umboniinae in Southern Africa and Mozambique. *Annals of the Natal Museum* 33(2): 379-459.
- Herbert, D.G. 1993. Revision of the Trochinae tribe Trochini in Southern Africa. *Annals of the Natal Museum* 34(2): 239-308.
- Herbert, D.G. 1995. A new species of Thysanodontinae from South Africa. *Annals of the Natal Museum* 36: 255-259.
- Hickman, C.S. & Mc Lean, J.H. 1990. Systematic revision and suprageneric classification of trochacean gastropods. *Natural History Museum of Los Angeles County Science Series VI*+169 pp.
- Kaicher, S.D. 1979. Card catalogue of world-wide shells. Trochidae Part 1. Pack #21. Cards 2072-2177.
- Kensley, B. 1973. *Sea-shells of southern Africa – Gastropods*. Maskew Miller Ltd and South African Museum, Cape Town, 225 pp.
- Kilburn, R. & Rippey, E. 1982. *Sea Shells of Southern Africa*. Macmillan Pub. 249 pp.
- Marshall, B.A. 1988. Thysanodontinae : a new subfamily of the Trochidae (Gastropoda). *Journal of Molluscan Studies* 54: 215-229.
- Marshall, B.A. 1995a. A revision of the recent *Calliostoma* species of New Zealand. *The Nautilus* 108(4): 83-127.
- Marshall, B.A. 1995b. Calliostomatidae from New Caledonia, the Loyalty Islands and the northern Lord Howe Rise in P. Bouchet (ed.), *Résultats des campagnes MUSORSTOM, Volume 14, Mémoires du Muséum national d'histoire naturelle* 167: 381-458.
- Özdikmen, H. 2013. Substitute names for three preoccupied generic names in Gastropoda. *Munis Entomology & Zoology* 8(1): 252-256.
- Smith, E.A. 1899. Descriptions of new species of South African marine shells. *Journal of Conchology* 9: 247-252.
- Smith, E. A. 1910. On South African Marine Mollusca, with Descriptions of New Species. *Annals of the Natal Museum* 2: 175-220.
- Sowerby III, G.B. 1903. Marine investigations in South Africa. Cape of Good Hope Dept. of Agriculture. v. 2 (1904). Cape Town :W.A. Richards & Sons,[1900?]-
- Steyn, D.G. & Lussi, M. 1998. *Marine Shells of South Africa*. Ekogilde Publishers, Hartebeespoort. 264 pp.
- Vilvens, C. 2001. Description of a new species of *Calliostoma* (Gastropoda: Trochidae: Calliostomatinae) from Madagascar. *Novapex* 2(4): 175-178.
- Vilvens, C., Nolf, F. & Verstraeten, J. 2004. Description of *Calliostoma madagascarensis* n. sp.(Gastropoda: Trochidae: Calliostomatinae) from Madagascar. *Novapex* 5(2-3): 49-55.
- Williams. S. T., Karube. S. & Ozawa. T. 2008. Molecular systematics of Vetigastropoda: Trochidae. Turbinidae and Trochoidea redefined. *Zoologica Scripta* 37(5): 483-506.
- Williams S.T., Donald K.M., Spencer H.G. & Nakano T. 2010. Molecular systematics of the marine gastropod families Trochidae and Calliostomatidae (Mollusca: Superfamily Trochoidea). *Molecular Phylogenetics and Evolution* 54: 783-809.

[web sites]

- <http://www.marinespecies.org>
Web site of WoRMS (World Register of Marine Species) (access on 2014-08-5)
- <http://www.laplaneterevisitee.org/fr/87/>
<http://www.mnhn.fr/fr/explorez/lieux/planete-revisitee>
Informations about the "La planète revisitée" program (access on 2014-08-6).