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Perbedaan Morfologi Cangkang Spesies *Rochia nilotica (Linnaeus, 1767)* dan *Rochia maxima (F. C. L. Koch, 1844) (Gastropoda: Tegulidae*

(Differences in shell morphology of the species Rochia nilotica (Linnaeus, 1767) and Rochia maxima (F. C. L. Koch, 1844) (Gastropoda: Tegulidae)

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ABSTRACT

Rochia nilotica (Linnaeus, 1767) previously known as *Trochus niloticus* Linnaeus, 1767, is known in Indonesia by the local name "lola" or "lolak". In Indonesian waters, "lola" is easily and widely found, its shiny shell has a high commercial value and is an industrial commodity with an export orientation. The other most similar species is *Trochus maximus* F. C. L. Koch, 1844. In adult shells, *T. niloticus* and *T. maximus* are easily distinguished by the shape of their shells; but their juvenile and semi-adult shells are often confused with one another. Both species have large shells, 110-120 mm in diameter and 115-140 mm in height. Initially, these two species were included in the genus *Trochus* Linnaeus, 1758 of the family Trochidae Rafinesque, 1815. In 2005, Bouchet & Rocroi in the "Taxonomy of the Gastropoda" approved the validity of the family Tegulidae Kuroda, Habe, & Oyama, 1971 of the superfamily Trochoidea Rafinesque, 1815, separate from the family Trochidae Rafinesque, 1815. These two large species are transferred into the genus *Rochia* Gray, 1857 from the family Tegulidae, becoming *Rochia nilotica* (Linnaeus, 1767) and *Rochia maxima* (F. C. L. Koch, 1844). Included in the family Tegulidae, among which are the genera *Rochia* Gray, 1857; *Tectus* Montfort, 1810; and *Tegula* Lesson, 1833. This paper discusses the differences between the two species *Rochia nilotica* (Linnaeus, 1767) and *Rochia maxima* (F. C. L. Koch, 1844) based on the morphological characters. The purpose of this paper is to clarify the differences between these two similar “lola” species.

***Keywords*:** Trochidae, Tegulidae, *Trochus*, *Rochia, nilotica*, *maxima,* lola

ABSTRAK

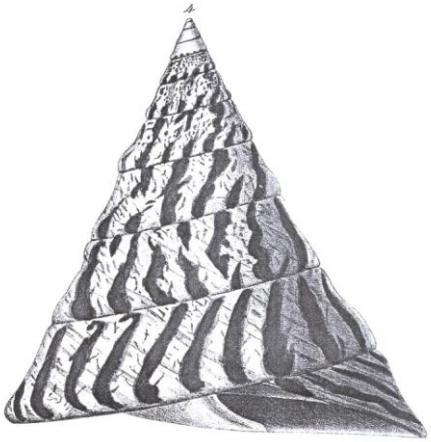
Rochia nilotica (Linnaeus, 1767) sebelumnya dikenal dengan nama Trochus niloticus Linnaeus, 1767, dikenal di Indonesia dengan nama lokal "lola" atau "lolak". Di perairan Indonesia, "lola" mudah dan banyak ditemukan, cangkangnya yang mengkilat memiliki nilai komersial yang tinggi dan merupakan komoditas industri yang berorientasi ekspor. Spesies lain yang paling mirip adalah *Trochus maximus* F. C. L. Koch, 1844. Pada cangkang dewasa, T. niloticus dan T. maximus mudah dibedakan dari bentuk cangkangnya; tetapi cangkang remaja dan semi-dewasa mereka sering tertukar satu sama lain. Kedua spesies tersebut memiliki cangkang besar, diameter 110-120 mm dan tinggi 115-140 mm. Awalnya, kedua spesies ini termasuk dalam genus Trochus Linnaeus, 1758 dari famili Trochidae Rafinesque, 1815. Pada tahun 2005, Bouchet & Rocroi dalam "Taksonomi Gastropoda" menyetujui validitas famili Tegulidae Kuroda, Habe, & Oyama, 1971 dari superfamili Trochoidea Rafinesque, 1815, terpisah dari famili Trochidae Rafinesque, 1815. Kedua spesies besar ini dipindahkan ke genus Rochia Gray, 1857 dari famili Tegulidae, menjadi *Rochia nilotica* (Linnaeus, 1767) dan *Rochia maxima* (F. C. L. Koch , 1844). Termasuk dalam famili Tegulidae, di antaranya marga Rochia Gray, 1857; *Tectus Montfort,* 1810; dan Tegula Lesson, 1833. Tulisan ini membahas perbedaan antara dua spesies *Rochia nilotica* (Linnaeus, 1767) dan *Rochia maxima* (F. C. L. Koch, 1844) berdasarkan karakter morfologinya. Tujuan dari makalah ini adalah untuk mengklarifikasi perbedaan antara dua spesies “lola” yang serupa ini.

Kata kunci: Trochidae, Tegulidae, Trochus, Rochia, nilotica, maxima, lola

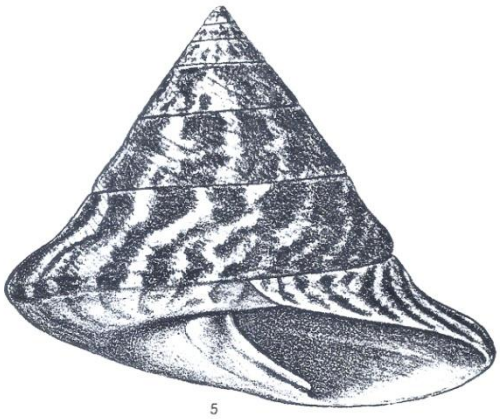
INTRODUCTION

Trochus niloticus Linnaeus, 1767 and *Trochus maximus* F. C. L. Koch, 1844 were originally described as separate species. In 1889, Tryon & Pilsbry placed *Trochus maximus* F. C. L. Koch, 1844 as a variety of *T. niloticus* Linnaeus, 1767. Several subsequent authors followed the opinion of Tryon & Pilsbry, 1889, some illustrations of *T. maximus* found were written as *T. niloticus*. In Indonesia for a long period of time, the name "lola" or “lolak” was known for only one species, *Trochus niloticus* Linnaeus, 1767. Lola known today refers to two species, namely *Rochia nilotica* (Linnaeus, 1767) and *Rochia maxima* (F. C. L. Koch, 1844), adult shells of these two species are easily distinguished as they have different shell shapes; in contrast to their juvenile or semi-adult shells which look similar in having thin shell, flat base, not swollen last whorl, angular periphery, knobs or tubeculates. Both species are included in the genus "*Rochia*" Gray, 1857 of the family Tegulidae Kuroda, Habe, & Oyama, 1971, superfamily Trochoidea Rafinesque, 1815. Superfamily Trochoidea having a nacreous shell, consisting of families, among which are Trochidae Rafinesque, 1815; Tegulidae Kuroda, Habe, & Oyama, 1971; and Turbinidae Rafinesque, 1815. Members of Trochidae and Tegulidae have a thin, multispirals chitinous operculum; whereas members of Turbinidae have a thick, calcareous operculum.

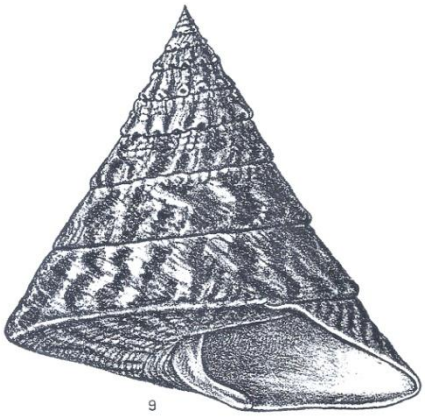
Reproduction Philippi, 1852: *Trochus niloticus* L., pl. 7, fig. 1.



Reproduction Philippi, 1852: *Trochus maximus* Koch, pl. 19, fig. 4.



Reproduction Tryon & Pilsbry, 1889: *Trochus niloticus* Linné, pl. 1, fig. 5.



Reproduction Tryon & Pilsbry, 1889: *Trochus niloticus* var. *maximus* Koch, pl. 1, fig. 9.

SYSTEMATICS

Phylum : Mollusca Linnaeus, 1758
Class : Gastropoda Cuvier, 1795
Subclass : Vetigastropoda Salvini-Plawen, 1989
Order : Trochida Rafinesque, 1815
Superfamily : Trochoidea Rafinesque, 1815
Family : Tegulidae Kuroda, Habe, & Oyama, 1971
Genus : *Rochia* Gray, 1857
Species : *R. nilotica* (Linnaeus, 1767), *R. maxima* (F. C. L. Koch, 1844)

Rochia nilotica (Linnaeus, 1767)

Figs. 1-8

Trochus niloticus L. --Philippi, 1852: p. 272-274; pl. 7, fig. 1; pl. 8, fig. 1.
Trochus niloticus Linné --Tryon & Pilsbry, 1889: p. 17-18; pl. 1, figs. 5-8.
Trochus niloticus Linnaeus --Hinton, 1975: pl. 2, fig. 1.
Trochus niloticus Linnaeus --Hinton, 1977: pl. 3, fig. 1.
Trochus niloticus L., 1767 --Abbott & Dance, 1982: p. 45, fig.
Tectus (Rochia) niloticus Linnaeus, 1767 --Roberts et al., 1982: p. 15; pl. 1, fig. 7.
Trochus niloticus Linné, 1767 --Springsteen & Leobrera, 1986: p. 32; pl. 4, fig. 8.
Trochus niloticus Linne, 1767 --Dharma, 1988: p. 34; pl. 3, fig. 11 (left).
Trochus niloticus Linnaeus, 1767 --Wilson, 1993: p. 90; pl. 7, fig. 16.

Description. Shell large, conical or pyramidal, thick, heavy; height and diameter of shell relatively equivalent (h/d= 0.92-1.07), shell height up to 118.1 mm, diameter up to 110 mm; last whorl swollen or widened, concave, periphery curved; base slightly convex with 13-18 spiral ribs, base of juvenile shell flat. Apex pointed, usually eroded. Whorls 8-10, sutures deep; radial ribs visible on the upper spire and junctions with sutures form knobs or tuberculates. Spiral striae appear stronger near sutures. Ground color white, with purplish red streaks in radial direction, streaks width varies; at the base the streaks usually narrower and sometimes discontinuous or zigzag, or occasionally a white marbled pattern; radial streaks fade on the upper spire and not visible on the top. Aperture transverse and oblique, outer lip simple, inside smooth and shiny. Columella smooth and shiny, outside the umbilicus folded, then with local thickening rotating downward until it reaches the aperture lip. Umbilicus open, deep. Periostracum usually found on the lower part of the shell i.e. last and penultimate whorls; usually thin, thick or very thick in adult shells, color brown. Operculum chitin, circular, with a central nucleus, multispirals consisting of 9-10 whorls, color brown.

Distribution. The distribution of *Rochia nilotica* (Linnaeus, 1767) in Indonesia is known only from the location data of the examined materials: Sepa Island, Thousand Islands; Pari Island, Thousand Islands; Tidung Island, Thousand Islands; Panimbang, Sunda Strait, Banten; Tanjung Panto, Banten; Situbondo Beach, East Java; Buton Island, South East Sulawesi; Banggai Island, Banggai Archipelago, Central Sulawesi; Bolaang Mongondow, North Sulawesi; Pangandaran, West Java; Bungin Island, West Sumbawa. Abroad, it is known from Papua New Guinea (Hinton, 1975); Australia (Hinton, 1977; Wilson, 1993), Philippines (Springsteen & Leobrera, 1986); Indo Pacific including Indian Ocean, New Ireland, New Caledonia, North Australia, French Polynesia, etc.

Habitat. Specimens are collected by fishermen, usually at low tide or by diving to a depth of 5 m; using compressor to a depth of 20 m. Usually juveniles or semi-adults live in shallower seas, while adults in deeper seas. They feed on algae or seaweed attached to coral reefs.

Material examined. Sepa Island, Thousand Islands; Pari Island, Thousand Islands; Tidung Island, Thousand Islands; Panimbang, Sunda Strait, Banten; Tanjung Panto, Banten; Situbondo Beach, East Java; Buton Island, South East Sulawesi; Banggai Island, Banggai Archipelago, Central Sulawesi; Bolaang Mongondow, North Sulawesi.

Discussion. Shell of *Rochia nilotica* (Linnaeus, 1767) is large, thick, and heavy. In general, last whorl concave, periphery of the last whorl is swollen or widened, the height and diameter of the shell are relatively equivalent (h/d= 0.92-1.07), the height can be slightly smaller or slightly larger than the diameter, and the base of the shell is slightly convex.

***Rochia maxima* (F. C. L. Koch, 1844)**

Figs. 9-12

Trochus maximus Koch --Philippi, 1852: p. 355-356; pl. 19, fig. 4.
Trochus niloticus Var. *maximus* Koch --Tryon & Pilsbry, 1889: p. 18; pl. 1, fig. 9.
Trochus niloticus Linne, 1767 --Dharma, 1988: p. 34; pl. 3, fig. 11 (right).
Trochus niloticus Linnaeus, 1767 --Dharma, 2005: p. 64; pl. 7, figs. 1a-b.
Trochus niloticus (Linnaeus, 1767) --Thach, 2005: p. 29; pl. 2, fig. 5.

Description. Shell large, spire conical or pyramidal, rather thin, rather light, height of the shell greater than diameter (h/d= 1.08-1.25), shell height up to 141.8 mm, diameter up to 122.6 mm; last whorl not or somewhat swollen, periphery keeled; base relatively flat with 16-19 spiral ribs. Apex pointed, usually eroded or covered with coral. Whorls 9-10, sutures deep; radial ribs visible on the upper spire and junctions with sutures form knobs or tuberculates; spiral striae appear stronger near sutures. Ground color white, with purplish red radial streaks, streaks width varies; radial streaks fade on the upper spire and not visible on the top; at the base the streaks become narrower and sometimes discontinuous or zigzag or occasionally a white marbled pattern. Aperture transverse and very oblique, outer lip simple, inside smooth and shiny. Columella smooth and shiny, outside the umbilicus folded, then with local thickening rotating downward until it reaches the aperture lip. Umbilicus open, deep. Umbilical area shiny luster. Periostracum usually found on the lower part of the shell i.e. last and penultimate whorls; usually thin, thick or very thick in adult shells, color brown. Operculum chitin, circular, with a central nucleus, multispirals consisting of 9-10 whorls, color brown.

Distribution. The distribution of *Rochia maxima* (F. C. L. Koch, 1844) in Indonesia is limited known only from the location data of the examined materials: Ketawai Island, Bangka; Tanjung Kelayang, Belitung; Nasik Strait, Belitung; Sijuk, Belitung; and Gorontalo, Sulawesi. Abroad, it is known from Vietnam (Thach, 2005).

Habitat. Specimens are collected by fishermen, usually at low tide or by diving to a depth of 4 m, using compressor to a depth of 20 m. Usually juveniles or semi-adults live in shallower seas, while adults in deeper seas. They feed on algae or seaweed attached to coral reefs.

Material examined. Sijuk, Belitung; Tanjung Kelayang, Belitung; Nasik Strait, Belitung; Ketawai Island, Bangka.

Discussion. Shell of *Rochia maxima* (F. C. L. Koch, 1844) is large, rather thin and rather light, in general the height of the shell is greater than the diameter (h/d= 1.08-1.25), the base is relatively flat. Compared with *Rochia nilotica* (Linnaeus, 1767), the shell of *R. maxima* is thinner and lighter in weight. Periphery of the last whorl of *R. nilotica* is swollen or widened, the height and diameter of the shell are nearly equal (h/d= 0.92-1.07), the height can be slightly smaller or slightly larger than the diameter; periphery of the last whorl of *R. maxima* is not or only somewhat widened, the height is usually larger than the diameter (h/d= 1.08-1.25). The sutures of *R. maxima* are deeper than those of *R. nilotica.* The base of *R. nilotica* is slightly convex, that of *R. maxima* is relatively flat; spiral ribs at the base of *R. maxima* are more visible than those of *R. nilotica*. It is usually quite difficult to distinguish juvenile or semi-adult shells of *R. nilotica* (fig. 7) and *R. maxima* (fig. 9) because the shells of both species are still thin, the base is still flat, the periphery of juvenile *R. nilotica* is angular, and usually the knobs and

tuberculates are still visible on the last whorl. From observation of the examined materials, *R. nilotica* and *R. maxima* were not found in the same location.

Table 1. Measurements of the height and diameter of the shells of *Rochia nilotica* and *Rochia maxima.*

No.	***Rochia nilotica***				***Rochia maxima***			
	Locality	h (mm)	d (mm)	h/d	Locality	h (mm)	d (mm)	h/d
1	Buton	92.3	91.1	1.01	Sijuk	141.8	122.6	1.16
2	Buton	118.1	110.0	1.07	Sijuk	116.6	102.1	1.14
3	Situbondo	56.0	59.4	0.94	Sijuk	121.1	104.8	1.16
4	Situbondo	61.5	62.7	0.98	Sijuk	125.8	106.3	1.18
5	Situbondo	65.0	69.8	0.93	Sijuk	88.8	75.7	1.17
6	Situbondo	69.7	69.1	1.01	Nasik S.	95.4	76.6	1.25
7	Situbondo	64.0	62.3	1.03	Nasik S.	91.7	81.0	1.13
8	Situbondo	68.8	68.4	1.01	Ketawai	77.2	71.2	1.08
9	Situbondo	58.1	58.3	1.00	Nasik S.	97.4	86.0	1.13
10	Situbondo	75.2	72.0	1.04	Nasik S.	93.3	83.5	1.12
11	Situbondo	70.5	72.2	0.98	Nasik S.	91.0	81.0	1.12
12	Situbondo	58.0	57.2	1.01	Kelayang	79.1	72.2	1.10
13	Situbondo	61.8	65.4	0.94				
14	Situbondo	62.9	59.5	1.06				
15	Situbondo	87.6	82.5	1.06				
16	Situbondo	80.0	82.2	0.97				
17	Sepa	62.6	60.4	1.04				
18	Banggai	99.6	96.3	1.03				
19	Banggai	100.2	102.3	0.98				
20	Panimbang	93.2	101.2	0.92				
21	Mongondow	89.4	91.2	0.98				
22	Pari	87.5	87.3	1.00				
23	Tidung	59.2	57.8	1.02				

Table 2. Key to the species.

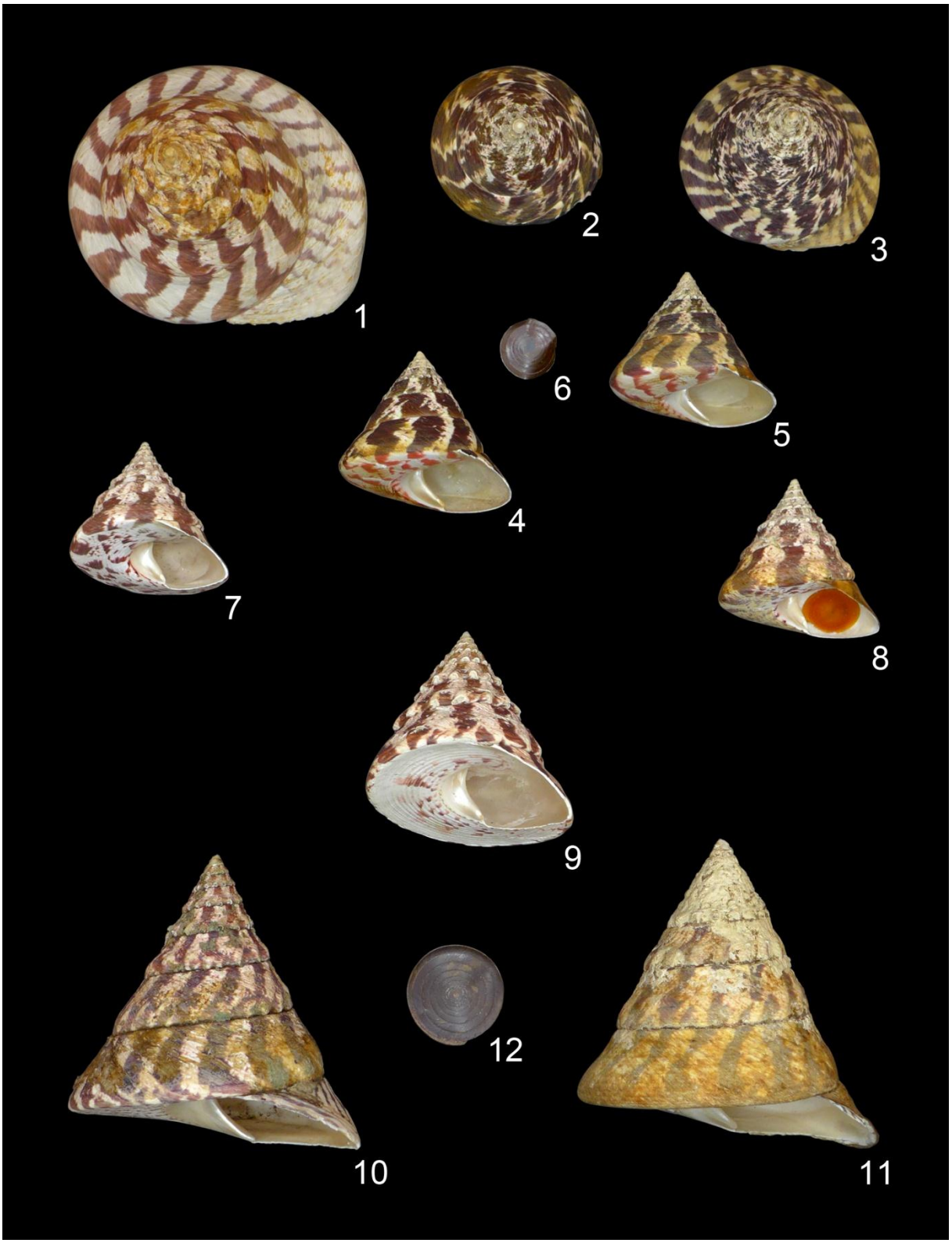
Characters	***Rochia nilotica***	***Rochia maxima***
shell thickness	thick	rather thin
shell weight	heavy	rather light
shell height to diameter (h/d)	0.92-1.07, height and diameter relatively equivalent	1.08-1.25, height greater than diameter
last whorl	swollen, concave	not or somewhat swollen
periphery	curved	keeled
base	slightly convex	relatively flat

Conclusion

Although *Rochia nilotica* (Linnaeus, 1767) and *Rochia maxima* (F. C. L. Koch, 1844) are very similar, but these two species are different. The shell of *R. nilotica* is thick and heavy. Compared with *R. nilotica*, the shell of *R. maxima* is thinner and lighter in weight. The periphery of the last whorl of *R. nilotica* is swollen or widened, the height and diameter of the shell are almost the same (h/d= 0.92-1.07), the height can be slightly smaller or slightly larger than the diameter; the periphery of the last whorl of *R. maxima* is not or only slightly widened, the height is usually greater than the diameter (h/d= 1.08-1.25). Base of *R. nilotica* is slightly convex, that of *R. maxima* is relatively flat; spiral ribs at the base of *R. maxima* are more visible than those of *R. nilotica*. From this conclusion, the differences between the two “lola” species that have long been confused become clear.

Explanation plate

Figs. **1-8.** ***Rochia nilotica*** (Linnaeus, 1767). **1.** Buton, South East Sulawesi, h= 118.1 mm; **2-6.** Situbondo, East Java: **2.** h= 68.8 mm, **3.** h= 80.0 mm, **4.** h= 61.5 mm, **5.** h= 64.0 mm, **6.** operculum, D= 22.3 mm; **7.** Tidung Island, Thousand Island, h= 59.2 mm; **8.** Sepa Island, Thousand Islands, h= 62.6 mm.
Figs**. 9-12.** ***Rochia maxima*** (F. C. L. Koch, 1844). Sijuk, Belitung: **9.** h= 88.8 mm, **10.** h= 116.6 mm, **11.** h= 125.8 mm, **12.** operculum, D= 38.0 mm.



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DECLARATION

The authors have no confilct of interest

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