

Description of a new subspecies of *Barycypraea fultoni* (SOWERBY 1903) with notes on
the genus *Barycypraea* SOWERBY 1903 (Mollusca: Cypraeidae).

By
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Abstract: A new subspecies of *Barycypraea fultoni* (SOW.) is described on the basis of constant conchological differences in shape, dentition and size, within a defined geographical range. The genus *Barycypraea* in South Africa is discussed with consideration of its living relatives and some fossil species.

Introduction: When the first rumors of *Cypraea fultoni* of unbelievable size and beauty from the waters of Mozambique were picked up, most skeptical persons involved in shells thought about unique cases of chance, mistaken data or dealer's tales. The rumors however took shape only in 1989 when the amazing discovery was first confirmed in "The Connoisseur" Winter 1989/1990 where a survey, with a detailed report and comprehensive illustrations was published.

In this magazine also *Barycypraea fultoni amorini* RAYBAUDI 1989 was established and the new taxon described herein was mentioned (provisionally considered a geographic variety of *B. fultoni fultoni*).

In addition to the following description a short update on the genus *Barycypraea* is given.

Barycypraea fultoni massieri n. ssp.

Diagnosis: A new subspecies of *Barycypraea fultoni* characterized by its greatly inflated dorsal dome, its longer, denser and more numerous teeth. Its anterior extremity and fossula are more produced, marginal tubercles are often visible.

Description: The holotype of *Barycypraea fultoni massieri* n. ssp. is fully adult and was delivered to the author complete with the preserved animal.

The shell is very solid and heavy, elegantly pyriform, with a greatly inflated dorsal dome and slightly flattened base. There may be more or less distinct tubercles along the margins, which are not necessarily correlated with any marginal spotting. The posterior extremity is retracted, forming a deep channel that bends upwards. Towards the dorsum a callous deposit strengthens the area under which the spire is completely hidden. The anterior extremity is made up of spoonlike projections on either side which are covered by a dome, hiding the terminal channel completely from dorsal view. This structure is rather elaborate, though not fragile. From the projections, a slightly corrugated margin is developed, more obvious when the shell is viewed ventrally. Altogether the anterior portion of the shell is distinctly tapered off the greatly inflated body. The aperture is very narrow throughout, it does not widen anteriorly.

There are 19 well produced columellar teeth and 29 labral ones. These extend slightly on both sides, becoming notably denser anteriorly. The terminal ridge is running into the shell, connected with the distinctly projecting, slightly wavy fossula.

The shell has a very thick, milky nacre which is not smooth but finely granulous, especially the posterior dorsal portion is covered with fine microscopic warts.

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Consequently the shell has a dull appearance as if it was varnished.

The base of the shell is dirty white with a shade of orange towards the pale yellow brown teeth. The margins are still paler than the base, with distant, rather indistinct orange or brown spots which become darker and denser towards the dorsum and finally disappear under the greyish-brown zone which reaches to the projections of the anterior extremities and frames the dorsum.

The 'maltese-cross'-markings are blurred, consisting of irregular, more or less parallel stripes of different shades of brown. Where the markings are covered by callus, they may have a bluish-grey tint. Towards the posterior extremity they are forming slight depressions left and right. Middorsally the embryonal zigzag-banding can be seen on a creamy white background.

Variability: *Barycypraea fultoni massieri* n. ssp. is a very variable race. Some of the paratypes are more inflated than the larger holotype. The degree of retraction of the posterior extremity varies considerably, also the marginal tubercles may be more distinct and dense, especially posteriorly on the labral side. All paratypes show the microscopic granulation of the naere which seems to be a typical feature. However, also nearly smooth shells have been studied. The callus-accumulation separating the dark dorsal markings from the posterior extremity may be more produced, forming deeper grooves. Also anteriorly there may be a channel-like depression in the area where the dark dorsal markings meet. These may be variable in shape. A few examples are illustrated. The teeth may be darker, also the base often shows a brownish blotching. The marginal spotting is often denser and reaches onto the base in some cases. The structure of the anterior extremity, the aperture, and density of teeth is always characteristic. Also the inflated appearance of the dorsal dome, making the shell almost globular, is a typical feature of this new subspecies.

Material: About thirty specimens were available for study, of which five have been chosen as indicated type material (abbreviations: L = length, W = width, H = height, col. = number of columellar teeth, labr. = number of labral teeth).

Holotype : L = 79,2 mm, W = 50,8 mm, H = 43,4 mm; col. 19, labr. 28. (HNC 27485)

Paratype 1: L = 68,2 mm, W = 45,4 mm, H = 38,2 mm; col. 19, labr. 24. (coll. W. MASSIER)

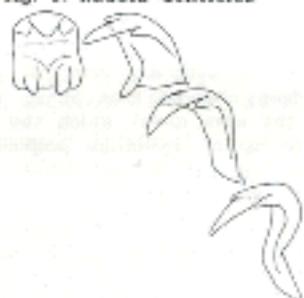
Paratype 2: L = 65,5 mm, W = 44,9 mm, H = 37,2 mm; col. 15, labr. 22. (coll. LORENZ jun.)

Paratype 3: L = 63,9 mm, W = 43,5 mm, H = 36,2 mm; col. 18, labr. 23. (coll. LORENZ jun.)

Paratype 4: L = 70,7 mm, W = 48,3 mm, H = 39,9 mm; col. 19, labr. 22. (coll. LORENZ jun.)

Animal: The poorly conserved, dried animal was greyish brown. The mantle must have been very thin, with fine fingerlike papillae, these were unbranched and rather short. No pattern could be made out on the mantle surface. No other details could be verified on the basis of the dead animal. The radula is illustrated below, along with a radula of a South African *Barycypraea fultoni fultoni*.

Text-fig. 1: Radula denticles



Barycypraea fultoni fultoni.

Park Rynia, Natal, 90 m (coll. LORENZ jun.).



Barycypraea fultoni massieri n. ssp.,

Holotype, Mozambique, HNC 27486.

Distribution: The exact distribution of *B. fultoni amorini* was given as "south of Quelimane", Mozambique, the data of the new race have been "taken by Russian trawlers from depths of 80 to 90 m on a smooth, sandy substrate between Beira and Quelimane", as well as "trawled from 120 m at Cap Corrientes, Mozambique". The exact range and habitat are yet to be verified.

Derivatio nominis: The new race is named in honour of Mr. WERNER MASSIER of Margate, Natal, who first drew my attention to the decisive differences in shell dimensions and number of teeth and who also supplied the type material.

Discussion: The most striking feature of the new race is the greatly inflated dorsal dome, always giving the shell a globular appearance, while the other two subspecies of *B. fultoni* are depressed. The new race differs from *B. f. fultoni* in the more numerous teeth, especially on columellar side, these are also longer and denser. In *Barycypraea f. massieri* n. ssp. the anterior extremity is more elaborate-fragile, the fossula slightly more produced.

Barycypraea f. fultoni is usually shiny and smooth when fresh while the new subspecies has a granulous surface in most cases. The basal spotting in the new race is very variable in intensity, but it more often seems to fade completely. The marginal spots forming tubercles is a feature only seen in *B. f. massieri*.

The differences between *B. f. amorini* and the new subspecies are apparent: While in *B. f. amorini* the base is plain greyish white and convex, it is flattened and often tinted with darker in *B. f. massieri*. The callous marginal processes in *B. f. amorini* separate it at once, also the deltoidal-depressed shape give a completely different impression than the inflated, pear-shaped *B. f. massieri*.

The status of *Barycypraea fultoni amorini* RAYBAUDI 1990 is so far unclear. Its striking deltoidal shape with the produced marginal calluses makes it unmistakable and certainly distinct. There are specimens resembling either *B. f. fultoni* as well as *B. f. massieri*. In the degree of marginal callosity there is considerable variability, but *B. f. amorini* seems more similar to typical *B. f. fultoni* in this respect. The elaborate anterior extremity is present only in the Mozambican races *B. f. amorini* and *B. f. massieri*.

Notes on the genus *Barycypraea*.

Systematic survey:
Class: Gastropoda
Order: Tsnoglossa
Family: Cypraeidae
Subfamily: Bernayinae

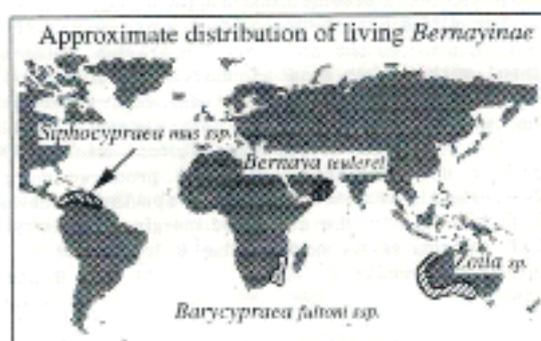
1. Genus: *Bernays* JOUSSEAUME 1884 (subgenus *Protocypraea*), 54 fossil taxa since the late Jurassic, one living species (*B. teulerei*, [CAZENAVETTE 1845]).
2. Genus: *Afrocyprea* + SCHILDER 1932, one species from the late Cretaceous (*A. chubbii* RENNIE).
3. Genus: *Gisortia* + JOUSSEAUME 1884 (syn. *Megalocypraea* +), 26 taxa from the Eocene to the Paleocene.
4. Genus: *Victia* + FABIANI 1905, 11 Taxa from the Eocene.
5. Genus: *Mandolina* + JOUSSEAUME 1884, 6 taxa from the Oligocene to the Miocene.
6. Genus: *Barycypraea* SCHILDER 1927, 10 fossil taxa since the Oligocene, 1 living species, 2 subspecies (*B. fultoni* [SOWERBY 1903], *B. fultoni amorini* RAYBAUDI 1989, *B. fultoni massieri* LORENZ jun. 1991).
7. Genus: *Siphocypraea* HEILPRIN 1897 (syn. *Muracypraea*), 20 fossil taxa since the late Miocene, one living species (*S. mas* [LINNAEUS 1758], ssp.: *S. m. donmoorei* PETUCH 1979 and ssp.? *S. tristensis* PETUCH).
8. Genus: *Zolla* JOUSSEAUME 1884 (subg. *Gigantocypraea* +), 11 fossil taxa since the late Miocene, at least 8 living species with as many subspecies or ecomorpha.

Barycypraea whose fossil records go back to the early Oligocene, belongs to a group of Cypraeid genera placed in the Bernayinae. The species forming this subfamily generally show archaic shell features and animals: All living species of Bernayinae lack a free swimming veliger stage, all have restricted ranges, the most successful group being the spongivorous genus *Zoila* in the southern half of Australia. The other genera, *Siphocypraea*, *Bernaya* and *Barycypraea* are represented by only one or two species in areas poorly populated by other Cypraeae-species.

The species of Bernayinae are mostly solid shells with smooth fossula and in many cases, a partly dissolving dentition. The living species accommodated in this subfamily are quite similar to fossil ones, although there are different features in the fossils, such as flaring ridges running transversally across the dorsum (e. g. *B. luxuriosa* SCHILDER 1939).

The subfamily is considered the oldest in the Cypraeidae which has maintained living representatives, it has been known since the late Jurassic. The Bernayinae reached its highest diversity and distribution in the late Paleocene to Oligocene with the development of extreme forms (*Gisortia* and *Vicetia*), while the decline of its representation in the world seas must have started with the rise of the modern Cypraeinae, in the genera *Trona*, *Macrocypraea* and *Chelicypraea* in the Miocene and *Mauritia*, *Cypraea* and *Lyncina* in the Pliocene.

Text-fig. 2:
Range of living Bernayinae



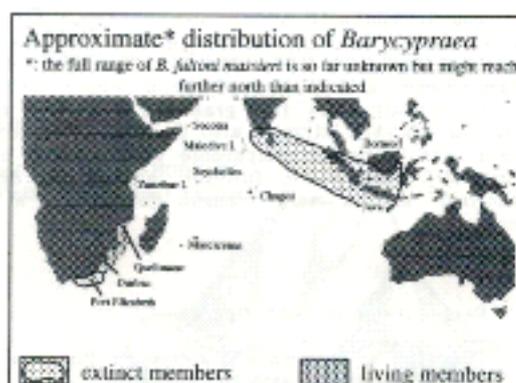
The Atlantic-American branch of Bernayinae maintained a single, highly variable and adaptable species in the once flourishing genus *Siphocypraea*, namely *Siphocypraea mus*. There are carnivorous forms in this species restricted to deeper water, with dorsal tubercles (*Siphocypraea mus domoorei* PETUCH) and algae-eating forms adapted to shallow water (*Siphocypraea mus* LINNAEUS). Only a few other members of Cypraeidae occur within their habitat in Venezuela and Columbia, of which one, *Propustularia surinamensis*, is another most archaic descendant of a once flourishing group of cowries (*Froudusta/Propustularia*).

As mentioned before, the Australian *Zoila* is the most successful surviving genus, represented by at least six species and innumerable ecological and geographical variations. Within its range, several other genera of Cypraeidae occur, sharing the same habitat which may be in shallow water or down several hundred metres.

The Arabian *Bernaya teulerei* is considered the most primitive living cowry with respect to its conchological features. Its solid shell without distinct dentition, with a wide aperture and smooth but callous fossula matches perfectly the *Bernaya*-species of the Paleocene deposits in North America and India. It can with good reason be called a living fossil.

From South Africa living representatives of the subfamily Bernayinae were known only from a single, very rare species for many decades: The famous "Maltese Cross Cowry" *Barycypraea fultoni* was presented as a classic example for an isolated sole survivor of a once blooming genus. Several, often peculiar species of *Barycypraea* have been found in the Miocene and the Eocene deposits in India and Indonesia, but also from the Pliocene in South Africa.

Text-fig. 3:
Range of *Barycypraea*



For a long time the classic *B. fultoni fultoni* was available only from the stomach of Musselcracker fish caught off the Natal coast. Only once or twice was a living specimen of *B. fultoni fultoni* dredged at about 90 m. A single specimen was found diving in 1980 at 55 m on a low profile reef in Natal.

Some light was brought into the mystery around *B. fultoni* when the extensive populations of *Barycypraea* in Mozambican waters were discovered. Apparently, the genus *Barycypraea* is more widespread than formerly thought, having survived in an area of almost 2000 km along the southeast African coast, in competition with modern genera such as *Lyncina* and *Erosaria*.

Barycypraea fultoni amorini is very distinct and outstanding. No other living member of Cypraeidae shows a comparable development of marginal calluses along with such a striking pattern. It is similar to the extinct *Barycypraea caputviperae* MARTIN 1899 from the Neogene of Java in general outline, rather than to the two races of *B. fultoni*.

The dorsal "Maltese Cross-Pattern" seems characteristic of the genus *Barycypraea*: it can be seen in well preserved specimens of *B. zetsmani* (when viewed under ultraviolet light) and occurs in all three living forms. The dorsal structures of the two fossil *Barycypraea* species discussed herein form grooves of a shape similar to this "Maltese Cross".

The Pliocene *Barycypraea zetsmani* LILJED & LE ROUX of Port Elizabeth is characterized by obsolete columellar dentition and distinct dorsal tubercles (these are still present in the deep water races of *B. mus*). Both features are occasionally rudimentarily present in *B. fultoni* - a shallow groove bordering the posterior outline of the maltese cross-pattern may be seen in *B. fultoni massieri*, the columellar dentition sometimes fades midway even in adult specimens of South African *B. fultoni*.

A development comparable to the shallow groove in *B. fultoni massieri* can be seen in *B. caputviperae* in which the dorsal margin forms a deep sulcus, and in the above mentioned *B. zetsmani* in which the dorsal markings (these become visible under ultraviolet light) form two small bumps anteriorly, and a distinct border towards the two tubercles situated posteriorly. It seems that this rudimentary groove seen in some *B. f. massieri*, and less distinct in the other races, is homologous to the grooves and sulci found in the fossil species.

Fading columellar dentition is understood as characteristic for primitive ancestral forms. The well developed teeth in *B. f. massieri* and *B. f. amorini* suggest that these are in a sense "more advanced".

Another interesting feature is the development of the anterior extremity. In the fossil species this portion of the shell shows little differentiation, neither a prolongation of the terminal teeth is seen, nor is there an elaborate channel. In *B. fultoni fultoni* the terminal teeth are slightly more produced, forming fingerlike prolongations covered by a slightly protruding dome on the anterior outlet. This feature is seen pronounced in the Mozambican races *B. f. amorini* and *B. f. massieri*.

The development of the anterior extremity, increasing from the fossil species, via *B. f. fultoni* to *B. f. amorini* and *B. f. massieri*, suggests that the northern living forms of *Barycypraea* are the more 'modern' ones. The fact that they are apparently more common and widespread would support this.

Incidentally, the fine granulation of the nacre in *B. f. massieri* reminds me of *Umbilia hesitata*. Strange also that the archaic *Umbilia* is presently made up by three main taxa, somehow comparable to the races of *Barycypraea*: There is a rare, shiny form (*U. armeniacs/B. fultoni*), an archaic deep water form (*U. capricornica/B. f. amorini*), and a more common form with a granulous surface (*U. hesitata/B. f. massieri*).

Explanations of text-figures:

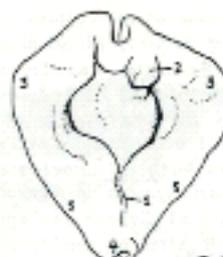
Text-fig. 4: *Barycypraea zetsmani*, Pliocene of Port Elizabeth (after LILTVED 1990):

A primitive member of the group with well developed posterior tubercles (2.), and the dorsal pattern forming a slit elevation anteriorly on dorsum (1.). The anterior extremity is hardly elaborate. The dorsal marking visible under UV light is heart shaped.



Text-fig. 5: *Barycypraea caputviperae*, Miocene of Java (after WENZ 1940):

A classic member of the genus. The posterior tubercles are slightly less distinguished than in *B. zetsmani* (2.), the dorsal groove (1.) is framed by the thick callus of the margins (3.). Although no dorsal marking is preserved, it is easy to make out where and how it could have been. The anterior extremity is also formed simply.



Text-fig. 6: *Barycypraes luxuriosa*, Pliocene of Borneo (after SCHLÖGL: 1939):

An extreme species. The tubercles (2.) and the marginal calluses (3.) are produced, forming a thick frame around the entire dorsal portion of the shell, leaving only a reduced slitlike depression anteriorly (1.) whilst forming another accumulation of callus along the anterior third of the margins (5.). Compare how this development is rudimentarily present in *B. zetsmani*, *B. caputviperae* and *B. f. amorini*.



Text-fig. 7: *Barycypraea fultoni fultoni* (after LILTVED):

The dorsal tubercles (2.) are very rarely implied by slight depressions formed by the dorsal marking, also the groove (1.) is mostly reduced.



Text-fig. 8: *Barycypraea fultoni amorini* (types, after RAYBAUDI 1989):

Dorsal tubercles (2.) or grooves (1.) are barely visible. The marginal callus is greatly produced (3.), also anteriorly there is a slight development of callus (5.). The anterior extremity (4.) is elaborate with fragile processes of the terminal teeth and a rostrated dome over the anterior channel.



Text-fig. 9: *Barycypraea fultoni massieri* (after RAYBAUDI 1989):

There may be faint dorsal tubercles and grooves in some specimens, the marginal callus may be more produced than shown here. The anterior extremity (4.) resembles that of *B. f. amorini* in its degree of development.



Text-fig. 10: *Barycypraea fultoni* (after BURGESS 1970):
Specimen with produced marginal calluses as seen in *B. f. amorini*.

Text-fig. 11: *Barycypraea fultoni* (after ABBOTT 1982):
Another specimen with wide marginal callus.

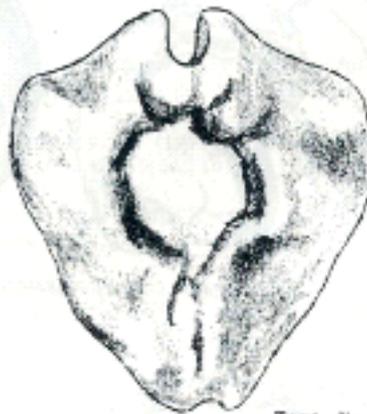
Text-fig. 12: *Barycypraea fultoni amorini* (from coll. HUBERT):
A less extreme specimen still showing distinct marginal calluses.



Text-fig. 4:
Barycypraea zietsmani



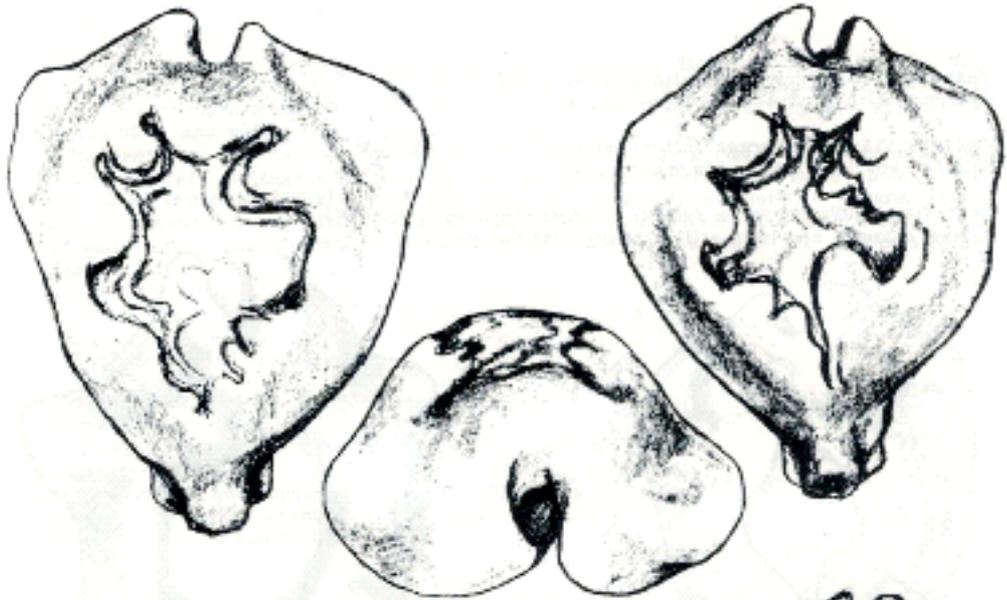
Text-fig. 6:
Barycypraea luxuriosa



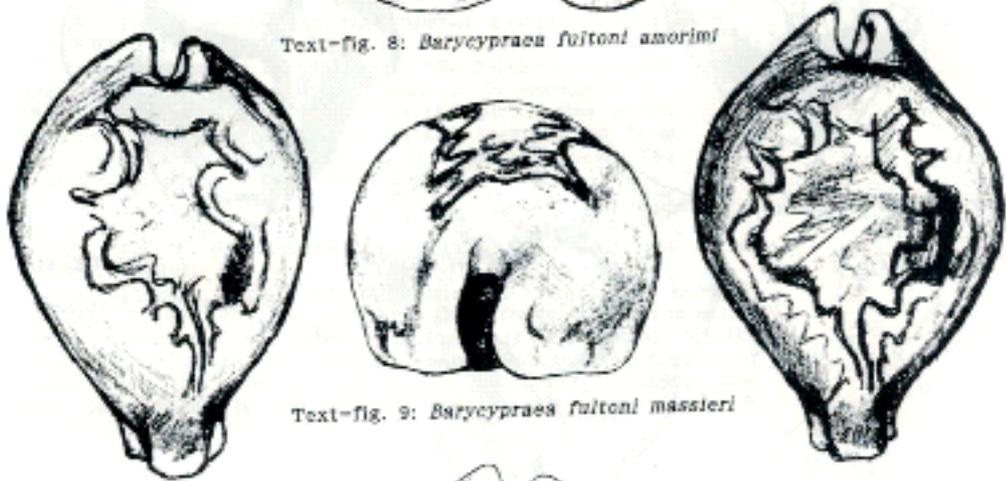
Text-fig. 6:
Barycypraea caputviperae



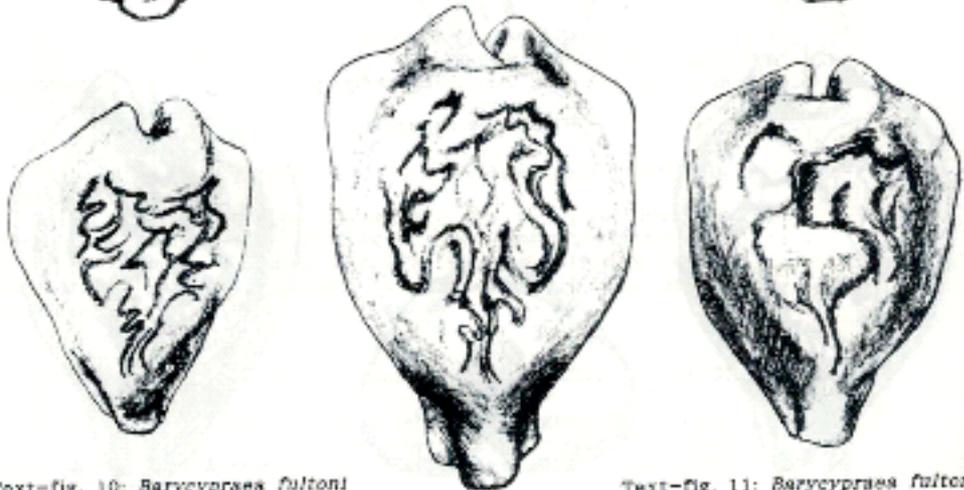
Text-fig. 7: *Barycypraea fultoni fultoni*



Text-fig. 8: *Barycypraea fultoni amorini*



Text-fig. 9: *Barycypraea fultoni massieri*



Text-fig. 10: *Barycypraea fultoni*

Text-fig. 11: *Barycypraea fultoni*

Text-fig. 12: *Barycypraea fultoni amorini*

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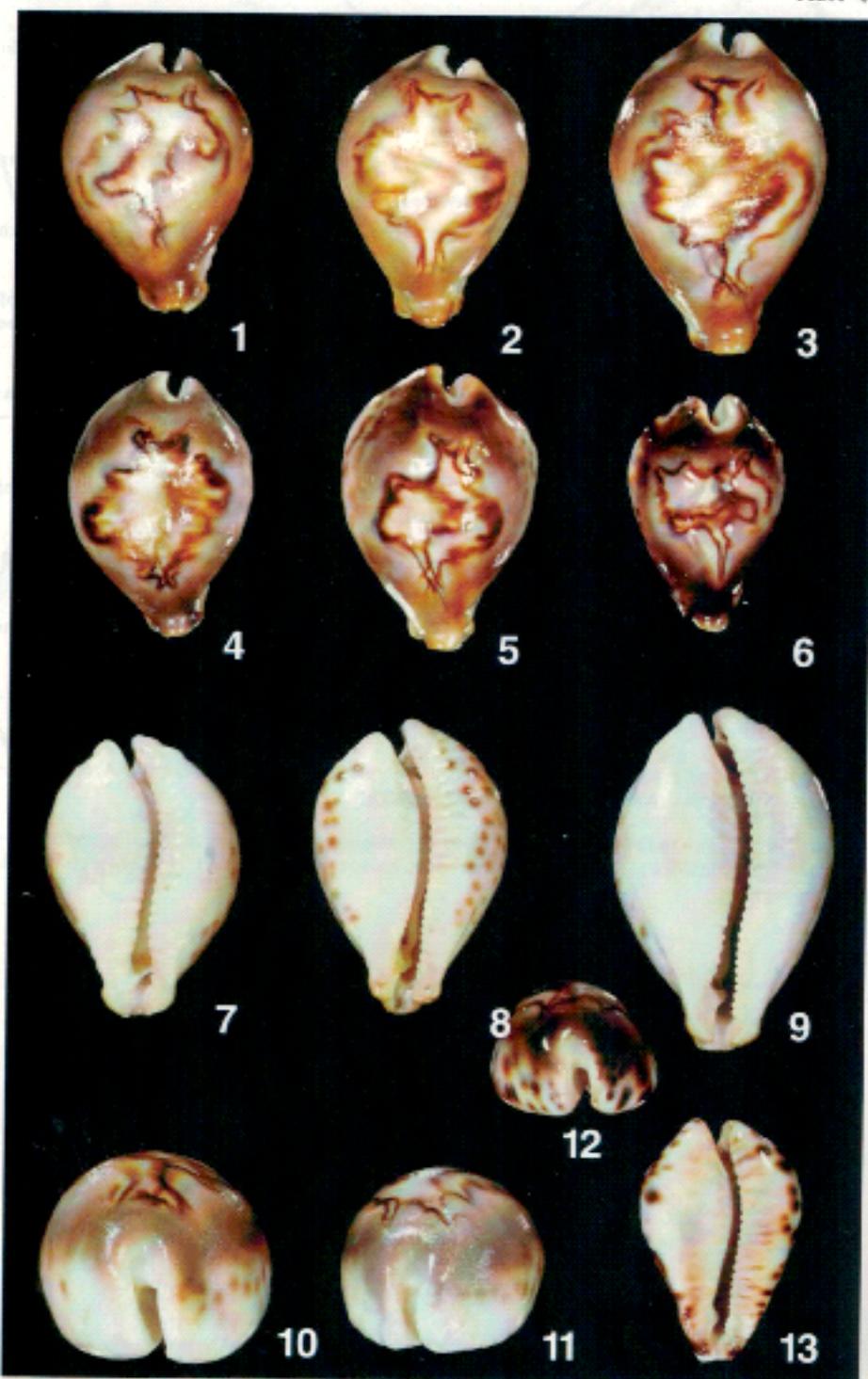
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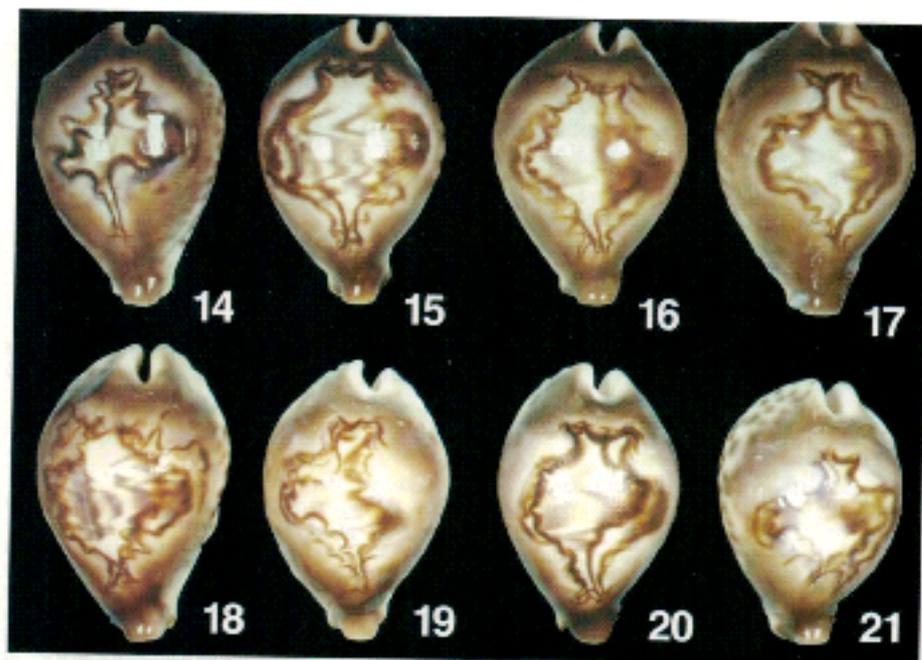
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Explanations of plate 5:
(page 36, reduced, photos: V. WIESE)

Barycypraea fultoni massieri n. sp.,
trawled off Mozambique.

Fig. 1, 7, 11: Paratype 2 (coll. F. LORENZ jun.)
Fig. 2: Paratype 1 (coll. W. MASSIER)
Fig. 3, 9, 10: Holotype HNC 27486
Fig. 4: Paratype 3 (coll. F. LORENZ jun.)
Fig. 5, 8: (coll. F. LORENZ jun.)

Barycypraea fultoni fultoni (SOWERBY 1903)

Fig. 6, 12, 13: Park Rynis, Natal, dredged from 90 m (coll. F. LORENZ jun.).

Explanations of plate 6:
(page 37, reduced, photos: L. RAYBAUDI MASSILIA)

Fig. 14-21:
Barycypraea fultoni massieri n. sp. (eight specimens from RAYBAUDI 1990)

Fig. 22-25:
Barycypraea fultoni amorini (RAYBAUDI 1990)
(two specimens from RAYBAUDI 1990)