Description of *Calliostoma madagascarensis* n. sp. (Gastropoda: Trochidae: Calliostomatinae) from Madagascar

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ABSTRACT. *Calliostoma madagascarensis* n.sp. is described and compared with similar *Calliostoma* species from the Indo-West Pacific.

RÉSUMÉ. *Calliostoma madagascarensis* n.sp. est décrite et comparée avec des espèces analogues de *Calliostoma* de l'Océan Indien et de l'Ouest de l'Océan Pacifique.

INTRODUCTION

Since a few years, many new dredgings occur on a commercial scale in the Mozambique Channel and in the neighbouring areas of Madagascar. They followed the campaign led by ORSTOM (Office de la Recherche Scientifique et Technique Outre-Mer, now IRD : Institut de Recherche pour le Développement) on the continental slope of Madagascar from 1971 to 1973, that undertook bathymetric prospecting and trawling in an attempt to find new shrimp fishing areas (Crosnier & Jouannic, 1973). Independently of the economic interest, this prospecting brought to light an abundance of interesting zoological material from an area where only very few collections have been made. The malacological material is now stored at the MNHN (Muséum national d'Histoire naturelle, Paris).
Amongst these dredgings are numerous shells from deep water that have been described in the past (Watson, 1886; von Martens and Thiele, 1904; Thiele, 1925; Barnard, 1963) as well as new species (Kilburn, 1973; Vilvens, 2001 and 2002).
In recent years, rather large trochid specimens that were identified as *Calliostoma scotti* Kilburn, 1973 were collected in the East of Madagascar. These specimens were first discussed in detail by F. Nolf and J. Verstraeten (2003). Particular characteristics and differences with similar species such as *C. formosense* E.A. Smith, 1907, *C. sublaeve* E.A. Smith, 1895 and *C. chuni* von Martens, 1903, were mentioned. After further examination of the shape and the details of sculpture, we concluded that the shells belong to another species, unknown until now, which is described in this paper.

Abbreviations

Repositories
IRSNB/KBIN : Institut royal des Sciences naturelles de Belgique, Bruxelles / Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels.
MNHN : Muséum national d'Histoire naturelle, Paris, France.
NM : Natal Museum, Pietermaritzburg, South Africa.

Other abbreviations
D : diameter
H : height
HA : height of the aperture
P1, P2, P3, ... : primary cords (P1 is the most adapical)
S1, S2, S3, ... : secondary cords (S1 is the most adapical)
lv : live-taken specimens present in sample
dd : no live-taken specimens present in sample

SYSTEMATICS

Family: **TROCHIDAE** Rafinesque, 1815
Subfamily : **CALLIOSTOMATINAE** Thiele, 1924
Genus: ***Calliostoma*** Swainson, 1840
Type species: *Trochus conulus* Linnaeus, 1758 (by s.d. Herrmannsen, 1846) – Recent, Mediterranean Sea.

Subgenus : ***Kombologion*** Clench & Turner, 1960
Type species : *Calliostoma bairdii* Verrill & Smith, 1880 (by o.d.) – Recent, north-eastern Atlantic.

Calliostoma (Kombologion) madagascarensis n.sp.
Figs 1-6

Type material. Holotype MNHN (unnumbered). Paratypes: 3 MNHN (unnumbered), 1 NM (L6612/T1983), 1 IRSNB (30 134 524), 1 coll. C.Vilvens, 1 coll. F.Nolf , 3 coll. J.Verstraeten.

Type locality. North-western Madagascar, 12°52.4'S, 48°10.4'E, 400-410 m.

Material examined. All type material. **North-western Madagascar**. Chalutages *Vauban*: stn CH 2, 12°53.3'S, 48°09.4'E, 480-520m, coll. A. Crosnier, 1 lv (paratype NM). - Stn CH 4, 12°52.4'S, 48°10.4'E, 400-410m, coll. A. Crosnier, 1 lv (holotype). - Stn CH 28, 12°49.2'S, 48°12.1'E, 445-455m, coll. A. Crosnier, 1 lv, 1 dd (paratypes MNHN). - **Western Madagascar.** off Morondava, 800 m, coll. J. Verstraeten, 4 dd (paratype IRSNB and 3 paratypes coll. J. Verstraeten). - **South-western Madagascar.** off Toliara and Morondava, depth unknown, 3 dd (paratype MNHN, paratype coll. F. Nolf, paratype coll. C. Vilvens).

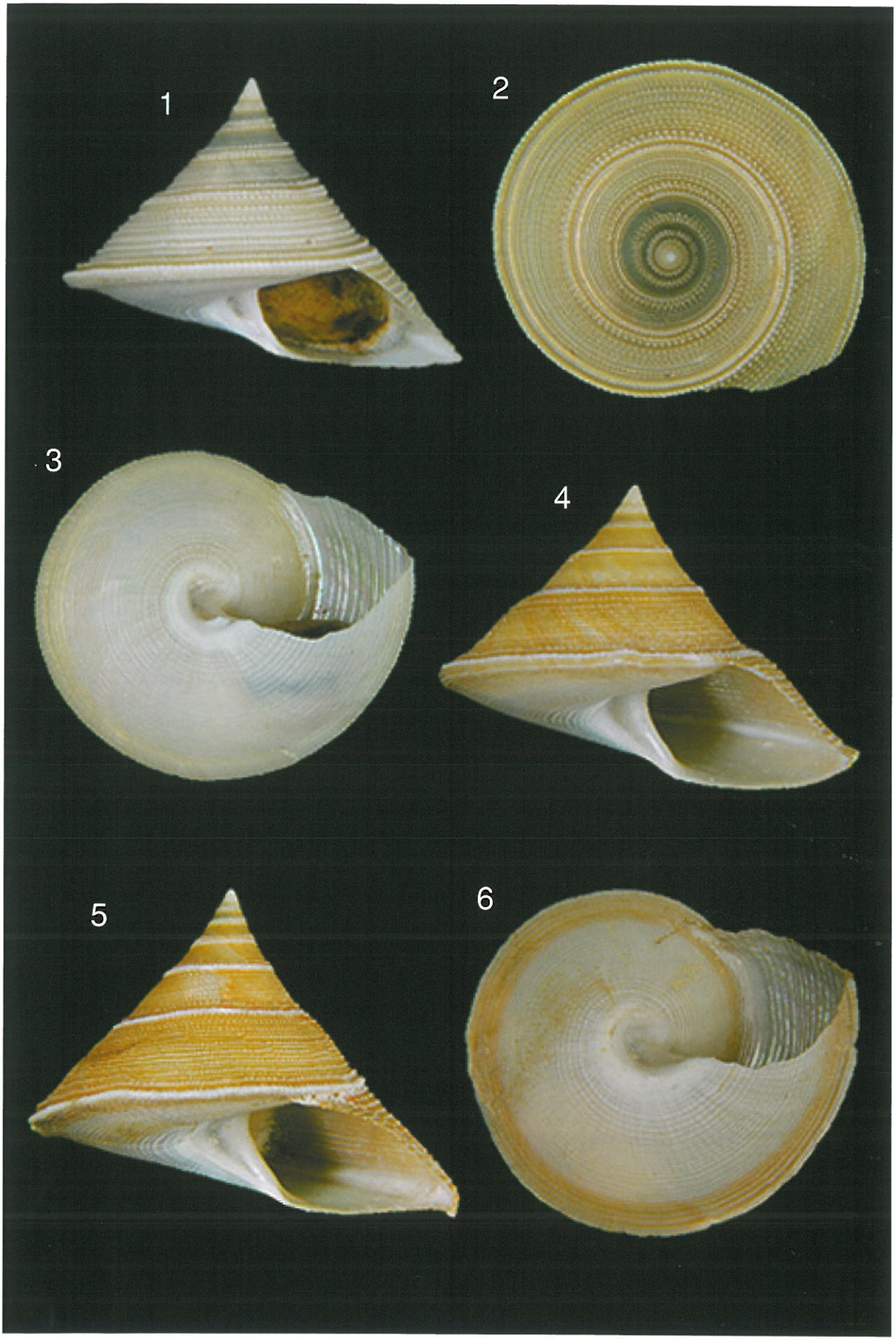
Distribution. Western Madagascar, 410-800 m

Diagnosis. A tall *Calliostoma* species, wider than high, coeloconoidal in shape, rather thin and light relative to its size, with an angular periphery, about 16-20 granular spiral cords on last whorl; the base has a weakly concave peripheral quarter and a weakly convex inner part, bearing about 30 granular spiral cords and no umbilicus.

Description. *Shell* rather tall for the genus (height up to 29.8 mm, width up to 39.8 mm), coeloconoidal in shape; spire moderately high, height 0.7x to 0.8x diameter, 2.6x to 3.2x higher than aperture, anomphalous.
Protoconch ca 500 µm in diameter, of 1.25 whorl, covered by reticulate network of fine ridges; apical fold weakly curved, no terminal varix visible.
Teleoconch of 8 whorls, bearing spiral cords. Suture only weakly visible, not channelled. First whorl of teleoconch convex, sculptured by three subgranular primary cords; P2 appearing immediately at the middle of whorl, P3 appearing next, between P2 and suture, and P1 appearing the last, subsutural; P2 stronger than the two others, P1 the weakest; interval between P1 and P2 slightly narrower than that between P2 and P3; abapical area below P3 concave; prosocline axial ribs in the intervals between cords, distance between ribs 2 times larger than width of ribs themselves. On second whorl, all primary cords becoming granular; axial ribs connecting granules, becoming finer, distance between ribs 3 times larger than width of ribs; P2 becoming clearly weaker than P1 and P3, P3 slightly stronger than P1. On third whorl, P1 and P3 similar in size; P2 very weak; nodules of P1 and P3 becoming strong, rounded, isolated but connected by cord; P4 emerging from suture, weaker than P1 and P3, partly covered by next whorl, granular; axial riblets still present, but broader than on preceding whorl. S1 and S2 appearing on fourth whorl, very weak and smooth; P2 obsolete, possibly disappearing; P4 fully visible; granules of P3 becoming weakly pointed, adapically oriented; axial ribs disappearing. On fifth whorl, additional tertiary cords appearing, as weak as P2, smooth; P4 almost as strong as P3, P1 also still strong but a little weaker than P3 and P4. New tertiaries appearing on sixth whorl between P1 and P3, all weak like P2, resulting in 7 fine cords (P2 included) between P1 and P3, all smooth except the most adapical that is subgranular; S4 emerging from suture at the end of this whorl, granular, weaker than P4. On the two last whorls, new additional cords appearing between P1 and P3, giving on the last whorl about 10-16 fully granular cords of variable size between P1 and P3; distance between cords more or less of same size as cords; all the cords granular; S3, when present (southern specimens), appearing at the middle or at the end of the seventh whorl, close to P4; P3 weaker, becoming similar to the tertiary cords and P2; P4 and P1 staying slightly stronger than other cords. Aperture subquadrate, interior of outer lip with fine lirae underlying the external cords; outer lip rather thin at rim, straight; basal part slightly curved, producing a pronounced angle at meeting point with outer part and no angle with inner lip. Columella curved in its upper part, more or less straight in its lower part, oblique, smooth; callus completely covering umbilicus. Base weakly concave in its peripheral quarter, weakly convex for inner part, with 26-32 spiral cords, broader in umbilical area than at periphery, all smooth save the 4 or 5 inner cords which are granular; distance between cords more or less of the same size as cords; axial threads very weak, only visible near the umbilical area, giving inner spiral cords their granular appearance.

Figures 1-6

1-3. *Calliostoma madagascarensis* n.sp., holotype MNHN, north-western Madagascar, 27.9 x 37.4 mm.
4. *C. madagascarensis* n.sp., paratype coll. J. Verstraeten, western Madagascar, 27.4 x 39.0 mm.
5-6. *C. madagascarensis* n.sp., paratype MNHN, south-western Madagascar, 29.8 x 38.8 mm.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Colour of protoconch and teleoconch pink-apricot; P4 and S4 lighter; base paler, pinkish white; callus silver.
Operculum circular, corneous, multispiral.

	H	D	HA	H / D	H / HA
holotype MNHN	27.9	37.4	9.0	0.7	3.1
paratype MNHN	29.8	38.8	9.3	0.8	3.2
paratype MNHN	24.0	34.6	7.5	0.7	3.2
paratype MNHN	19.6	26.5	6.9	0.7	2.8
paratype IRSNB/KBIN	27.4	35.5	9.1	0.8	3.0
paratype NM	27.5	37.7	8.8	0.7	3.1
paratype F.N.	29.3	39.8	9.7	0.7	3.0
paratype C.V.	27.1	36.1	9.6	0.8	2.8
paratype J.V.	27.4	39.0	10.4	0.7	2.6
paratype J. .	25.2	32.3	9.0	0.8	2.8
paratype J.V.	22.4	30.3	8.2	0.7	2.7

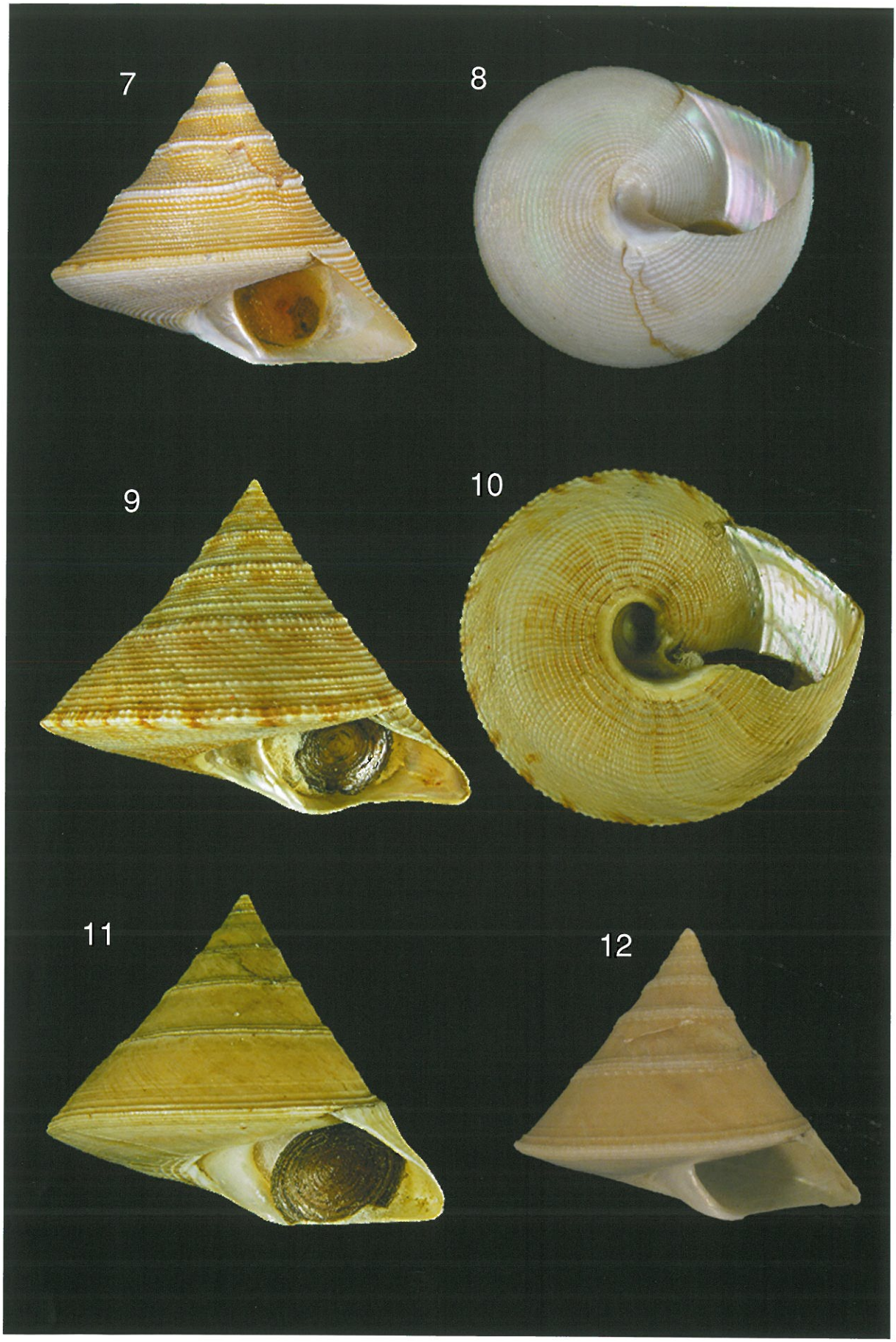
Table 1. *Calliostoma madagascarensis* : Shells measurements in mm.

Discussion. Within the known malacofauna of the eastern Indian Ocean, *Calliostoma madagascarensis* n.sp. is rather close to *C. scotti* Kilburn, 1973 (Figs 7-8) from Mozambique and KwaZulu-Natal (RSA), but, although this species shows an ontogeny analogous to that of the new species, it is different because it is much heavier and has a fully convex base.
C. madagascarensis is also superficially similar to *C. formosense* E.A. Smith, 1907 (Figs 9-10) from the eastern Pacific, but this well known species has regular suprasutural brown marks on the whorls, spiral cords of last whorls which are only weakly subgranular, a fully convex base and a serrate periphery viewed from the base.
The new species is also different from *C. sublaeve* E.A. Smith, 1895 (Fig. 11) from southern India and *C. chuni* (von Martens, 1903) (Fig. 12) from Somalia because these two closely related species show a large, almost smooth area (or at least with poorly visible fine cords) between the subsutural and suprasutural cords of the whorls, and have a convex base with an almost smooth median area.
The subgenus *Kombologion* Clench & Turner, 1960 was provisionally chosen for the new species on account of its affinities with *C. scotti* which is included in this subgenus.
The known distributions of the various species discussed here, using the poor number of records available to us, are listed in the following table :

Species	Distribution
C. scotti Kilburn, 1973	from South Africa (KwaZulu-Natal) to Mozambique, 420-548 m
C. madagascarensis Vilvens, Nolf & Verstraeten n.sp.	Western Madagascar, 410-800 m
C. chuni (von Martens, 1903)	Somalia, 200-300 m
C. sublaeve E.A. Smith, 1895	Southern India, Sri Lanka and Andaman Islands, described from 365-640 m but found at the present time about 80 m
C. formosense E.A. Smith, 1907	from southern Japan to Taiwan, until 300 m

Table 2. Distribution of some *Calliostoma* species from Indo-West Pacific

Figures 7-12
7-8. *Calliostoma scotti* Kilburn, 1973, off Durban, KwaZulu-Natal, South Africa, 30.1 x 36.2 mm, coll. F. Nolf.
9-10. *C. formosense* E.A. Smith, 1907, Tung-chiang, South Taiwan, 46.2 x 59.2 mm, coll. F. Nolf.
11. *C. sublaeve* E.A. Smith, 1895, S.E. India, 34.1 x 41.9 mm, coll. F. Nolf.
12. *C. chuni* (von Martens, 1903), Ras Hafun, N.E. Somalia, 26.7 x 31.9 mm, coll. J. Verstraeten.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Using these data on a map (Fig. 13), we can identify 5 areas of distribution without clear overlap; but two of them (that of *C. scotti* and that of *C. madagascarensis*) seem to be rather close. We can conclude that only *C. scotti* and *C. madagascarensis* could be sympatric but are most probably parapatric, this group and the three other species being allopatric.

Etymology. The new species is named after the type locality.

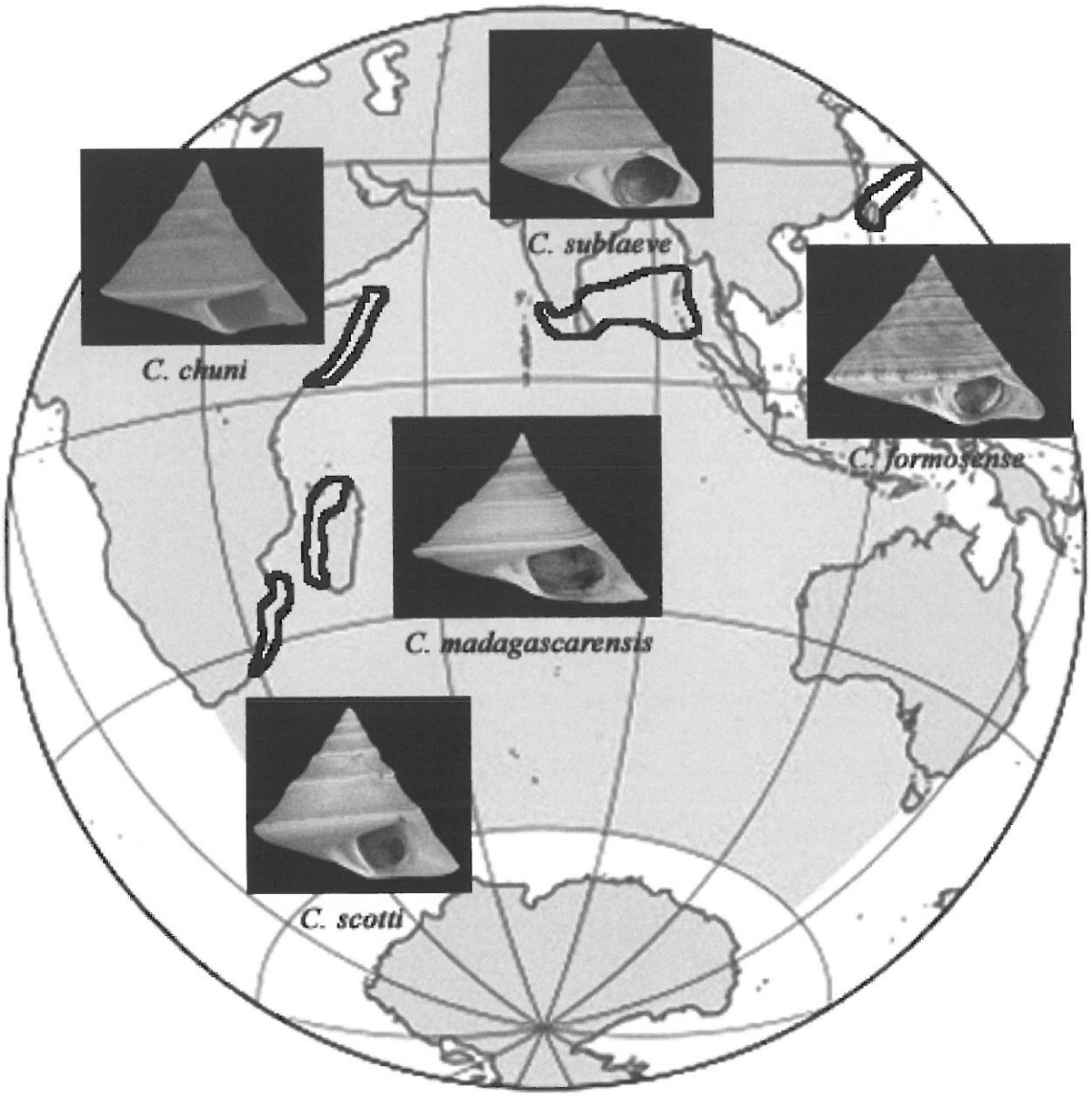

Figure 13. Distribution map of some *Calliostoma* species from Indo-West Pacific.

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