# THE FAMILY NATICIDAE (MOLLUSCA: GASTROPODA) IN THE FIJI ISLANDS

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*Abstract.* The family Naticidae is represented in the Fiji Islands by 21 Recent species which are assignable to 3 genera and 3 subgenera. In addition, Ladd (1934) recorded Recent species of Polinicinae from Tertiary deposits of Viti Levu, and Ladd & Hoffmeister (1945) described species of Globulariinae from Tertiary deposits of the Lau Islands. Species of the latter subfamily have become extinct in Fiji. All the Recent species recorded from the Fiji Islands have a wide Indo-Pacific distribution and no endemics have been recognized.

The family Naticidae is world-wide in distribution and species are found in tropical and temperate waters. Tropical Naticidae live chiefly within the intertidal region and dredging in Fiji at depths of 15-20 fathoms (27-37 metres) failed to add any new records to the intertidal naticid population. Species in the family are moderately numerous, but the actual number of species recorded from the Fiji Islands is comparatively small. A certain number of named variants of doubtful taxonomic value is to be anticipated in view of the usual degree of ecophenotypic and individual variation evident in populations of Naticidae.

## TAXONOMY

A natural supraspecific classification of the Naticidae, based on some tangible evidence of genetic or phylogenetic affinities, remains to be proposed for Recent and fossil groups. Modern writers generally interpret genetic affinities on the basis of opercula and the arrangement of the funicle within the umbilicus. Palaeontologists, who rarely obtain specimens accompanied by opercula, rely solely on umbilical features in deciding the species' generic relationship. Malacologists derive no advantage from anatomical examinations in achieving a more natural and correct classification. Risbec (1956) who examined the anatomy of tropical Naticidae did not hesitate to combine *Polinices* and *Natica* in a single genus, despite the differences in opercula of the two groups. *Polinices* and *Natica* are placed in two separate subfamilies on the basis of corneous and calcareous opercula; on the basis of the radula, however, both genus-groups would be regarded as congeneric. The genera *Natica* s.str. and *Tanea* on the other hand, have a prominent different type of radula, but both genera are currently included in the same subfamily. This clearly illustrates the artificiality of our present naticid classification. A more natural classification, probably too orthodox in a modern taxonomic concept, would be to consider species which differ only in the type of operculum but not the radula, to be only subgenerically separable from each other; species such as *Tanea* or *Globisinum* which show distinct differences in radular pattern, should be separated generically.

The importance placed on the form and sculpture of the operculum in naticid classification is overrated in the writer's opinion. Early forerunners of Naticidae

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most probably had a single type of operculum, i.e. a calcareous one. This prototypic operculum was aborted in the naticid, cul-de-sac offshoot group of Polinicinae but was retained by species of Naticinae. The presence of an inner corneous operculum, which on one side is attached to the animal's foot and on the other to the outer calcareous operculum, would tend to lend some support to this hypothesis. In naticid specimens which have been preserved in alcohol and which have hardened after removal, the calcareous operculum is easily dislodged or may even fall off from its corneous opercular backing; this may account for literature reports of true naticids having a corneous operculum.

In tropical Naticidae, the radula is of little taxonomic value in separating species, genera or subfamilies, and the radulae of *Polinices* and *Natica* are practically the same. The protoconch is even less reliable in tropical naticids and is more or less of a sterotyped form. Several writers have expressed doubt as to the stability of funicular characters, particularly the size of the funicle and the direction of entrance into the umbilicus. The funicle of *Natica gualtieriana* Récluz ( = *marochiensis* auctt.) is variable indeed, sometimes small, leaving a wide umbilical space and at other times fairly broad and almost filling the umbilicus. Being a common species, the variability of the funicle in *N.gualtieriana* is easily observed, and is no more excessive than in species of which large series are unobtainable.

Species of Naticidae have either a corneous or calcareous external operculum, and each type is confined to a particular species. In unisulcate calcareous opercula, the arrangement of the marginal rib shows a certain amount of variation: there may be a marginal groove, followed by an elevated rib which is bordered once again by a groove, or a marginal rib which is followed by a groove, or only a marginal rib without any grooves whatsoever. In Fijian populations of Naticidae, species with a unisulcate operculum never produce an aberrant with a multisulcate operculum and vice versa. In *Natica vitellus* (Linnaeus), however, the operculum is either bisulcate or trisulcate. The stability of differences in the two types of calcareous opercula would favour a subgeneric separation of the two groups of species.

The close relationship of various naticid groups becomes more apparent if an analysis of diagnostic characters of some species is made. The New Zealand species *Tanea zelandica* (Quoy & Gaimard) resembles in shell form, funicle and unisulcate operculum the group of *Notocochlis* Powell, in shell ornament *Naticarius* Duméril, but in radular features (unicuspid rachidian and simple inner marginals) the species shows a close relationship to the Mediterranean species *Natica stercusmuscarum* (Gmelin) and the East Indian Ocean *N.lineata* (Röding). *Natica zonalis* Récluz, has all the features of the *Natica-Notocochlis* group, but the multisulcate operculum places the species in *Naticarius*. *Natica fasciata* (Röding) has the shape of *Tectonatica* Sacco, the operculum of *Notocochlis* and umbilical features which are intermediate between *Natica* s.str. and *Tectonatica*. It is evident that umbilical and opercular characters are not always in agreement nor do they follow a pre-diagnosed generic pattern. Since the differences in shape and extension of the parietal callus and the thickness of the funicle are often one of degree only, the group of species with unisulcate opercula *(Notocochlis* Powell) has been combined with *Natica* s.str. (bi- to trisulcate opercula).

## Ecology and Animal

Tropical species of *Polinices* are common sand-dwellers of the intertidal

region, leaving wide tracks in the sand when on the move. Naticinae, however, prefer a sandy substratum mixed with weed and rarely expose themselves during daylight hours. The foot of *Polinices* is large and broad, and divides into a propodium and mesopodium (Fig. 1). The broad sole of the foot not only assists in locomotion over soft bottom but is also used for the purpose of propelling the animal forward through a propodial flipping motion. The animal of *Polinices* is able to retract completely into the shell after a short time lapse. The animal of *Natica* is smaller and retracts appreciably faster into its shell.

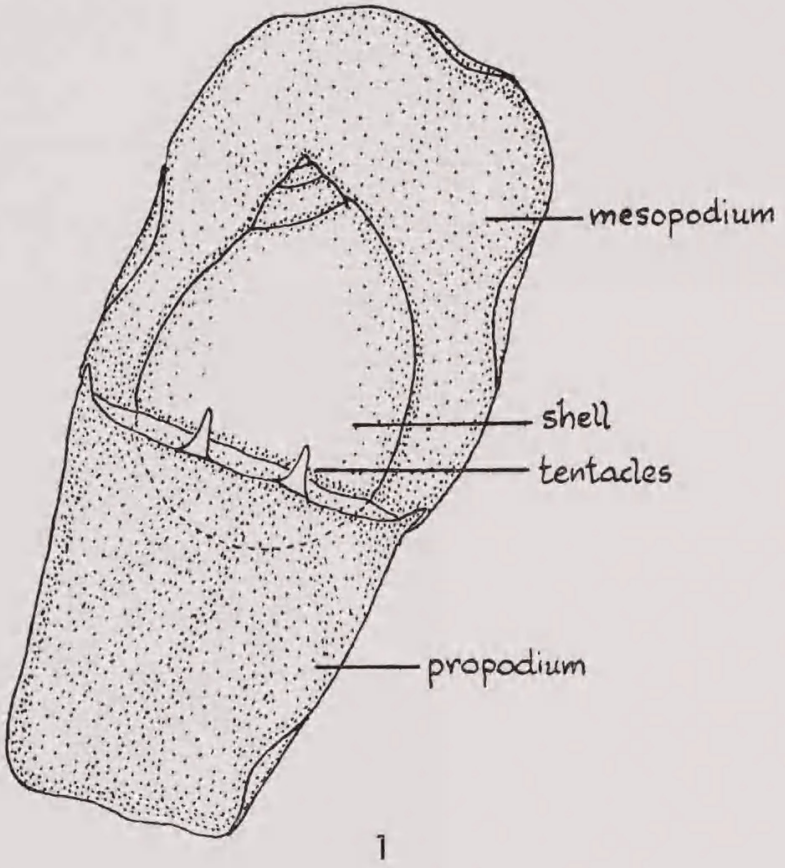


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Fig. 1. *Polinices tumidus* (Swainson). Dorsal view of animal.

Naticidae are carnivorous prosobranchs which gain access to other mollusc's soft parts by boring holes through their shells. The holes are regular, larger in diameter at the point of commencement than at the point of break-through, and incompletely bored holes show a central nodule in the depression. Data on the mechanism of boring and the composition of the accessory boring organ may be found in Ziegelmeier (1954).

Risbec (1956) reported on the anatomy of Naticidae from New Caledonia. This work, similarly to his work on the Mitridae from the same region, should be accepted with some reservations. Risbec (loc.cit.) lists specific names unaccompanied by authorities, and while the identity of some of his species is equivocal others have certainly been misidentified. The same author described the operculum of *Natica solida* Blainville (= *fasciata* Röding) as being corneous; the species is a true *Natica* which has a calcareous operculum, and Risbec's species was most probably a *Polinices*. The operculum of *Natica rufa* Born ( = *vitellus* Linnaeus)

was said to have a single marginal rib, but the actual Pacific *N.vitellus* has not less than 2 marginal ribs. The operculum of Risbec's *"Natica zelandica"* was sculptured with 3 marginal ribs, but the New Zealand species *Tanea zelandica* (Quoy & Gaimard) has only a single marginal rib. Curiously enough, Risbec's figure of the radula of his *"N.zelandica"* does indeed represent the radula of a *Tanea* species (single large cusp on a concave rachidian), and the figured radula may have possibly belonged to *N.lineata* (Röding), a species which is known to have a *Tanea* type of radula.

## SYSTEMATICS

### KEY TO THE GENERA AND SUBGENERA OF FIJIAN NATICIDAE

**Operculum calcareous, animal moderate in size, shell smooth or radially plicate at sutures** ..... **Naticinae**

1. Operculum with 1-3 marginal ribs, funicle prominent or merging with umbilical wall, sometimes partially covered by parietal callus ..... **Natica** s.str.
2. Operculum multisulcate (6-8), funicle prominent, umbilicus open ..... **(Naticarius)**
3. Operculum with a single marginal rib, umbilicus almost or entirely covered by the parietal callus apart from a narrow lateral space ..... **(Tectonati**

**Operculum corneous, animal large, shell smooth** ..... **Polinicinae**

4. Shell heavy, solid, pyriform to pyriformly-ovate, umbilicus partially or completely filled with callus, funicle prominent ..... **Polinices** s.str.
5. Shell heavy, solid, ovate and compressed, funicle prominent, umbilical groove deep and semicircular ..... **(Neverita)**
6. Shell light in weight, pyriform, parietal callus narrow, partly folded over umbilicus, funicle indistinct ..... **(Mammilla)**

**Operculum corneous, animal very large, shell spirally grooved** ..... **Sininae**

7. Shell inflated, aperture semiovate, columellar callus narrow and folded over deep umbilicus ..... **Eunaticina**
8. Shell compressed, ear-shaped, aperture large and elliptical, umbilicus shallow ..... **Sinum**

## Order MESOGASTROPODA

### TAENIOGLOSSA

### Superfamily NATICACEA

### Family NATICIDAE Forbes, 1838

(Polinicidae Mörch, 1852, Cat. Conch. Com. Yoldi 1: 31)

### Subfamily NATICINAE Forbes, 1838

Shell small to moderate in size, varicoloured, ornamented with bands, spots or axial flames; often smooth, occasionally sculptured with spiral striae or radial ribs at the sutures. Spire low, body whorl inflated, aperture semiovate, rarely ovate, smooth within, labial lip moderately thin. Umbilicus open, funicle well developed, occasionally covered by parietal callus.

The operculum is calcareous, unisulcate or multisulcate. The rachidian of the radula has 1-5 cusps in addition to 2 accessory basal cusps, lateral with 1-7 cusps; inner marginal generally bifid but occasionally simple, outer marginal always simple. Animal moderate in size, and able to retract completely into its shell.

## Genus **Natica** Scopoli, 1777

*Natica Scopoli,* 1777, Introd. Hist. nat., p. 392. Type species by SD (Harris, 1897) *Nerita vitellus* Linnaeus, 1758. Recent, Indo-Pacific.

1798. *Cochlis* Röding, Mus. Bolten, p. 146. Type species by SD (Iredale, 1924) *Cochlis albula* Röding, 1798 = *Nerita vitellus* Linnaeus, 1758.

1826. *Nacca* Risso, Hist. nat. Eur. mérid. 4 : 148. Type species by SD (Herrmannsen, 1847) *Natica fulminea* (Gmelin) = *Nerita fulminea* Gmelin, 1791. Recent, West Africa.

1933. *Notocochlis* Powell, Trans. Proc. N.Z. Inst. 63: 166. Type species by OD *Cochlis migratoria* Powell, 1927. Recent, New Zealand.

Shell small to large, rounded and solid, spire low, smooth or with radial ribs at sutures; aperture wide, semiovate, umbilicus deep, posteriorly open or partly covered by the parietal callus, funicle weak or strong, entering umbilicus at right angles or obliquely. Parietal callus prominent, sometimes coalescing with funicle.

The operculum is calcareous, smooth and with 1-3 marginal ribs, columellar edge smooth or serrated.

Woodring (1957) considered the possibility that a type designation by Anton (1839) for *Natica* might be prior to the one by Harris (loc. cit.). Anton signalled his type designations by using "Versalbuchstaben" (Capital letters) for species so designated. In the section on *Natica* Lamarck (non Scopoli), Anton listed six species a-f, and none of these species have been singled out as the type; all six names are printed in italics; there was thus no type designation made by Anton.

**Natica (Natica) vitellus** (Linnaeus, 1758) (Figs. 2-5).

1758. *Nerita vitellus* Linnaeus, Syst. Nat. ed. p. 10, p. 77 (ref. Rumphius, pl. 22, fig. D).

1778. *Nerita rufa Born,* Ind. rer. nat. Caes. Vindob., p. 413 (ref. Rumphius, pl. 22, fig. D).

1781. *"Nerita dilute rufescens* Chemnitz", Syst. Conch. Cab. 5 : 258, pl. 187, figs. 1872-73 *(non binom.).*

1781. *"Nerita rufa* Chemnitz", Syst. Conch. Cab. 5 :259, pl. 187, figs. 1874-75 *(non binom.).*

1781. *"Nerita globosa laevis* Chemnitz", Syst. Conch. Cab. 5 : 267, pl. 188, figs. 189 a,b, 1897 *(non binom.).*

1786. *"Nerita fasciata* Martyn", Univ. Conch. 3 : pl. 110, right figure *(non. binom.).*

1791. *Nerita leucozonias* Gmelin, Syst. Nat., ed. 13, p. 3672 (ref. Kämmerer, pl. 12, figs. 5,6).

1791. *Nerita spadicea* Gmelin, Syst. Nat. ed. 13, p. 3672 (ref. Chemnitz, *op. cit.,* figs. 1872, 73).

1791. *Nerita spadicea* var. b, Gmelin, Syst. Nat. ed. 13, p. 3672 (ref. Chemnitz, *op.cit.,* figs. 1896 a,b, 1897).

1798. *Cochlis albula* Röding, Mus. Bolten., p.146 (ref. Chemnitz, *op. cit.,* figs. 1896 a,b, 1897).

1798. *Cochlis rufescens* Röding, Mus. Bolten., p. 148 (ref. Chemnitz, *op. cit.,* figs. 1872-73).

1807. *Natica fuscata* Link, Beschr. Nat.Samml. Univ. Rostock, p. 140 (ref. Chemnitz, *op.cit.,* figs. 1896 a,b, 1897).

1822. *Natica helvacea* Lamarck, Hist. nat. anim. s. vert. 6 :200 (ref. Chemnitz, *op. cit.,* figs. 1896 a,b, 1897).

1825. *Natica forscalii* Sowerby, Cat. shells Tank., p. 47 (ref. Chemnitz, 1795, Vol. 11, pl. 197, figs. 1901, 1902. Hab : Red Sea).

1849. *Natica pallens* Philippi, Zeit. Malakozool., p. 157.

1852. *Natica chemnitzii* Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 15, pl. 2, figs. 3,4 (non Pfeiffer, 1840).

1852. *Natica (Nerita) globosa* "Chemnitz", Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 21, pl. 3, figs. 1,2 & pl. 8, fig. 5 (non Grateloup, 1828).

1855. *Natica globosa* Chemnitz, Reeve, Conch. Icon., pl. 11, figs. 46a,b (non Grateloup, 1828).

1855. *Natica forskalii* Chemnitz, Reeve, Conch. Icon., pl. 14, figs. 59 a,b.

1855. *Natica rufa* Born, Reeve, Conch. Icon., pl. 16, figs. 70 a,b.

1883. *Natica rufa* Born, Sowerby, Thes. Conchyl. 5 :80, pl. 4, fig. 42.

1953. *Natica rufa Lamack*, Mermod, Rev.Suisse Zool. 60(2) : 191, fig. 192.

1953. *Natica rufa Lamarck*, Mermod, Rev. Suisse Zool. 60(2) : 186, fig. 188 (figd. type).

1956. *Natica vitellus* Linné, Kaicher, Indo-Pacif. sea-shells, pl. 2, fig. 7.

1966. *Natica vitellus* (Linné), Habe & Kosuge, Shells world col. 2 :36, pl. 12, fig. 16 (forma *albula* Röding).

1967. *Natica vitellus* (Linné), Habe & Kosuge, Stand. book Jap. shells col. 3 :47, pl. 18, fig. 20.

Shell moderately large, 25-45mm in height, solid, spire low, smooth apart from fine growth striae which tend to be more prominent at the suture and early whorls. Variable in colour, white with a single broad brown zone on body whorl, or brown in colour with lower half of body whorl, central band and an area near suture white; nuclear whorls purplish-brown. Aperture wide, semi-ovate, white, marked with brown within; parietal callus thick but narrow, and extending only partially over posterior of umbilicus. Funicle ill-defined, often merging with umbilical wall; umbilicus open and deep.

The operculum (Fig. 4) is calcareous, white in colour, the columellar edge is serrated and the labial edge has 2 marginal ribs and the nucleus terminates in a somewhat callous knob.

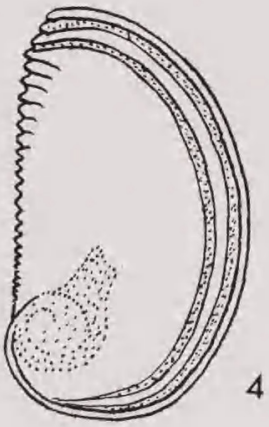
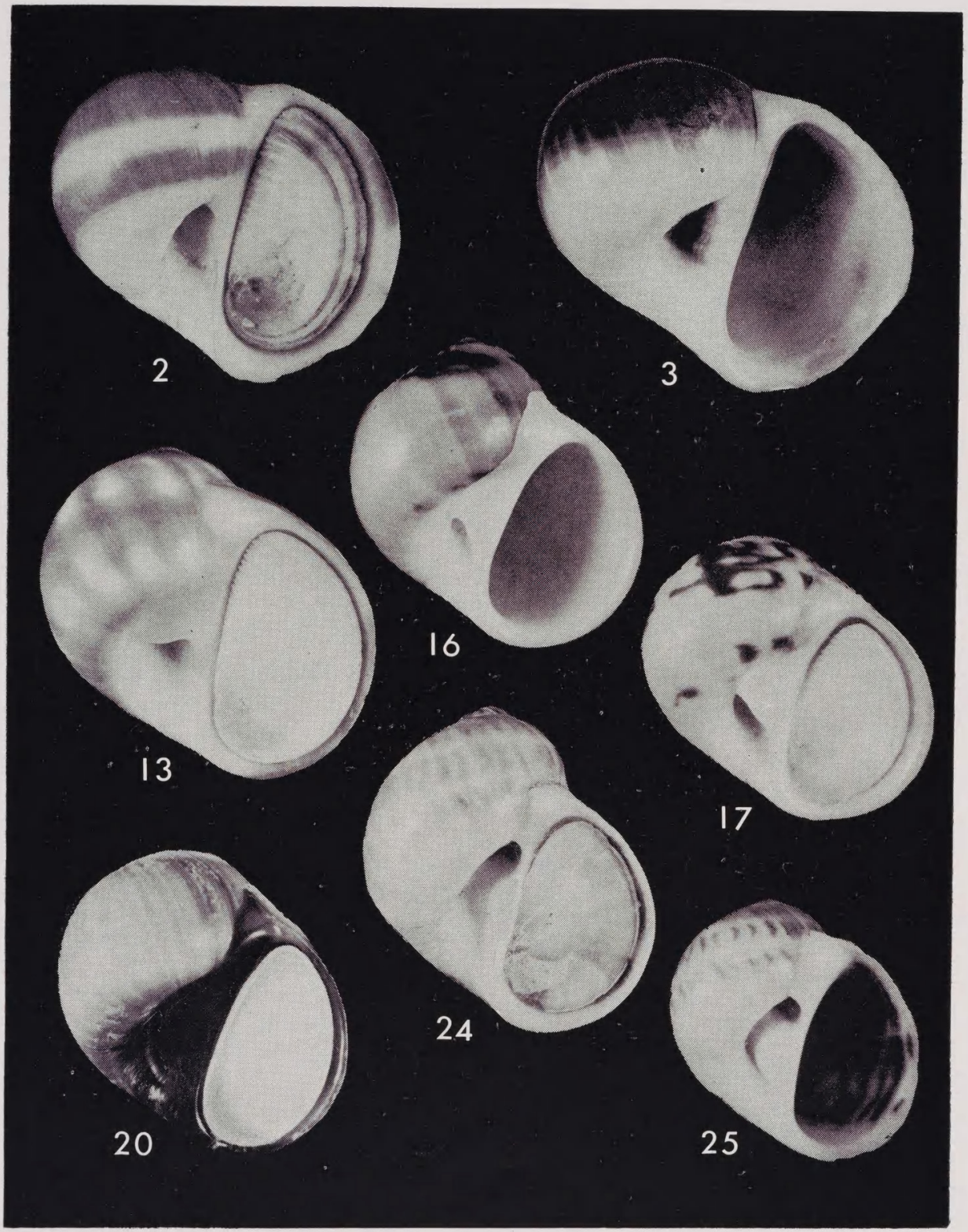



Fig. 4. *Natica vitellus* (Linnaeus). Operculum.

TYPE LOCALITY: Asiatic Ocean.

DISTRIBUTION AND ECOLOGY: The species is uncommon in the Fiji Islands and has been recorded from the north to the south along the western coast of Viti Levu. Clean coral-sand pockets and weedy-sand lagoons.




Figs. 2, 3, 13, 16, 17, 20, 24, 25. 2, 3. *Natica vitellus* (Linnaeus). 2. Nananu-i-Ra I., Fiji I.; height 29.4mm. 3. Manava I., Fiji I.; height 40.7mm. 13. *N. stellata* Hedley. Soepiori, Schouten I., West New Guinea; height 28.0mm (Powell coll., AIM). 16, 17. *N. arachnoidea* (Gmelin). Manava I., Fiii I.; height 19.1mm and 17.3mm respectively. 20. *N. fasciata* (Röding). Viti Levu Bay, Fiji I.; height 18.4mm. 24, 25. *N. gualtieriana* Récluz. Caboni beach, Fiji I.; height 23.3mm and 16.4mm respectively.

The forms *Natica rufa* (Born), *N.spadicea* (Gmelin) and *N.helvacea* Lamarck, are considered to be valid species by some authors; based on colour variants of the species, these forms do not display any major differences in umbilical or opercular features. *Natica stellata* (Hedley), however, which is a valid species, has been confused with *N.vitellus* and has been figured as that species by several authors. The superficially similar species *N.orientalis* (Gmelin), is uniformly brown in colour, the thick and prominent funicle enters the umbilicus at an oblique angle, the sutures have a flattened presutural ramp and the operculum is multisulcate. This species which has not been recorded from the Fiji Islands, has been correctly figured by Orr-Maes (1967,pl.9,fig.C).

**Natica (Natica) stellata** Hedley, 1913 (Figs. 6, 8-13)

1781. *"Nerita vitellus* Chemnitz", Syst. Conch. Cab. 5 : 255, pl. 186, figs. 1866-67 *(non binom.).*

1786. *"Nerita stellatus* Martyn", Univ. Conch. 3 : pl. 110, left figure *(non binom.).*

1798. *Cochlis vitellus* Röding, Mus. Bolten., p. 148 (ref. Chemnitz, *op. cit.*, pl. 186, figs. 1866-67) [non *Nerita vitellus* Linnaeus, 1758].

1807. *Natica vitellus* Link, Beschr. Nat.-Samml. Univ. Rostock, p. 140 (ref. Chemnitz, *op cit.* 186, figs. 1866-67 [non *Nerita vitellus* Linnaeus, 1758].

1855. *Natica vitellus* Reeve, Conch. Icon., pl. 10, figs. 39 a,b (non *Nerita vitellus* Linnaeus, 1758).

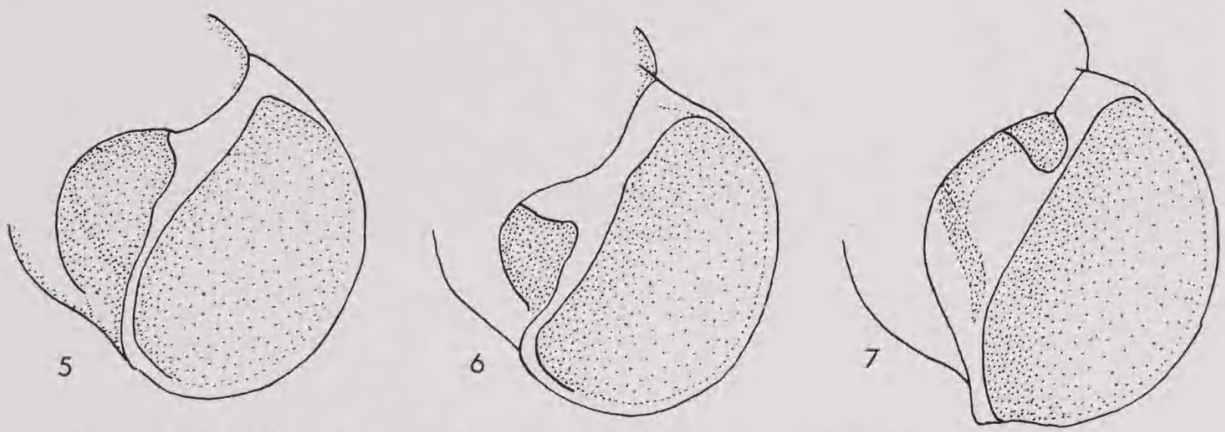
1883. *Natica vitellus* Sowerby, Thes. Conchyl. 5 :93, pl. 4, fig. 41 (non *Nerita vitellus* Linnaeus, 1758).

1913. *Natica stellatus* "Martyn", Hedley, Proc. Linn. Soc. (N.S.W.) 38(2) : 299 (ref. Martyn, *op. cit.*, pl. 110, figure on left).

1956. *Natica stellata* Hedley, Kaicher, Indo-Pacif. sea-shells, pl. 2, fig. 5.

1961. *Natica stellata* Chenu, Rippingale & McMichael, Gt. Barrier reef shells, p. 92, pl. 11, fig. 16.

*Natica stellata* Hedley, erroneously considered to be the *N.vitellus* of Linnaeus by 19th century authors, has not been recorded from the Fiji Islands. The species is similar in shape to *N.vitellus* but is a saturated orange in colour and ornamented with spiral rows of white spots on the body whorl. The pink parietal callus forms a tongue-shaped extension over the posterior of the umbilicus. The operclum (Figs. 10-11) is calcareous, white, and has 2-3 marginal ribs; the internal corneous operculum (Fig. 9) is attached along a central axis to the foot, but the edges are free. The rachidians of the radula (Fig. 8) are tricuspid, and the 2 basal accessory cusps are mounted on a broad shield; the lateral is tricuspid, inner marginal and




Figs. 5-7. Umbilical features. 5 *Natica vitellus* (Linnaeus). 6. *N. stellata* Hedley. 7. *Natica (Naticarius) orientalis* (Gmelin).

outer marginal simple. The examined specimen came from Soepiori, Schouten Islands, West New Guinea (Powell coll.).

The authorship of *N.stellata* is occasionally credited to Chenu, 1845, instead of Hedley. Chenu's re-publication of Martyn's non-binomial "The Universal Conchologist", does not validate specific names published in this work.

**Natica (Natica) arachnoidea** (Gmelin, 1791) (Figs. 14-17)

1781. *"Nerita lineis rufus* etc. Chemnitz", Syst. Conch. Cab. 5:271, pl. 188, figs. 1915-16 *(non binom.).*

1791. *Nerita arachnoidea* Gmelin, Syst. Nat., ed. 13 p. 3674 (ref. Chemnitz, *op cit.* figs. 1915-16).

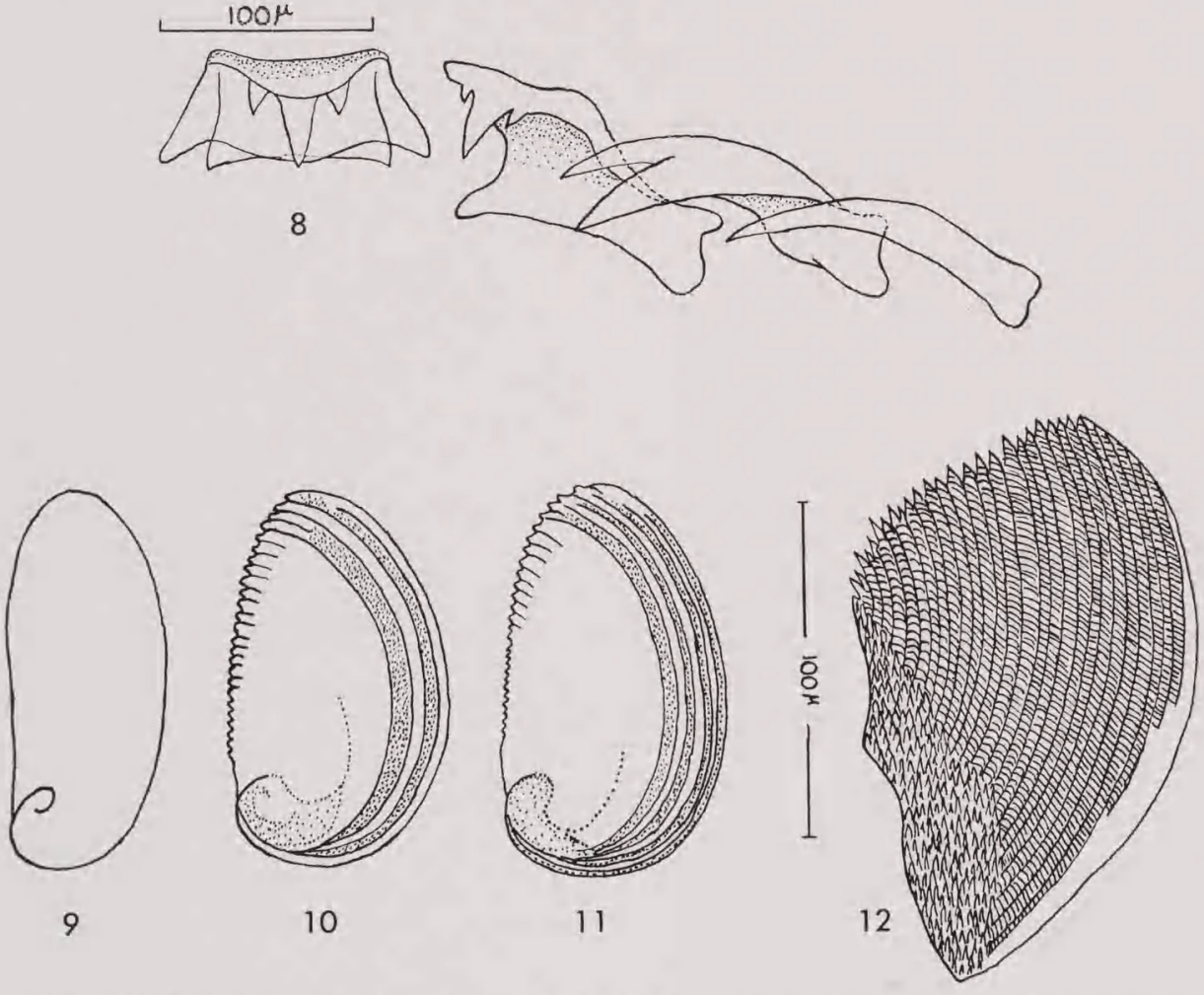
1844. *Natica raynoldiana* Récluz, Proc. Zool. Soc. Lond., pt. 11 : 212 (Hab : Zanzibar, Philippines & Ceylon).

1852. *Natica arachnoidea* Gmelin, Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 25, pl. 3, figs. 18,19 & pl. 15, fig. 18.

1855. *Natica raynaudiana* Récluz, Reeve, Conch. Icon., pl. 13, figs. 56 a,b.

1883. *Natica raynaudiana* Récluz,, Sowerby, Thes. Conchyl. 5:90, pl. 7, fig. 88.

1909. *Natica arachnoidea* Gmelin, Schepman, Siboga-Exped. 49b(2) : 207.




Figs. 8-12. *Natica stellata* Hedley. 8. Half-row of radula. 9. Internal corneous operculum. 10, 11. Calcareous external opercula. 10. With 2 marginal ribs. 11. With 3 marginal ribs. 12. Single jaw plate.

1956. *Natica raynoldiana* Récluz, Kaicher, Indo-Pacif. sea-shells, pl. 1, fig. 13.

1961. *Notocochlis arachnoidea* Gmelin, Rippingale & McMichael, Queensl. & Gt. Barr. reef shells, p. 92, pl. 11, fig. 15.

1966. *Natica fulgrans* (sic) Récluz, Habe & Kosuge, Shells world col. 2 :35, pl. 12, fig. 7 (non *Natica fulgurans* Récluz, 1844).

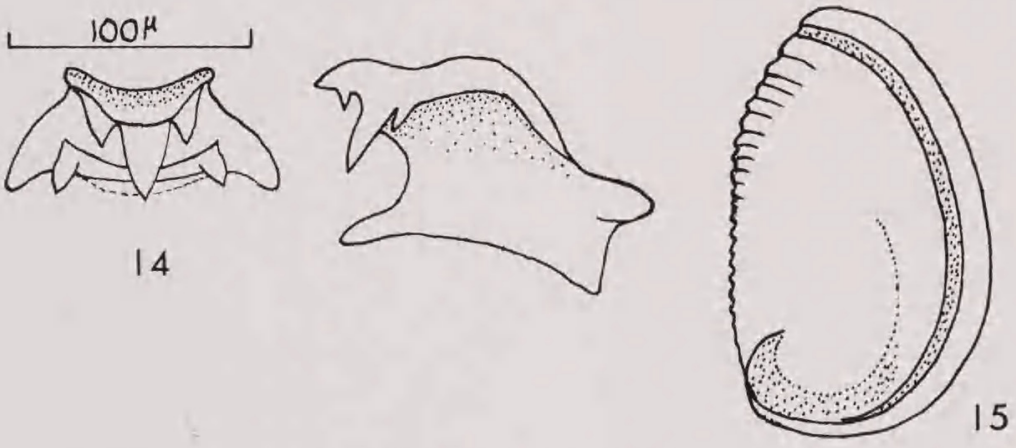
Shell moderately small, 10-25 mm in height, solid, spire low, smooth apart from fine axial growth striae. White, yellow or orange in colour, ornamented with irregular brown streaks, zones or lines, protoconch purplish-brown, umbilical area white. Aperture semiovate, funicle concealed under parietal callus which covers two-thirds to three-quarters of umbilical area; posterior umbilical depression of varying width.

The operculum (Fig. 15) is calcareous, white and unisulcate; periostracum thin, brown and opaque. The rachidian of the radula (Fig. 14) is tricuspid, the 2 basal accessory cusps are mounted on a narrow shield and the lateral is tricuspid; inner marginal bicuspid, outer marginal simple.

TYPE LOCALITY: None.

DISTRIBUTION AND ECOLOGY: The species is moderately common throughout the Fiji Islands. In weedy-sand of the intertidal zone.

*Natica arachnoidea* (Gmelin) and *N.raynoldiana* Récluz, were both based on the Indian Ocean form of the species, which has a cream base colour and a more regular, net-like ornamentation which is often arranged in a band-like formation.




Figs. 14, 15. *Natica arachnoidea* (Gmelin). 14. Rachidian and lateral of radula. 15. Operculum.

**Natica (Natica) fasciata** (Röding), 1798) (Figs. 18-20)

1781. *"Papilla seu Ruma Lupi* Chemnitz", Syst. Conch. Cab. 5 :286, pl. 190, figs. 1940-41 *(non binom.).*

1791. *Nerita melanostoma* var.e Gmelin, Syst. Nat. ed. p. 3674 (ref. Chemnitz, *op cit.*, figs. 1940-41 and Lister, pl. 559, fig. 2).

1798. *Albula fasciata* Röding, Mus. Bolten., p. 21 (ref. Chemnitz, *op. cit.* figs. 1940-41).

1825. *Natica solida* Blainville, Dict. Sci. Na. 34 :251.

1825 *Natica solida* Blainville, Man. Malac. Conch., pl. 36 bis, fig. 8.

1830. *Natica cinnamomea* Menke, Syn. meth. Moll., pp. 47, 169 (ref. Gmelin, *Nerita melanostoma* var.e).

1838. *Natica lupinus* Deshayes in Deshayes & Edwards, Hist. nat. anim. s. vert. 8 :648 (ref. Chemnitz, *op. cit.*, figs. 1940-41 and Lister, pl. 559, fig. 2).

1852. *Natica cinnamomea* Menke, Philippi, Syst. Conch. Cab., 2nd ed. 2 (1) : 27, pl. 3, figs. 22,23.

1855. *Natica solida* Blainville, Reeve, Conch. Icon., pl. 16, figs. 71 a,b.

1883. *Natica solida* Blainville, Sowerby, Thes. Conchyl. 5 :88, pl. 6, fig. 81.

1956. *Natica solida* Blainville, Kaicher, Indo-Pacif. sea-shells, pl. 1. fig. 14.

1966. *Natica solida* Blainville, Habe & Kosuge, Shells world col. 2 :34, pl. 12, fig. 4.

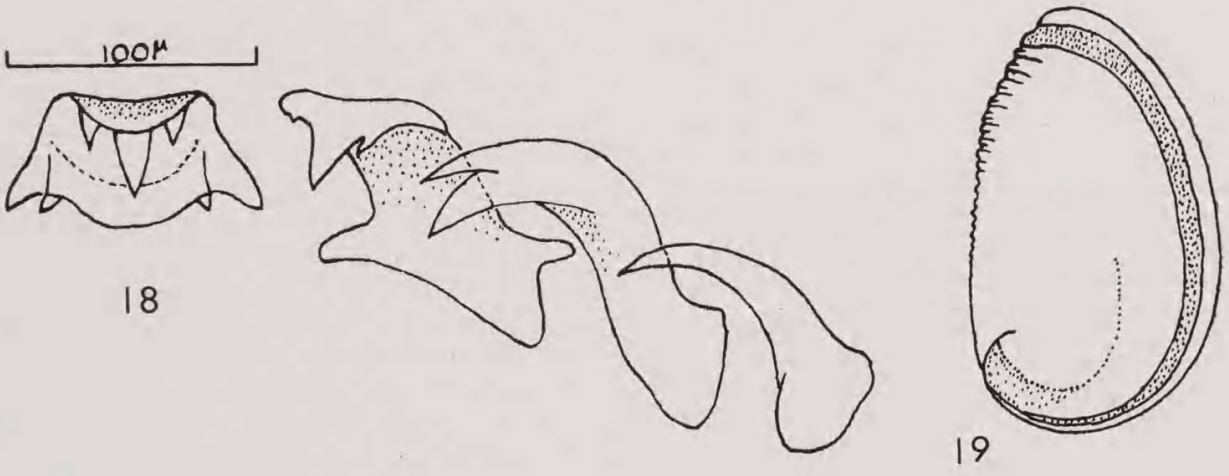
Shell moderately small, 15-25 mm in height, solid, rounded and globose, spire short, sculptured with irregular growth striae. Light or dark brown in colour, ornamented with a lighter coloured band at suture and lower third of body whorl; the nuclear whorls purple in colour. Aperture semi-ovate, parietal callus dark chocolate-brown and shining, covering greater part of umbilicus, with the exception of an anterior umbilical opening. Area adjacent to umbilical groove dark brown. Periostracum light brown, thin and opaque.

The operculum (Fig. 19) is calcareous, white, with a single marginal rib and serrations on the columbellar edge. The radula (Fig. 18) has tricuspid rachidians, 2 accessory basal cusps, tricuspid laterals, bifid inner marginals and simple outer marginals.

TYPE LOCALITY: East Indies (Chemnitz, 1781).

DISTRIBUTION AND ECOLOGY: The species is rare in Fiji and has been recorded only from the north coast of Vitu Levu. In weedy-sand of the intertidal region.

The species has some resemblance to *Tectonatica* but the umbilical opening is larger in *Natica fasciata,* and the actual parietal callus extension leaves a narrow anterior opening.




Figs. 18, 19. *Natica fasciata* (Röding). 18. Half-row of radula. 19. Operculum.

**Natica (Natica) gualtieriana** Récluz, 1844 (Figs. 21-25)

1833. *Natica marochiensis* Gmelin, Quoy & Gaimard, Voy. Astrolabe 2 : 236, pl. 66, fig. 16, 17 (non *Nerita marochiensis* Gmelin, 1791).

1844. *Natica gualteriana* Récluz, Proc. Zool. Soc. Lond., pt. 11 : 208.

1849. *Natica tessellata* Philippi, Zeit. Malakozool. 5 :158 *(nom. subst. pro N. marochiensis* Quoy & Gaimard, 1833).

1852. *Natica tessellata* Philippi. Syst. Conch. Cab., 2nd ed. 2(1) : 48, pl. 7, fig. 7.

1855. *Natica gualteriana* Petit, Reeve, Conch. Icon., pl. 25, figs. 114, a.b.

1883. *Natica gualteriana* Petit, Sowerby, Thes. Conchyl. 5 : 81, pl. 9, fig. 152.

1907. *Natica gualtieriana* Couturier, J. Conchyl. 55: 165 *(nom. correct.).*

1934. *Natica (Natica) marochiensis* (Gmelin), Ladd, Bern. P. Bish. Mus. Bull. 119 : 209; pl. 36, figs. 2,3 (Tertiary of Viti Levu) [non *Nerita marochiensis* Gmelin, 1791].

1956. *Natica marochiensis* Gmelin, Kaicher, Indo-Pacif. sea-shells, pl. 1, fig. 11 (non *Nerita marochiensis* Gmelin, 1791).

1962. *Notocochlis luridus* (Philippi), Habe, Col. Illust. shells Jap. 2 :39, pl. 18, fig. 4 (non *Natica lurida* Philippi, 1836).

Shell moderately small, 8-25 mm in height, solid, spire moderately elevated, sculptured with axial growth striae and radial ribs at the sutures. White in colour, variously maculated with grey or brown, straight or curved streaks, generally arranged in 2-3 spiral zones on body whorl; some specimens dark greyish-brown, with streaks confluent. Aperture semi-ovate, maculated with brown within, funicle prominent, variable in thickness, axially elongate or rounded, extending vertically into umbilicus or winding sideways; umbilicus open or partially covered. Periostracum thin, brown and moderately translucent.

The operculum (Fig. 22-23) is calcareous, white and with a single marginal rib. The rachidian of the radula (Fig. 21) is tricuspid, the 2 basal cusps are mounted on a shield and the lateral has 7 cusps; the inner marginal is bifid and the outer marginal simple.

TYPE LOCALITY: Sual, Province of Pangasinan, Island of Luzon, Philippines.

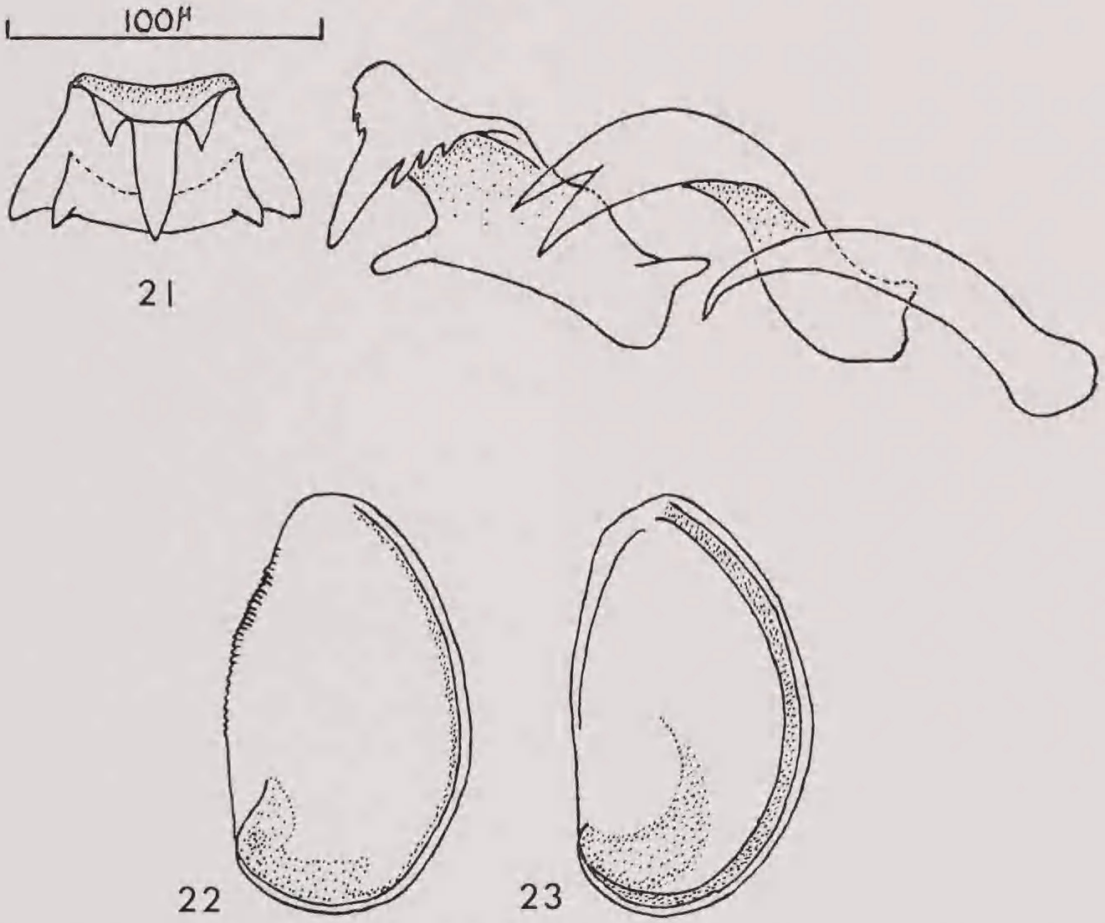
DISTRIBUTION AND ECOLOGY: The species is common throughout the Fiji Islands. In clean and muddy sand, intermixed with weed within the intertidal region; occasionally specimens are dredged from deeper water.

No naticid species has had a more confused taxonomic history than the common Indo-Pacific *Natica gualtieriana.* Chemnitz (1781) described the non-binomial" *Neritae maroccanae",* and supplied 6 figures on plate 188, figs. 1905-10. He recorded the species from the coasts of Africa, in particular Morocco and the Antilles. Gmelin (1791) described *Nerita marochiensis* and based his species on Chemnitz's illustrations and locality indication. Dillwyn (1817) renamed the species *Nerita maroccana,* cited all six of Chemnitz's figures, and gave as locality Africa, the West Indies and the Bay of Naples. Lamarck (1822) reported *Natica marochiensis* from Morocco, Antilles and Guiana. Lamarck's *N.marochiensis,* however, also contained specimens of the Caribbean *N.cayenensis* Récluz *(fide* Mermod, 1953). Quoy & Gaimard (1833) initiated the confusion by reporting *N.marochiensis* from the Central Pacific. Philippi (1836) named a *N.lurida* which he based on figures 1907-8 from Chemnitz, but which according to Pfeiffer (1840) was an error for figures 1909-10. Pfeiffer (loc.cit.) described *N.chemnitzii* from the west coast of Mexico, and cited Chemnitz's figures 1905-6 as illustrations.

Philippi (1852) in his revision of Naticidae, placed his *N.lurida* of 1836 in the synonymy of *"Natica maroccana* Chemnitz", and added the additional locality of Panama. On the next page, however, Philippi reports his variety *lurida* from Havana, Hawaii and the Ryukyu Islands. Reeve (1855) records *N.marochiensis* from North Africa and the West Indies and Sowerby (1883) from Panama, Guiana, the West Indies, Morocco and the Mediterranean.

From the foregoing notes it is evident that 19th century authors were overwhelmingly in favour for the Caribbean-Mediterranean region as the locality for *N.marochiensis*. As far as recent authors are concerned, Ladd (1934), Kaicher (1956) and Keen (1958) applied the name *N.marochiensis* to the Indo-Pacific species, while Hedley (1913), Powell (1927), Nicklés (1947) and Warmke & Abbott (1961) place *N.marochiensis* in the West African-Caribbean region.

It is clear that the usage of *N.marochiensis* by 20th century writers has been misapplied, and the name should be restricted to the species living in the Caribbean-Mediterranean region. For the rather similar West American species the name *N.chemnitzii* Pfeiffer, 1840 is available. *Natica sagittata* Menke is an East Australian species which is not conspecific with *N.gualtieriana* Récluz. MacNeil (1960) considered *N.sagittata* to be an Indonesian species, and confused the Caribbean *N.livida* Pfeiffer with the Indo-Pacific *N.gualtieriana*. *N.gualtieriana* and *N.marochiensis* are rather similar, but appear to be nevertheless separable. *Natica marochiensis* has a more globose shell, the spire whorls are more elevated and the




Figs. 21-23. *Natica gualtieriana* Récluz. 21. Half-row of radula. 22. Operculum without adjacent groove. 23. Operculum with adjacent grove.

nuclear whorls are purple in colour, but always white in *N.gualtieriana.* The columellar edge of the operculum and a narrow zone adjacent to the edge are always scabrous in *N.marochiensis* and *N.chemnitzii,* but smooth in *N.gualtieriana.*

**Natica (Natica) areolata** Récluz, 1844 (Figs. 26, 28-30)

1844. *Natica areolata* Récluz, proc. Zool. Soc Lond., pt. 11 : 206.
1852. *Natica areolata* Récluz, Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 67, pl. 11, fig. 2.
1886. *Natica areolata* Récluz, Tryon Man. Conch. 8 :25, pl. 6. fig. 23.

Shell small, 7-15 mm in height, thin and fragile, moderately globose, spire low. White in colour, ornamented with broad, arrow-shaped or curved, orange-brown axial markings arranged in 3 spiral zones on body whorl and separated by narrow white lines; in some specimens markings confluent, and shell smooth. Apertures semi-ovate, funicle white, prominent and spiralling up umbilicus; umbilicus open in some specimens but filled by funicle in others, leaving a narrow opening posteriorly.

The operculum (Fig. 26) is white, calcareous, and has 1-2 marginal ribs; the columellar edge is either smooth or finely serrated. The periostracum is thin, light brown in colour and moderately opaque.

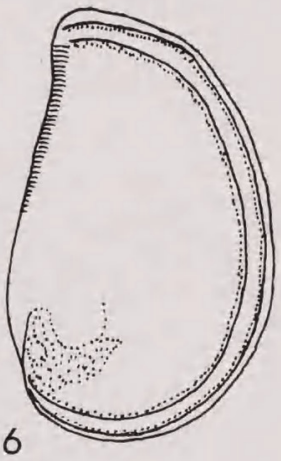



Fig. 26. *Natica areolata* Récluz. Operculum.

TYPE LOCALITY: Island of Capul, Philippines and Amboina.

DISTRIBUTION AND ECOLOGY: The species is moderately uncommon in the North and south of Viti Levu. In weedy coral-sand on offshore islands.

The species is rather similar to the East Australian *Natica sagittata* Menke, but in that species the ornamentation consists of close-set, curved or arrow-shaped lines and not broad zones.

**Natica (Natica) pseustes** Watson, 1881 (Fig. 27)

1881. *Natica pseustes* Watson, J. Linn. Soc. Lond. Zool. 15(85) : 255.
1886. *Natica pseustes* Watson, Rept. Voy. H.M.S. Challenger Zool. 15 :444, pl. 27, figs. 3 a,b,c.

Shell small, rounded, thin, glossy and porcellaneous transparent-white, dead white round umbilicus and also below suture; this white band flecked with irregular, sharply defined ruddy chestnut spots, a stain of this colour suffusing whole umbilicus and pillar. Remainder of shell covered with a delicate network of fine, sharply defined light chestnut lines; amidst this network two or three spiral zones with the brown lines sparser and with pale lanceolate spots. Sculptured with delicate hair-like lines of growth, strongest and most crowded near suture and round umbilicus; a very faint appearance of rounded threads and furrows, one of which below suture a little stronger than the rest, and surface densely, delicately, sharply, microscopically scratched. Mouth very oblique, semicircular, but pointed above and rounded below, with a slight angulation at front of pillar. Spire scarcely raised, but just perceptibly conical, apex large, sutures almost horizontal and very slight. Umbilicus consisting only of the channel or gutter, which twists round the pillar callus and disappears behind it. (Condensed original description). Height 0.327 in.(= 8.31 mm).

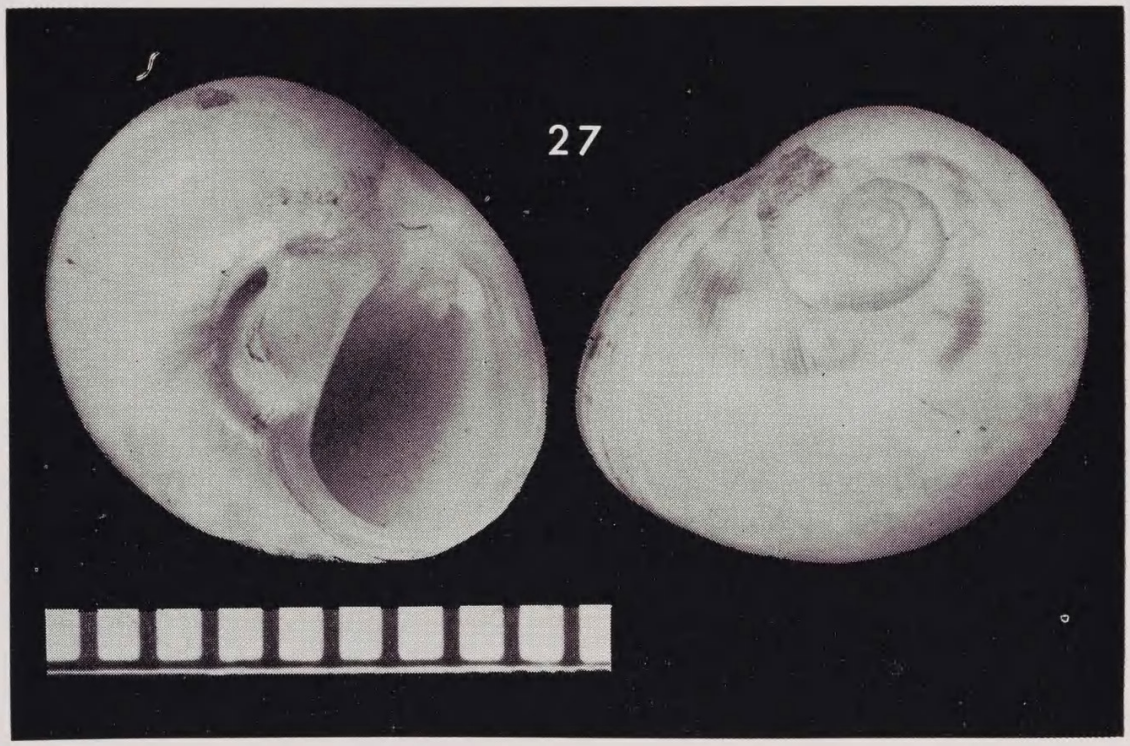



Fig. 27. *Natica pseustes* Watson. Levuka, Fiji Islands. Holotype B.M.N.H. No. 1887.2.9.1361; height 8.3mm.
(Photograph courtesy of Dr J. D. Taylor, British Museum (Nat. Hist.), London)

TYPE LOCALITY: Levuka, Fiji Islands. Shallow water.

No recent specimens answering to Watson's description have been recorded from the Fiji Islands. Watson (1881) considered *Natica pseustes* to be identical with specimens of a species dredged by McAndrew at the Gulf of Suez. A photograph of the holotype of *N.pseustes* (Fig. 27) was recently received. Watson's *N.pseustes* appears to be a small specimen of *N.arachnoidea* (Gmelin).

## Subgenus **Naticarius** Duméril, 1806

*Naticarius* Duméril, 1806, Zool.Analyt., p.164. Type species by SM (Froriep, 1806) *Nerita canrena* Linnaeus, 1758. Recent, West Indies.

1810. *Naticus* Montfort, Conch. Syst. 2:219. Type species by OD *Naticus canrenus* Linné = *Nerita canrena* Linnaeus, 1758.

1962. *Naricarius* Duméril, Macpherson & Gabriel, Mar. Moll. Victoria, p. 138 *(nom. null.)*.

Shell moderately small to large, solid, rounded and inflated, smooth or axially wrinkled at sutures; aperture semi-ovate, smooth within, umbilicus deep, parietal callus distinct and slightly overlapping funicle, funicle broad, penetrating umbilicus without completely filling it.

The operculum is calcareous and multisulcate. The radula is basically the same as in *Natica* s.str.

Iredale (1916) considered Duméril's names to be substitute names for genus-groups established by earlier authors. In the case of *Naticarius* Duméril, there is no evidence in the text that *Naticarius* has been proposed as a replacement name for either *Natica* Scopoli or *Natica* Lamarck, and the citation lacks any reference to previous authors. The genera *Phyllidia, Scyllaea, Aplysia, Valvearius, Purpurarius, Salpa* and *Thalia* have been credited by Duméril (1806) to prior authors, and as such are considered "unjustified emendations" wherever applicable. *Naticarius* Duméril is considered to be a new genus-group without included nominal species, and Froriep's (1806) inclusion of *Nerita canrena* as a single example for *Naticarius* is considered to be a type designation by subsequent monotypy.

**Natica (Naticarius) alapapilionis** (Röding, 1798) (Fig. 32)

1781. *"Ala papilionis* Chemnitz", Syst. Conch. Cab. 5:257, pl. 186, figs. 1868-71 *(non binom.)*.

1798. *Cochlis alapapilionis* Röding, Mus. Bolten, p. 146 (ref. Chemnitz, *op. cit.*, figs. 1868-71).

1816. *Natica zonaria* Lamarck, Tabl. Encycl. Méth., p. 11, pl. 453, figs. 2 a,b.

1828. *Natica taeniata* Menke, Synop. meth. Moll., p. 26 (ref. Chemnitz, *op. cit.* figs. 1868-71).

1852. *Natica articulata* Philippi, Syst. Conch. Cab., 2nd ed. 2(1): 119, pl. 17. figs. 4,8.

1853. *Natica crenata* Récluz, J. Conchyl. 4(3): 32, pl. 7, figs. 4, 5 (Philippines).

1956. *Natica alapapilionis* Röding, Kaicher, Indo-Pacif. sea-shells, pl. 1, fig. 15.

1966. *Notocochlis alapapilionis* (Röding), Habe & Kosuge, Shells world col. 2:35, pl. 12. fig. 11.

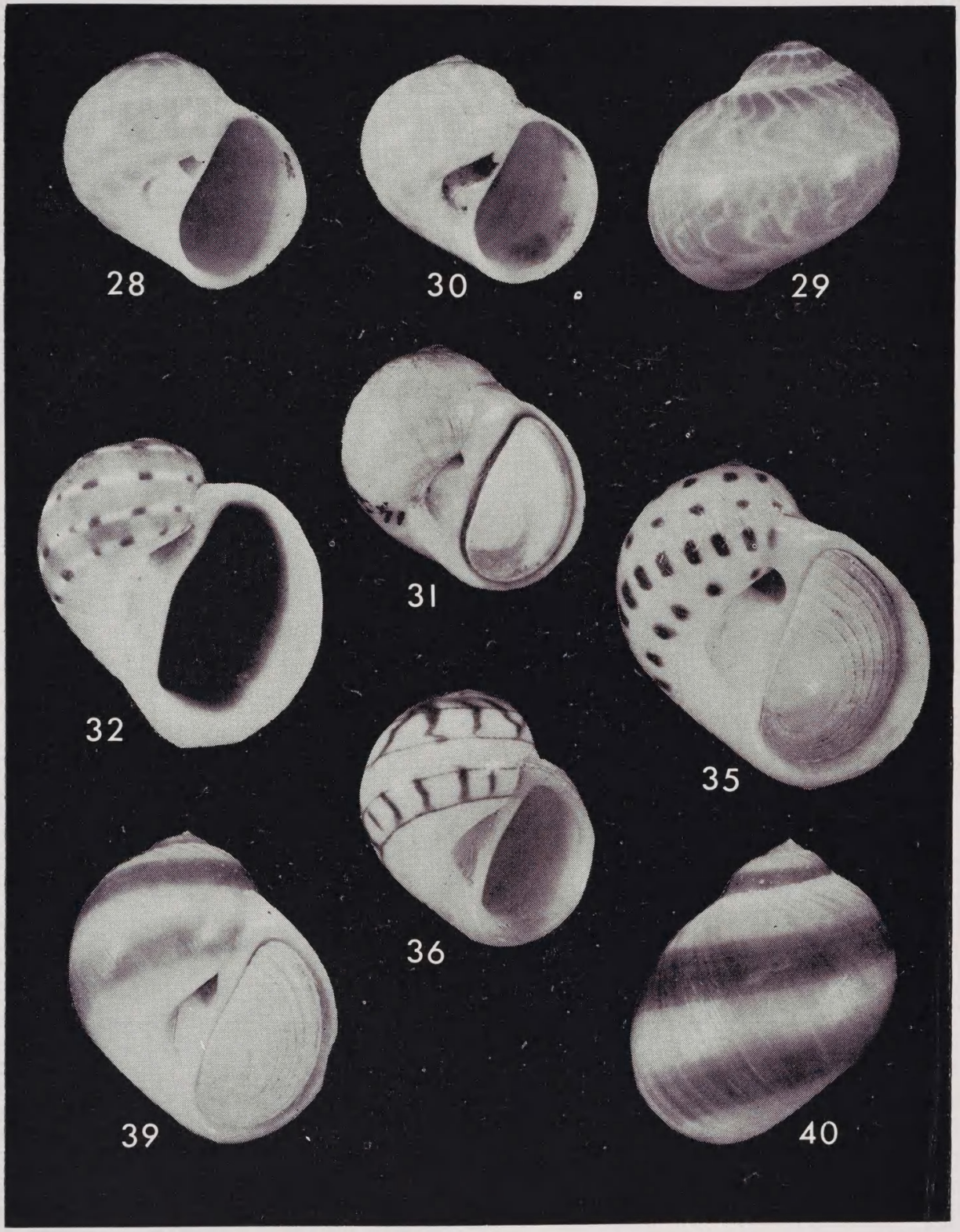
1967. *Naticarius alapapilionis* (Röding), Habe & Kosuge, Stand. book Jap. shells col. 3:47, pl. 18, fig. 18.

Shell moderate in size, 15-30 mm in height, light in weight, spire short, smooth apart from radial ribs at sutures. Light brown, tan or purplish-brown in colour, ornamented with 4 narrow, linear zones of alternating, horizontally oriented dark brown and white spots; umbilical area white, spire whorls violet. Aperture wide, semi-ovate, purplish within, edge of labial lip white. Umbilicus open and extending anteriorly, parietal callus confined to juncture of aperture with body whorl, funicle slender, entering umbilicus at an oblique angle.

The operculum is calcareous, white and multisulcate.

TYPE LOCALITY: Indian Ocean and Philippines (Deshayes & Edwards, 1838).

DISTRIBUTION AND ECOLOGY: The species is moderately rare in Fiji, and has been recorded from offshore islands east of Viti Levu. In intertidal weedy sand pools.




Figs. 28-32, 35, 36, 39, 40. 28-30. *Natica areolata* (Rēcluz). Caboni Beach, Fiji I. 28-29. Height 14.4mm. 30. Height 14.2mm. 31. *Cochlis migratoria* Powell, 1927. Parengarenga Harbour, New Zealand, intertidal. Holotype Powell coll., AIM No. TP-1465; height 15.0mm. Type species of *Notocochlis* Powell, 1933. 32. *Natica (Naticarius) alapapilionis* (Röding). Leleuvia I., Fiji I.; height 21.7mm. 35. *N. (N.) onca* (Röding). Caboni beach, Fiji I.; height 23.7mm. 36. *N. (N.) lineozona* Jousseaume, 1874. Lomalagi, Fiji I.; height 9.4mm. 39, 40. *N. (N.) zonalis* Rēcluz. Manava I., Fiji I.; height 18.6mm.

**Natica (Naticarius) onca** (Röding, 1798) (Figs. 33-35)

1781. *"Pavimentum chinense* Chemnitz", Syst. Conch. Cab. 5:264, pl. 187, figs. 1887-91 *(non binom.).*

1798. *Cochlis onca* Röding, Mus. Bolten. p. 147, (ref. Chemnitz, *op. cit.* figs. 1887-88).

1798. *Cochlis pavimentum* Röding, Mus. Bolten. p. 147 (ref. Chemnitz, *op cit.*, figs. 1889-90).

1806. *Natica litterata* Link, Beschr. Nat.-Samml. Univ. Rostock, p. 140 (ref. Chemnitz, *op cit.*, figs. 1881-91 = error for figs. 1887-91).

1816. *Natica chinensis* Lamarck. Tabl. Encycl. Méth., p. 10, pl. 453, figs. 3 a,b.

1825. *Nerita candida* Wood, Ind. Testac., p. 169, pl. 35, fig. 2a.

1855. *Natica chinensis* Lamarck, Reeve, Conch. Icon., pl. 19. figs. 82 a,b.

1883. *Natica chinensis* Lamarck, Sowerby, Thes. Conchyl. 5:83, pl. 1, fig. 9.

1953. *Natica chinensis* Lamarck, Mermod, Rev. suisse Zool. 60(2) : 199, fig. 198 (figd. type).

1956. *Natica onca* Röding, Kaicher, Indo-Pacif. sea-shells, pl. 2, fig. 4.

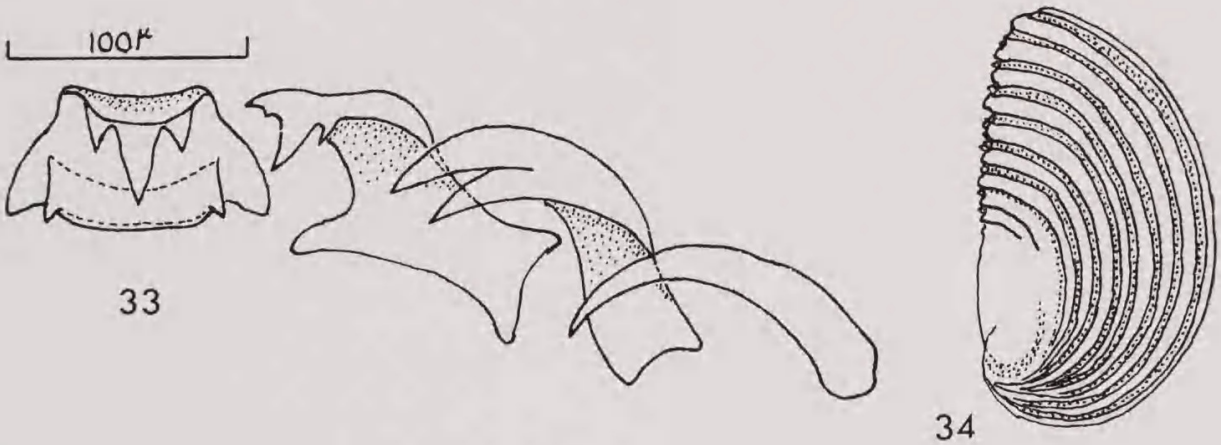
1966. *Naticarius onca* (Röding), Habe & Kosuge, Stand. book Jap. shells col. 3 : 46, pl. 18, fig. 10.

Shell moderate in size, 10-25 mm in height, solid, spire low, sculptured with fine, close-set growth striae, sutures with prominent or obsolete radial ribs. White or cream in colour, ornamented with 5 spiral rows of evenly spaced, dark brown quadrate spots on the body whorl; nuclear whorls white. Aperture semi-ovate, white within, parietal callus prominent at juncture of aperture, umbilicus open posteriorly, funicle broad and prominent, entering umbilicus at an oblique angle, umbilical groove prominent. Periostracum light brown, thin and semi-translucent.

The operculum (Fig. 34) is calcareous, white, and multisulcate (with 7-8 ribs). The radula (Fig. 33) of *Naticarius* is basically the same as in *Natica* s.str.: the rachidians are tricuspid with 2 basal cusps at the base, and the lateral is tricuspid; the inner marginal is bifid, and outer marginal simple.

TYPE LOCALITY: Moluccas (Chemnitz, 1781).

DISTRIBUTION AND ECOLOGY: The species is moderately common throughout the Fiji Islands. In weedy, clean or muddy sand of the intertidal region.




Figs. 33, 34. *Natica (Naticarius) onca* (Röding). 33. Half-row of radula. 34. Operculum.

**Natica (Naticarius) lineozona** Jousseaume, 1874 (Fig. 36)

1874. *Natica lineozona* Jousseaume, Rev. Mag. Zool. (3) 2:22. pl. 11, figs. 3,4 (January 1874).

1874. *Natica gaidei* Souverbie in Souverbie & Montrouzier, J. Conchyl. 22:196, pl. 7, fig. 7 (April 1874).

1875. *Natica gaidei* Souverbie, J. Conchyl. 23:292, pl. 13, fig. 8 (operculum).

1883. *Natica notata* Sowerby, Thes. Conchyl. 5:83, pl. 9, fig. 168.

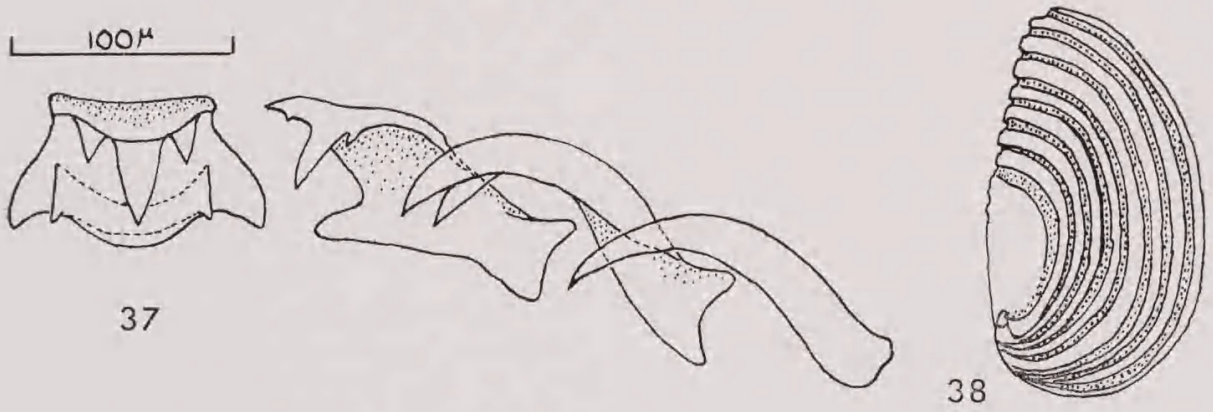
1967. *Natica lineozona* Jousseaume, Orr-Maes, Proc. Acad. Nat. Sci. Phild. 119(4): 120. pl. 9, fig. B (Cocos-Keeling I.).

Shell small, 5-10 mm in height, moderately solid, spire short, smooth. White in colour, ornamented with 4 dark brown spiral lines and irregular, straight or curved axial streaks; the axial markings confined within anterior zone, but extending over posterior zone a short distance towards suture. Aperture semi-ovate, parietal callus narrow and moderately thin, only partially overlapping the umbilicus; funicle indistinct, partly merged with umbilical wall, umbilicus open. Periostracum light brown, thin and opaque.

The operculum is calcareous, white and multisulcate *(fide* Souverbie, 1875).

TYPE LOCALITY: Lifu, Loyalty Islands (Souverbie in Souverbie & Montrouzier, 1874).

DISTRIBUTION AND ECOLOGY: The species is rare in the Fiji Islands and has been recorded from the South coast of Viti Levu. In coral sand of reef tide-pools.




Figs. 37, 38. *Natica (Naticarius) zonalis* Récluz. 37. Half-row of radula. 38. Operculum.

**Natica (Naticarius) zonalis** Récluz, 1850 (Figs. 37-40)

1850. *Natica zonalis* Récluz, J. Conchyl. 1(4): 386, pl. 14, fig. 9 (shell) fig. 10 (operculum).

1886. *Natica zonalis* Récluz, Tryon, Man. Conch. 8:29, pl. 8, fig. 61.

1961. *Naticarius gualtierianus* Rippingale & McMichael, Queensl. & Gt. Barr. reef shells, p. 91, pl. 11, fig. 13. (non *Natica gualteriana* Récluz 1844).

Shell moderately small, 10-20 mm in height, ovate and sub-globular, solid, spire short, nuclear whorls elevated; sculptured with fine growth striae which form prominent

radial riblets at sutures. White or light brown in colour, ornamented with 2 moderately broad, dark brown bands on body whorl, and a single band of same colour at suture of penultimate whorl; in some specimens the 2 bands become confluent. Aperture semi-ovate parietal callus narrow, funicle moderate in size, entering umbilicus at an oblique angle; umbilicus open posteriorly. Periostracum light brown, thin and opaque.

The operculum (Fig. 38) is calcareous, white and multi-sulcate (7-9 ribs). The rachidians of the radula (Fig. 37) are tricuspid, two additional basal cusps are mounted on a shield and the lateral is tricuspid; inner marginal is bifid, outer marginal simple.

TYPE LOCALITY: Fiji Islands.

DISTRIBUTION AND ECOLOGY: The species is moderately uncommon in Fiji, and occurs in widely scattered localities throughout the group. In clean coral sand, interspersed with weed, in the intertidal zone.

Rippingale & McMichael's *Naticarius gaultierianus* from Queensland appears to be *Natica zonalis;* the figured operculum is multisulcate, whereas *Natica gualtieriana* has a unisulcate operculum. *Natica philippinensis* Watson, 1881, is probably a small specimen of *N.zonalis.*

## Subgenus **Tectonatica** Sacco, 1890

*Tectonatica Sacco,* 1890, Boll. Mus. Zool. Anat. Univ. Torino 5(86) : 33. Type species by M *Natica tectula* Bors. = *N.tectula* Sacco, 1890. Mio-Pliocene of Italy.

1892. *?Cryptonatica* Dall, Trans. Wag. Free Inst. Sci. 3 :362. Type species by SD (Dall, 1909) *Natica clausa* Broderip & Sowerby, 1829. Arctic to N.W. Pacific.

Shell small to medium sized, moderately solid, rounded and smooth; aperture semi-ovate, umbilicus almost completely filled with callus, callus bordered by a groove.

According to Wenz (1941), the operculum is calcareous and smooth (and presumably unisulcate ?).

The authorship of *Natica tectula* is generally credited to Bonelli, without a date, and Glibert gives 1826 as the year of authorship. Bonelli's name *N.tectula* appeared in a manuscript catalogue of shells in the Turin Museum, entry No. 3480 *(fide* Sorgenfrei, 1958), and is an unavailable name. The authorship is here credited to Sacco, but a prior validation may be in existence.

### **Natica (Tectonatica) bougei** Sowerby, 1908 (Figs. 41-43)

1908. *Natica bougei* Sowerby, Proc. Malac. Soc. Lond. 8 (1): 17, pl. 1, fig. 3.

Shell small, 4-9 mm in height, pyriformly-ovate, spire short; sculptured with fine axial growth striae which form obsolete radial riblets at sutures. White in colour, ornamented with irregular, wavy or zigzag, blackish-brown axial lines on body whorl; in some specimens the lines coalesce and form small blotches. Aperture semi-ovate, parietal callus moderately broad, completely filling umbilicus; parietal callus slightly concave anteriorly, a narrow umbilical marginal groove bordering the callus.

The operculum (Fig. 41) is calcareous, white, unisulcate, and the columellar edge lacks serrations.

TYPE LOCALITY: New Caledonia.

DISTRIBUTION AND ECOLOGY: The species is moderately rare in Fiji, and has been recorded from the North and South coasts of Viti Levu. In clean coral sand of offshore islands.

The species conforms to the diagnosis of *Tectonatica,* and the somewhat oblique elongation of the type species is also evident in *Natica bougei.*

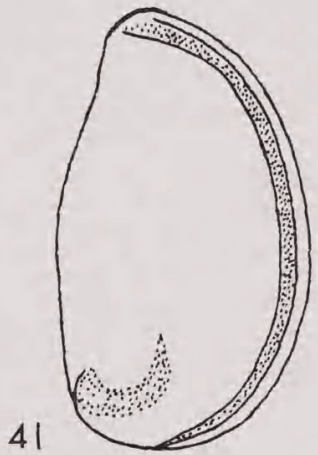



Fig. 41. *Natica (Tectonatica) bougei* Sowerby. Operculum.

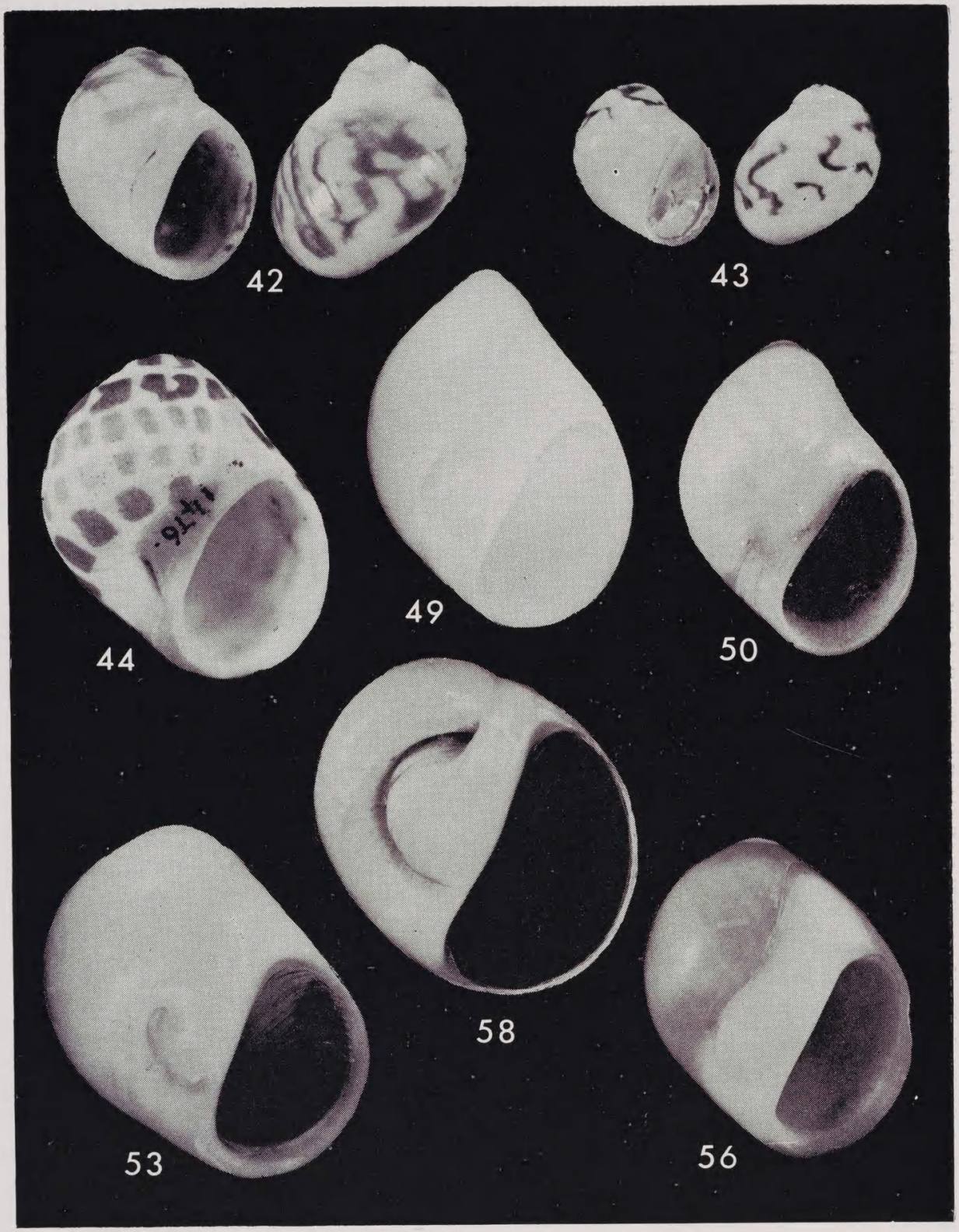
**Natica (Tectonatica) violacea** Sowerby, 1825 (Fig. 44)

1825. *Natica violacea* Sowerby, Cat. shells Tankerv., App. p. 11.
1828. *Nerita glabra* Wood, Suppl. Ind. Testac., p. 26, pl. 8, fig. 14.
1842. *Natica rhodostoma* Philippi, Abb. Beschr. Conchyl. 1(1) : 16, pl. 1, fig. 7.
1852. *Natica violacea* Sowerby, Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 66, pl. 10, fig. 13.
1855. *Natica violacea* Sowerby, Reeve, Conch. Icon., pl. 15, figs. 65 a,b.
1883. *Natica violacea Sowerby,* Sowerby, Thes. Conchyl. 5 :89, pl. 1, fig. 11.
1966. *Natica violacea* Sowerby, Habe & Kosuge, Shells world col. 2 :34, pl. 12, fig. 2.

Shell moderately small, 15-20 mm in height, solid, pyriformly-ovate and subglobular, spire short; sculptured with fine axial growth striae, sutures grooved. White in colour, ornamented with 5 spiral rows of irregular, sometimes rhomboidal spots or wavy lines on body whorl and 1 row of spots on penultimate whorl; parietal callus and base of shell rosy-violet in colour. Aperture semi-ovate, parietal callus completely covering umbilicus apart from a narrow umbilical marginal groove.

TYPE LOCALITY: East Indies.

DISTRIBUTION: The species is apparently rare in the Fiji Islands, and only one dead specimen has so far been collected. This specimen is unsuitable for a photograph and a specimen from Tautira, Tahiti (Powell coll.), has been illustrated instead.




Figs. 42-44, 49, 50, 53, 56, 58. 42, 43. *Natica (Tectonatica) bougei* Sowerby. Nananu-i-Ra I., Fiji I.; height 8.5mm and 5.8mm respectively. 44. *N. (T.) violacea* Sowerby. Tautira, Tahiti (Powell coll.); height 20.0mm. 49, 50. *Polinices tumidus* (Swainson). Manava I., Fiji I.; height 45.5mm and 24.0mm respectively. 53. *P. flemingiana* (Récluz). Manava I., Fiji I.; height 45.4mm. 56. *P. aurantius* (Röding). Manava I., Fiji I.; height 25.5mm. 58. *Polinices (Neverita) albumen* (Linnaeus). Manava I., Fiji I.; height 35.4mm.

## Subfamily POLINICINAE Gray, 1847 (ex-Polinicina)

(= Mammillinae Iredale & McMichael, 1962, Mem. Aust. Mus. 11: 57.)

### Genus **Polinices** Montfort, 1810

*Polinices* Montfort, 1810, Conch.Syst. 2:223. Type species by OD *Polinices albus* Montfort, 1810 = *Nerita mamilla* Linnaeus, 1758. Recent, Caribbean.

1798. *Albula* Röding, Mus. Bolten., p. 20. Type species by SD (Winkworth, 1945) *Albula mammilla* Röding, 1798 = *Mamillaria tumida* Swainson, 1840. Recent, Indo-Pacific. (Non *Albula* Osbeck, 1762; nec. Scopoli, 1777).

1830. *Polynices* Menke, Syn. meth. Moll., ed. 2, p. 47 and auctt. *(nom. null).*

1834. *Naticina* Guilding, Trans. Linn. Soc. Lond. 17 :30. Type species by OD *N.lactea* Guilding, 1834.

1840. *Naticella* "Guilding", Swainson, Treat. Malac., p.345. Type species by M. *N.aurantia* Martini = *Albula aurantium* Röding, 1798.

1852. *Mamma* "Klein", Mörch, Cat. Conchyl. Com. Yoldi, fasc. 1 :133 (publ. in synonymy of *Polinices* Montfort).

1852. *Pollinices* Mörch, Cat. Conchyl. Com. Yoldi, fasc. 1: 132 *(nom. null).*

1882. *Uber* "Humphrey', Dunker, Ind. Moll. Mar. Japon., p. 62. Type species by SD (Hedley,1924) *Nerita mamilla* Linnaeus,1758.

Shell moderate in size, inflated, solid, porcellaneous and smooth apart from irregular growth striae; sutures indistinct and adpressed, aperture semi-ovate, smooth within, umbilicus broad and deep, partly or completely covered by the umbilical callus, parietal callus prominent, funicle coalesced with umbilical callus.

The operculum is corneous. The radula is basically similar to the radula of *Natica.*

Some authors have equalled *Polinices albus* Montfort to *Nerita mamilla* Linnaeus, but Woodring (1957) places *Polinices albus* in the synonymy of the Caribbean *Natica brunnea* Link, 1807 (= *Albula hepatica* Röding, 1798). The species *Polinices hepaticus* (Röding) is a tan or orange-brown species, but *P.albus* is a pure white species resembling the Caribbean *P.lacteus* (Guilding). Montfort's references for his *P.albus* are to the white Linnaean *Nerita mamilla,* Columna's and Lister's *"Cochlea nivea",* Rumphius' *"Valvata albula"* and d'Argenville's *"Ubertenue albidum"* and *"Mammelon blanc". Polinices albus* is most probably synonymous with *Nerita mamilla* Linnaeus, a dubious taxon which may be an earlier name for *Polinices lacteus* (Guilding) from the West Indies. For further discussions see under *P.tumidus* (Swainson).

Winkworth (1945) listed *Albula mamilla* Röding, as the type species of *Albula* by tautonymy. Röding (1798) did not cite a specific name *"albula"* either as a valid name or synonym, and Winkworth's nomination of *Albula mammilla* Röding is a type selection by subsequent designation.

**Polinices (Polinices) tumidus** (Swainson, 1840) (Figs. 45, 47-50)

1781. *"Mamma albula* Chemnitz", Syst. Conch. Cab. 5 :280, pl. 189, figs. 1928-31 *(non binom.).*

1798. *Albula mammilla* Röding, Mus. Bolten., p. 20 (ref. Chemnitz, *op.cit.,* figs. 1928-31) [non *Nerita mamilla Linnaeus,* 1758].

1840. *Mamillaria tumida* Swainson, Treat. Malac., p. 345 (ref. Chemnitz, *op. cit.,* figs. 1928-31).

1844. *Natica pyriformis* Récluz, Proc. Zool. Soc. Lond., pt. 11 :211.

1851. *Natica albula* Récluz, J. Conchyl. 2(2) : 194 (ref. Rumphius, pl. 22, fig. F).

1852. *Natica ponderosa* Philippi, Syst. Conch. Cab. 2nd ed. 2(1) : 32, pl. 4, figs. 9,10.

1852. *Natica cygnea* Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 80, pl. 12, fig. 6.

1855. *Natica pyriformis* Récluz, Reeve, Conch. Icon., pl. 5, fig. 16.

1855. *Natica mamilla* Linnaeus, Reeve, Conch. Icon., pl. 7, fig. 27 (Non *Nerita mamilla* Linnaeus, 1758).

1883. *Natica mamilla* Linnaeus, Sowerby, Thes. Conchyl. 5 : 85, pl. 3, figs. 28-30 (non *Nerita mamilla* Linnaeus, 1758).

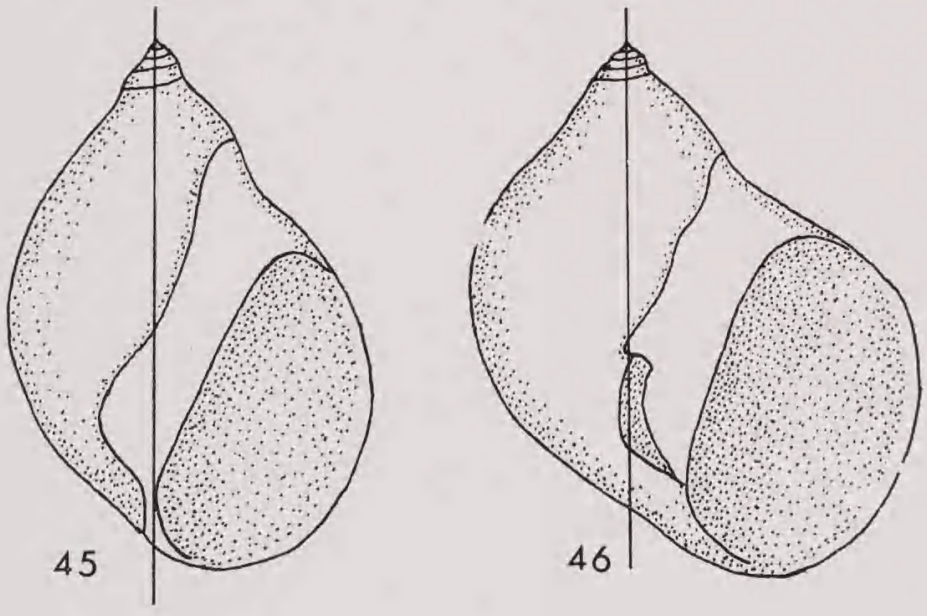
1934. *Polinices (Polinices) mamilla* (Linnaeus), Ladd, Bern. P. Bish. Mus. Bull. 119 : 210, pl. 36, figs. 4, 5 (non *Nerita mamilla* Linnaeus, 1758).

1967. *Polynices pyriformis* (Récluz), Habe & Kosuge, Stand. book Jap. shells col. 3 :45, pl. 18, fig. 7.

Shell small to large, 13-50 mm in height, pyriformly-ovate, spire axis bisecting anterior end of columella (Fig. 45). Porcellaneous-white in colour, occasionally with dark striae or ill-defined spots at sutures; immature specimens banded with a light bluish-grey zone on body whorl and at sutures. Spire short, protoconch minute, aperture wide and semi-ovate. Umbilicus completely covered by a heavy callus in adult specimens, a small anterior umbilical groove present in juveniles.

The operculum (Fig. 48) is corneous, light brown in colour, with a dark brown zone adjoining the columellar edge. The radula (Fig. 47) has tricuspid rachidians which have 2 additional basal cusps, and tricuspid laterals; the inner marginals are bifid, outer marginals simple. The jaws are similar to those of *P.aurantius* (Röding).

TYPE LOCALITY: East Indies and Tranquebar (Chemnitz, 1781).

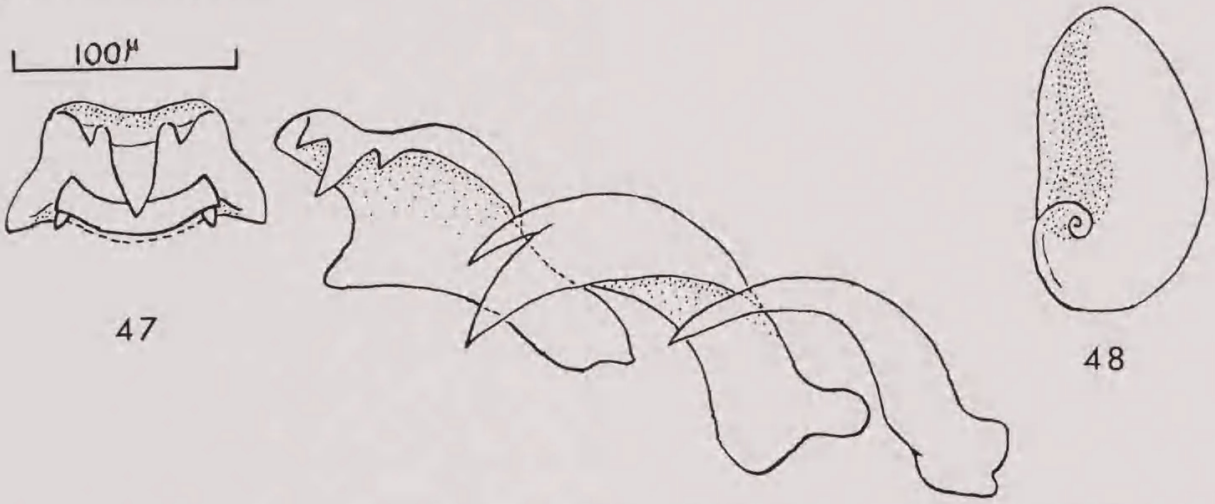



Figs. 45, 46. 45. *Polinices tumidus* (Swainson). 46. *P. flemingiana* (Récluz). Showing orientation of siphonal fasciole in relation to longitudinal axis.

DISTRIBUTION AND ECOLOGY: The species is common throughout the Fiji Islands. In moist sand, on sand-bars and beaches, at high tide level. Fossil record: Walu Bay, Suva, Miocene of Viti Levu (Ladd, 1934).

Ladd (1934), Tinker (1952) and Kaicher (1956) associate the Linnaean *Nerita mamilla* with the common, large and white Indo-Pacific species. Hedley (1924), Rippingale & McMichael (1961), Powell (1965) and Habe & Kosuge (1967), however, consider *Natica pyriformis* to be the appropriate name for the species, *Nerita mamilla* Linnaeus, is in the writer's opinion undefined, and not applicable to the Indo-Pacific species. Linnaeus' cited figures most probably represent the Caribbean *P.lacteus* (Guilding), the Indo-Pacific species *P.tumidus* (Swainson) and *Natica fasciata* (Röding). Linnaeus' original type locality was "Barbados", and this indication would exclude the Indo-Pacific species from consideration; the locality "Alexandriae" was added in 1767, but the species was not any better elucidated. Taxonomic stability would be best served by discarding *Nerita mamilla* as a *nomen dubium.*

Swainson's *Mamillaria tumida* is the earliest name applicable to this species. Swainson's (1840) references to Chemnitz's (1781) figures represent an unequivoval representation of the Indo-Pacific *"Polinices mamilla* auctt." and *Natica pyriformis* Récluz.




Figs. 47, 48. *Polinices tumidus* (Swainson). 47. Half-row radula. 48. Operculum.

**Polinices (Polinices) flemingiana** (Récluz, 1844) (Figs. 46, 51-53)

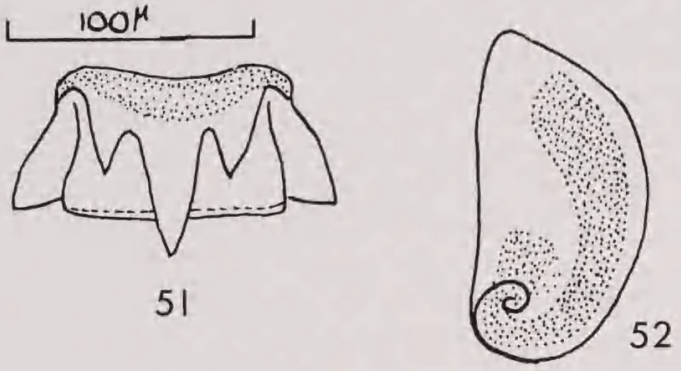
1844. *Natica flemingiana* Récluz, Proc. Zool. Soc. Lond., pt. 11 : 209.
1852. *Natica flemingiana* Récluz, J. Conchyl. 3(2) : 171, pl. 7, figs. 2,3.
1852. *Natica virginea* Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 81, pl. 12, fig. 7.
1855. *Natica flemingiana* Récluz, Reeve, Conch. Icon., pl. 18, figs. 80 a,b.
1855. *Natica jukesii* Reeve, Conch. Icon., pl. 19, sp. 84.
1883. *Natica flemingiana* Récluz, Sowerby, Thes. Conchyl. 5 :86, pl. 7, fig. 99.
1924. *Uber flemingianum* Récluz, Hedley, Rec. Aust. Mus. 14(3) : 156.
1956. *Polinices flemingiana* Récluz, Kaicher, Indo-Pacif. sea shells. pl. 1, fig. 5.

Shell similar in size and colour to *P.tumidus* (Swainson) but differs in the following features: aperture elongated obliquely and vertical axis of the shells offset well to left of siphonal fasciole (Fig. 46). A deep anterior umbilical groove present in all adult specimens.

The operculum (Fig. 52) is corneous, light brown in colour, and *in situ* the dark brown zone extends from the nucleus along the labial wall of the operculum. The radula (Fig. 51) is similar to *P.tumidus,* except that the main cusp of the rachidian is longer and the basal shield is higher; the lateral and marginals are basically the same as in *P.tumidus.*

TYPE LOCALITY: Sorsogon, Island of Luzon, Philippines.

DISTRIBUTION AND ECOLOGY: The species is moderately common throughout the Fiji Islands, but is less frequently encountered than *P.tumidus,* although it shares that species habitat.




Figs. 51, 52. *Polinices flemingiana* (Récluz). 51. Rachidian of radula. 52. Operculum.

**Polinices (Polinices) aurantius** (Röding, 1798) (Figs. 54-56)

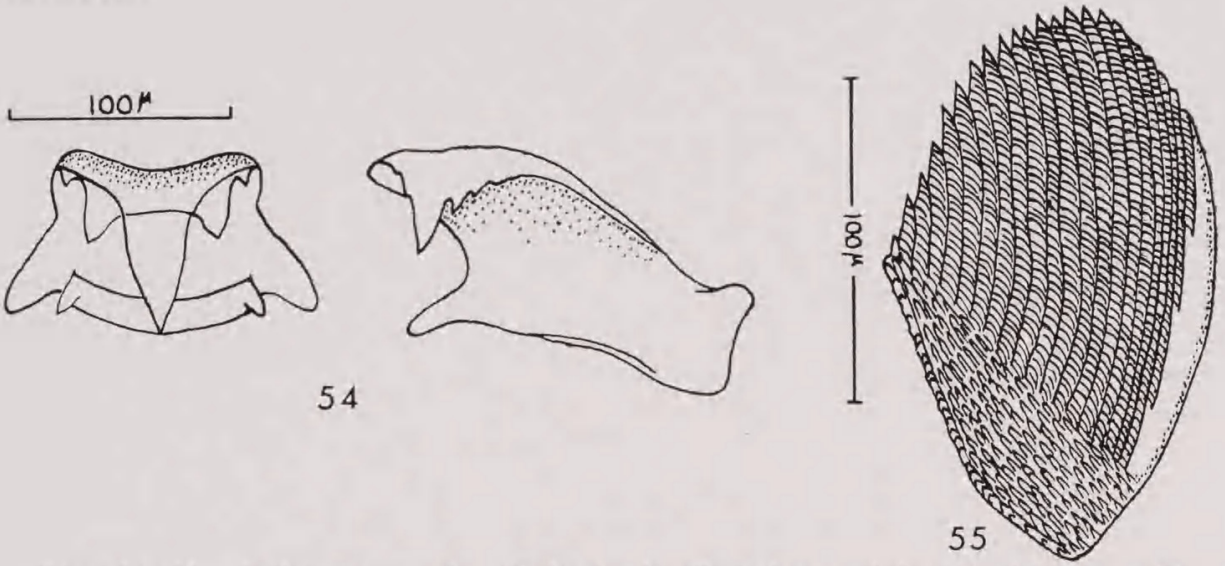
1781. *"Mamma Veneris citrina Chemnitz",* Syst. Conch. Cab. 5 : 283, pl. 189, figs. 1934-35 *(non binom.).*
1798. *Albula aurantium* Röding, Mus. Bolten., p. 20 (ref. Chemnitz, *op. cit.,* figs. 1934-35).
1822. *Natica aurantia* Lamarck, Hist. nat. Anim. s. vert. 6 : 198.
1844. *Natica straminea* Récluz, Proc. Zool. Soc. Lond., pt. 11 :211 (publ. in synonymy of *N.aurantia* Lamarck).
1844. *Natica sulphurea* Récluz, Proc. Zool. Soc. Lond., pt. 11 :211 (publ. in synonymy of *N.aurantia* Lamarck).
1852. *Natica straminea* Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 113, pl. 16, fig. 3.
1855. *Natica aurantia* Lamarck, Reeve, Conch. Icon., pl. 6, sp. 20 & pl. 9, fig. 32.
1883. *Natica aurantia* Lamarck, Sowerby, Thes. Conchyl. 5 : 85, pl. 2, figs. 15, 16.
1924. *Uber mellosum* Hedley, Rec. Aust. Mus. 14(3) : 158, pl. 22, fig. 5.
1953. *Natica aurantia* Lamarck, Mermod, Rev. suisse Zool. 60 (2) : 178, fig. 182.
1956. *Polinices aurantia* Lamarck, Kaicher, Indo-Pacif. sea-shells, pl. 1, fig. 12.
1966. *Polinices aurantius* (Röding), Habe & Kosuge, Shells world. col. 2 : 35, pl. 12, fig. 10.

Shell similar in general appearance to *P.tumidus* (Swainson), but slightly smaller, less pyriform and more globular; light yellow to orange in colour, apex and umbilical callus white. Aperture slightly narrower than in *P.tumidus,* a thick callus completely fills umbilicus apart from a shallow marginal groove where the callus joins the whorl; this groove tends to be deeper anteriorly. Periostracum orange-brown and opaque.

The operculum is uniformly light orange-brown. The rachidian of the radula (Fig. 54) has 5 cusps in addition to 2 small basal cusps and the lateral has 7 cusps; the inner marginal is bifid and the outer marginal simple.

TYPE LOCALITY: Tranquebar (Chemnitz, 1781).

DISTRIBUTION AND ECOLOGY: The species is rare in the Fiji Islands, and has been recorded only from offshore Islands off the coast of Vitu Levu. In clean coral-sand, intertidal.




Figs. 54, 55. *Polinices aurantius* (Röding). 54. Rachidian and lateral of radula. 55. Single jawplate.

## Subgenus **Neverita** Risso, 1826

*Neverita Risso*, 1826, Hist. nat. Eur. mérid. 4 :149. Type species by M. *Neverita josephinia* Risso, 1826. Recent, Mediterranean.

1840. *Mamillaria* Swainson, Treat. Malac., p. 345. Type species by SD (Hedley, 1924) *M.lactea* Swainson, 1840 = *Nerita peselephanti* Link, 1807. Recent. Indo-West Pacific.

Shell moderately large in size, ovate, broad and depressed, smooth and solid, sutures linear; body whorl large, aperture semi-ovate, smooth within. Funicle broad, almost filling umbilicus and connecting with the prominent parietal callus, umbilical groove deep and semi-circular.

The operculum is corneous. The radula is basically similar to *Polinices* s.str.

### **Polinices (Neverita) albumen** (Linnaeus, 1758) (Fig. 57-58)

1758. *Nerita albumen* Linnaeus, Syst. Nat. ed. 10, p. 776 (ref. Rumphius, pl. 22, fig. B only).
1781. *"Vitellus compressus* Chemnitz", Syst. Conch. Cab. 5 : 276, pl. 189, figs. 1924-25 *(non binom.)*.
1855. *Natica albumen* Lamarck, Reeve, Conch. Icon., pl. 8, figs. 31 a,b.
1883. *Natica albumen* Lamarck, Sowerby, Thes. Conchyl. 5 :78, pl. 5, fig. 57.
1956. *Polinices albumen* (Linné), Kaicher, Indo-Pacif. sea-shells, pl. 1, fig. 6.
1966. *Polinices albumen* (Linné), Habe & Kosuge, Shells world col. 2 : 36, pl. 12, fig. 18.
1967. *Polinices (Mammillaria) albumen* (Linné), Habe & Kosuge, Stand. book Jap, shells col. 3 : 48, pl. 18, fig. 28.

Shell moderately large, 25-45 mm in height, ovate, laterally compressed, commencement of aperture about equal with spire; cream or light yellow in colour, spire white. Aperture semi-ovate, funicle broad and almost filling aperture, parietal callus coalescing with funicle, umbilical groove deep and semi-circular, deepest posteriorly.

The operculum is corneous and dark orange-brown in colour.

TYPE LOCALITY: Asiatic Ocean.

DISTRIBUTION AND ECOLOGY: The species is uncommon but occurs in widely scattered localities throughout the Fiji Islands. In clean coral sand on offshore islands.

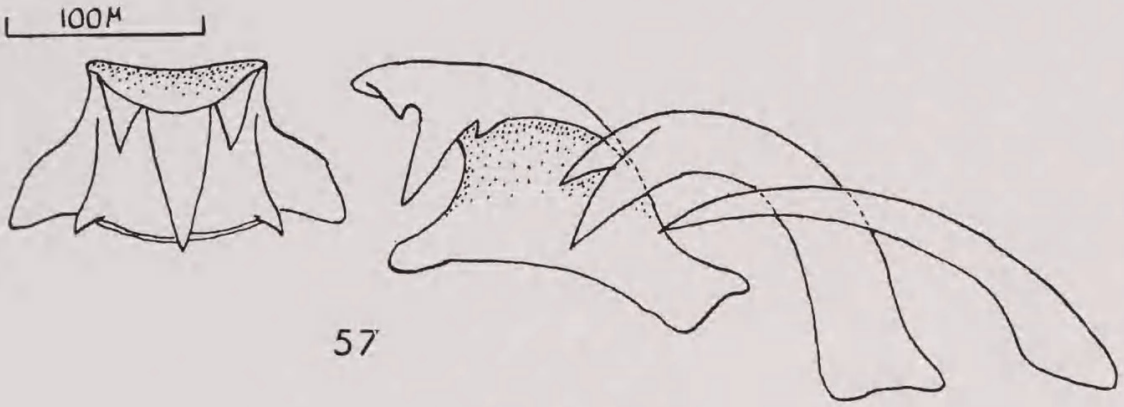



Fig. 57. *Polinices (Neverita) albumen* (Linnaeus). Half-row of radula.

## Subgenus **Mammilla** Schumacher, 1817

*Mammilla* Schumacher, 1817, Ess. nouv. syst., pp. 58, 190. Type species by M *Mammilla fasciata* Schumacher, 1817 = *Albula mammata* Röding, 1798. Recent, Western Pacific.

1840. *Naticaria* Swainson, Treat. Malac., p. 346. Type species by SD (Hedley, 1924) *Naticaria melanostoma* Martini = *Nerita melanostoma* Gmelin, 1791. Recent, Indo-Pacific.

1847. *Ruma "Chem."*, Gray, Proc. Zool. Soc. Lond., p. 149. Type species by OD *Natica maura* = *Natica maura* Lamarck, 1816. Recent, Indo-Pacific.

1851. *Reuma* "Chemnitz", Récluz, J. Conchyl. 2(2) : 197 *(nom. null.)*.

Shell small to moderate in size, thin and inflated, smooth or sculptured with fine spiral striae; whorls small, separated by adpressed sutures, body whorl large. Aperture semi-ovate to elliptical, smooth within, parietal callus narrow, partly overlapping umbilicus, funicle indistinct.

The operculum is corneous.

Species of the subgenus differ from *Polinices s.str.* in having thinner, less solid shells, a somewhat wider aperture and a moderately narrow parietal callus.

### **Polinices (Mammilla) maurus** (Lamarck, 1816) (Figs. 59-61)

1816. *Natica maura* Lamarck, Tabl. Encycl. Méth., p. 10, pl. 453, figs. 4a,b.

1822. *Natica melanostoma* var. b. Lamarck, Anim. s. vert. 6 : 198.

1852. *Natica maura* Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 58, pl. 9, fig. 6.

1855. *Natica maura* Bruguière, Reeve, Conch. Icon., p. 7, figs. 25 a,b.

1883. *Natica maura* Bruguière, Sowerby, Thes. Conchyl. 5 : 98, pl. 3, fig. 36.

1913. *Polinices nuxcastanea* "Martyn", Hedley, Proc. Linn. Soc. N.S.W. 38 (2) : 301 (ref. Martyn, 1786, pl. 106).

1924. *Uber nuxcastaneum* "Martyn", Hedley, Rec. Aust. Mus. 14(3) : 159.

1953. *Natica melanostoma* var. b Lamarck, Mermod, Rev. suisse Zool. 60(2) : 178, fig. 181(4) (figd. type).

1956. *Polinices maura* Bruguière, Kaicher, Indo-Pacif. sea-shells, pl. 1, fig. 8.

1966. *Mammilla maura* (Bruguière), Habe & Kosuge, Shells world col. 2 :35, pl. 12, fig. 12.

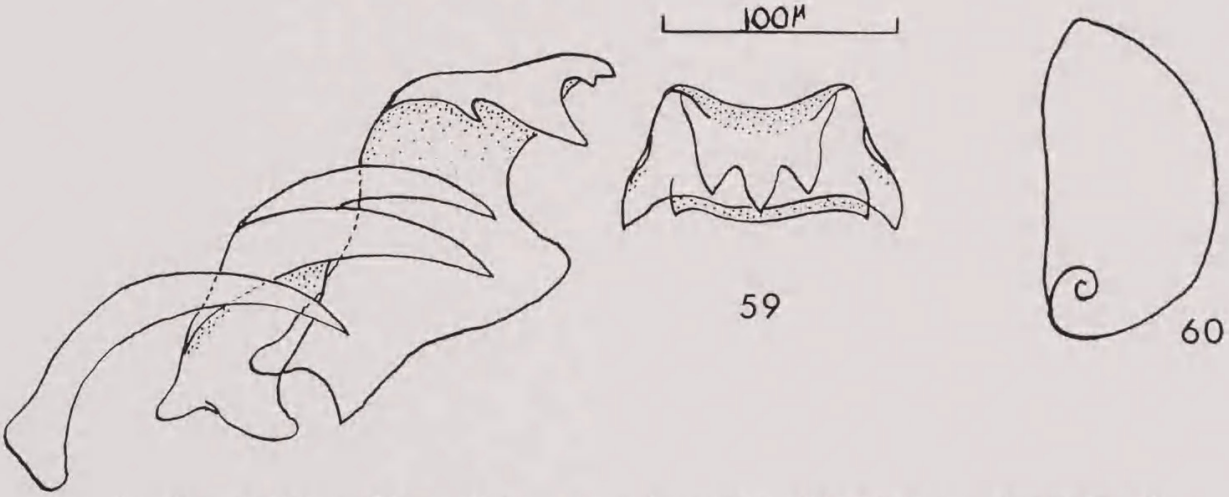
Shell moderately large, 20-50mm in height, pyriformly ovate, light in weight, smooth apart from fine, close-set growth striate; dull in texture, tan or dark brown in colour, apex white. Aperture semi-ovate, wide, parietal callus dark brown and folded over umbilicus without completely covering the deep umbilical groove. Periostracum brown in colour and moderately opaque.

The operculum (Fig. 60) is corneous and dark reddish-brown. The radula (Fig. 59) is similar to *Polinices tumidus* (Swainson).

TYPE LOCALITY: Indian Ocean (Lamarck, 1822).

DISTRIBUTION AND ECOLOGY: The species is moderately common throughout the Fiji Islands. In weedy coral-sand, but more commonly found in muddy-sand localities, intertidal.

Several authors have credited Bruguière with the authorship of *P.maurus,* and one author gives 1792 as the year of description. The species was described by Lamarck in the "Tableau Encyclopédique et Méthodique", which was published in 1816, several years after Bruguière's death.




Figs. 59, 60. *Polinices (Mammilla) maurus* (Lamarck). 59. Half-row of radula. 60. Operculum.

**Polinices (Mammilla) melanostomus** (Gmelin, 1791) (Figs. 62-65)

1781. *"Mamma aethiopissae* Chemnitz", Syst. Conch. Cab. 5 : 278, pl. 189, figs. 1926-27 *(non binom.).*

1791. *Nerita melanostoma* Gmelin, Syst. Nat. ed. 13, p. 3674 (ref. Lister, pl. 566, fig. 15 & Chemnitz, *op. cit.,* figs. 1926-27).

1851. *Natica opaca* Récluz, J. Conchyl. 2(2) : 199.

1852. *Mamilla putamen* Mörch, Cat. Conchyl. Com. Yoldi 1 : 132 (ref. Lister, pl. 566, fig. 15).

1852. *Natica melanostoma var. lactea* Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 31 (non *Naticina lactea* Guilding, 1834).

1852. *Natica melanostoma* var. *subfasciata* Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 31 (non d'Orbigny, 1850).

1852. *Natica melanostoma* var. *zonata* Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 31, pl. 4, figs. 15,16.

1855. *Natica melanostoma* Gmelin, Reeve, Conch. Icon., pl. 8, figs. 30 a,b.

1855. *Natica succineoides* Reeve, Conch. Icon. pl. 17, figs. 73 a,b.

1924. *Uber opacum* Récluz, Hedley, Rec. Aust. Mus. 14(3) : 159, pl. 22, fig. 3.

1953. *Natica melanostoma* Lamarck, Mermod, Rev. suisse Zool. 60(2) : 176, fig. 1/3).

1956. *Polinices melanostoma* Gmelin, Kaicher, Indo-Pacif. sea-shells, pl. 1, fig. 7.

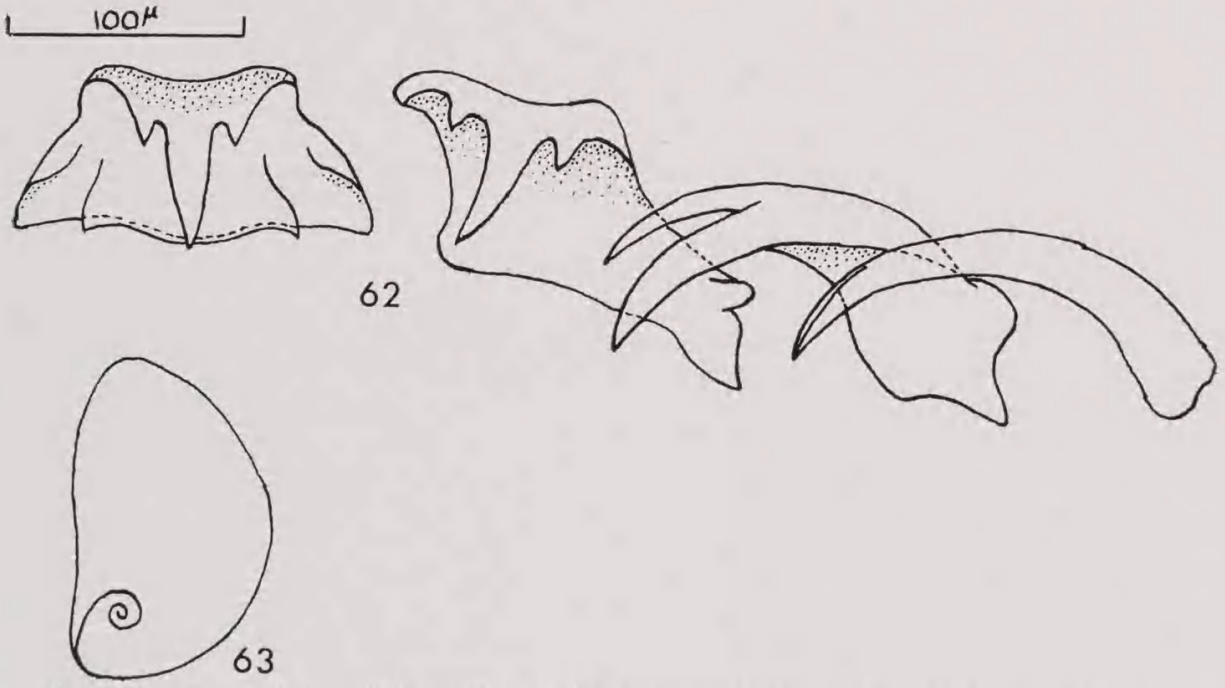
1967. *Mammilla opaca* (Récluz), Habe & Kosuge, Stand. book Jap. shells col. 3 :45, pl. 18, fig. 1.

Shell moderately large, 25-55mm in height, similar to *P.maurus* in shape but more solid; surface shining and ornamented with close-set growth lines and obsolete macroscopic spirals. White or steel-grey in colour, ornamented with 3 brownish-grey bands on body whorl; in some specimens these zones broken up into irregular spots or blotches. Aperture semi-ovate, wide, white or light brown within. Parietal callus dark brown and folded over umbilicus without completely covering it; a prominent, curved dark brown zone extending from centre of umbilicus to base.

The operculum (Fig. 63) is corneous, dark reddish-brown in colour and similar to the operculum of *P.maurus* (Gmelin). The rachidian of the radula (Fig. 62) has a central cusp which is longer than in *P.maurus* and the accessory side-cusps are set much higher.

TYPE LOCALITY: Indian Seas.

DISTRIBUTION AND ECOLOGY: The species is moderately common throughout the Fiji Islands. In clean coral or weedy sand of offshore islands. Fossil record: Coast of Ravuka, Late Pleistocene (Ladd,1934).




Figs. 62, 63. *Polinices (Mammilla) melanostomus* (Gmelin). 62. Half-row of radula. 63. Operculum.

Gmelin's reference to figures 1926-27 in Chemnitz (1781) are the most appropriate citations for the species. The Lister figure 36 and Born's *Helix mamillaris* (non Linnaeus) appear to be the related species *P.(M.)sebae* (Récluz, 1844).

**Polinices (Mammilla) melanostomoides** (Quoy & Gaimard, 1833) (Figs. 66-67)

1833. *Natica melanostomoides* Quoy & Gaimard, Voy. Astrolabe 2 :229, pl. 66, figs. 4-8.
1852. *Natica melanostomoides* Quoy & Gaimard, Philippi, Syst. Conch. Cab., 2nd ed. 2(1) : 58, pl. 9, fig. 5.
1855. *Natica melanostomoides* Quoy & Gaimard, Reeve, Conch. Icon., pl. 22, sp. 101.
1883. *Natica melanostomoides* Quoy, Sowerby, Thes. Conchyl. 5 :97, pl. 6, fig. 78.
1924. *Uber melanostomoides* Quoy & Gaimard, Hedley, Rec. Aust. Mus. 14(3) : 158.
1966. *Mammilla sebae* (Récluz), Habe & Kosuge, Shells world col. 2 :121, pl. 45, fig. 14 (non *Natica sebae* Récluz, 1844).

Shell moderately small, 20-25mm in height, fragile, irregularly pyriform, laterally slightly compressed, spire short; white in colour, ornamented with 3 spiral rows of irregular, dark brown spots. Aperture wide, ear-shaped, columella concavely excavated, parietal callus dark brown, narrow, and folded over the umbilicus leaving a narrow groove; anterior edge of columella stained dark brown.

TYPE LOCALITY: New Guinea and New Ireland.

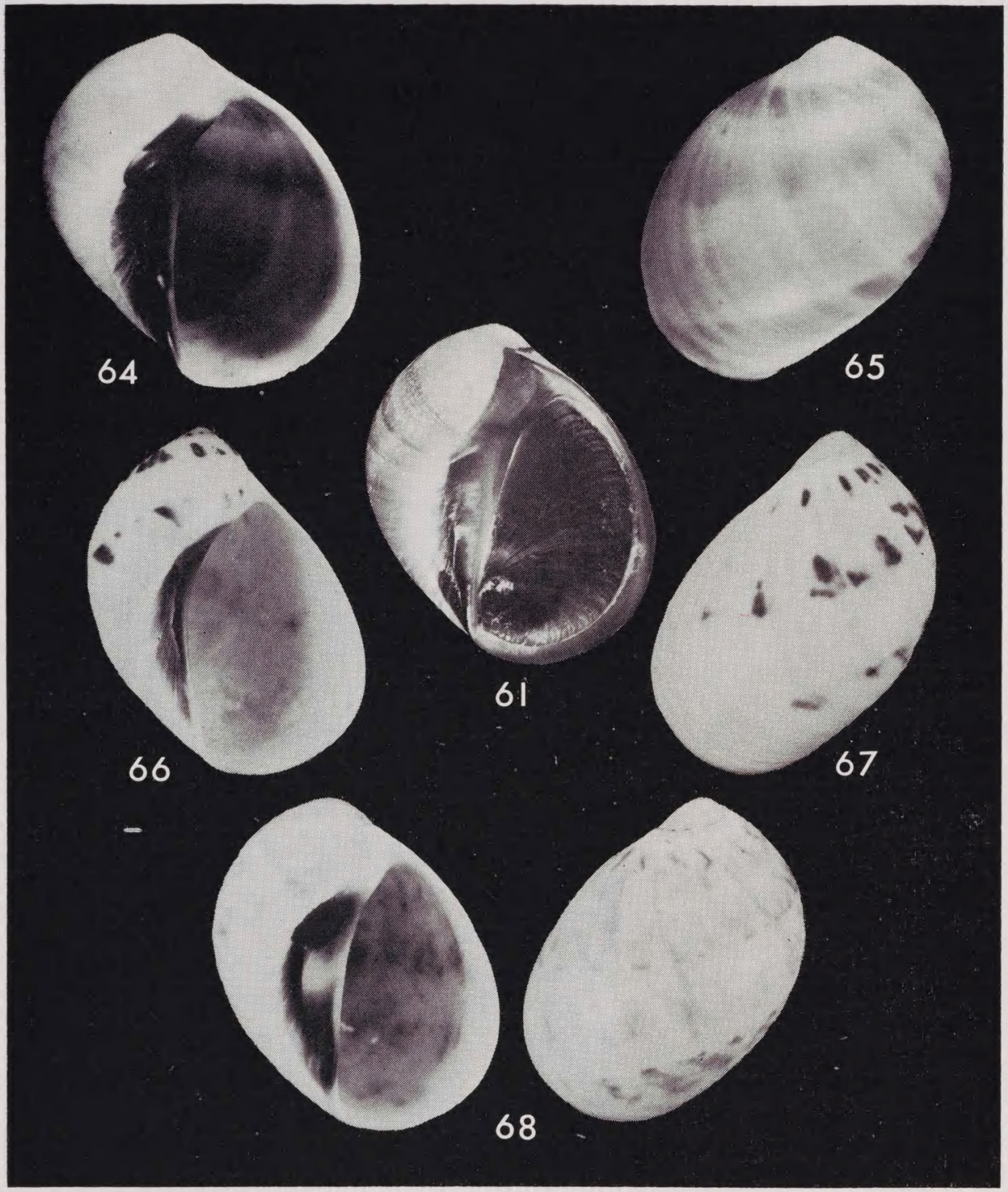
DISTRIBUTION AND ECOLOGY: The species is rare in the Fiji Islands, and all specimens collected were found devoid of animal; the species has been recorded from Manava I., off the coast of Nth. Viti Levu. In coral sand.

**Polinices (Mammilla) simiae** (Deshayes in Deshayes & Edwards, 1838) (Fig. 68)

1781. *"Ruma simiae* Chemnitz" Syst. Conch. Cab. 5 : 285, pl. 189, fig. 1938 *(nom binom.).*
1828. *Natica sigaretina* Menke, Synop. meth. Moll., p. 26 (ref. Chemnitz, *op. cit.*, fig. 1938) [non J. de C. Sowerby, 1824].
1834. *Natica simiae* Deshayes in Deshayes & Edwards, Hist. nat. anima. s. vert., ed. 2,2 : 522 (ref. Chemnitz, *op cit.*, fig. 1938).
1844. *Natica samarensis* Récluz, Proc. Zool. Soc. Lond., pt. 11 :214.
1852. *Natica simiae* Deshayes, Philippi, Syst. Conch. Cab. 2nd ed. 2(1) : 35, pl. 4, fig. 17.
1855. *Natica simiae* Chemnitz, Reeve, Conch. Icon., pl. 17, figs. 76a, b.
1883. *Natica simiae* Chemnitz, Sowerby, Thes. Conchyl. 5 :97, pl. 6, fig. 71.
1924. *Uber simiae* Deshayes, Hedley, Rec. Aust. Mus. 14(3) : 162, pl. 22, fig. 2.
1929. *Mammilla propesimiae* Iredale, Aust. Zool., 5(4) : 341, pl. 38, fig. 5 (figure only, description lacking).
1934. *Polinices simiae* (Deshayes), Powell, Trans. Proc. R.Soc. N.Z. 64(2) : 156.
1967. *Mammilla simiae* (Deshayes), Habe & Kosuge. Stand. book Jap. shell col. 3 :45, pl. 18, fig. 2.

Shell small, 10-20 mm in height, similar in form to *P.(M.)melanostoma,* but more fragile. White or cream in colour, ornamented with a broad, brownish zone adjacent to suture containing irregular maculations and dots; a narrow zone of streak-like markings situated at base and centre part of body whorl irregularly marbled in a lighter colour. Parietal callus dark brown and thicker than in *P.(M.)melanostoma;* umbilicus and anterior edge of columella stained with brown.

TYPE LOCALITY: New Zealand.




Figs. 61, 64-68. 61. *Polinices (Mammilla) maurus* (Lamarck). Manava I., Fiji I.; height 39.0mm. 64, 65. *P. (M.) melanostomus* (Gmelin). Manava I., Fiji I.; height 29.7mm. 66, 67. *P. (M.) melanostomoides* (Quoy & Gaimard). Manava I., Fiji I.; height 24.7mm. 68. *P. (M.) simiae* (Deshayes in Deshayes & Edwards). Malolo Barrier reef, Mamanuca group, Fiji I.; height 22.5mm.

DISTRIBUTION: The species is rare in the Fiji Islands and specimens collected were found devoid of animal on sandy lagoons off the west coast of Viti Levu.

Deshayes & Edwards (1838) gave New Zealand as the type locality, and attributed the indication to Chemnitz. Chemnitz's specimens, however, came from

the Nicobar Islands, and it was Chemnitz (1781) who credited d'Argenville with the New Zealand locality. The species is widely distributed throughout the Pacific, and is less rare in the Hawaiian and Kermadec Islands. The species does occur in New Zealand but is confined to the northern part of the North Island.

## Subfamily SININAE Woodring, 1928

### Genus **Eunaticina** Fischer, 1885

*Eunaticina* Fischer, 1885, Man. Conchyl., p. 768. Type species (art. 67i of ICZN) *Naticina papilla* (Gmelin) = *Nerita papilla* Gmelin, 1791. Recent, Western Pacific. *(Nom. subst. pro Naticina* Gray, 1847).

1840. *Naticina* Gray, Synop. Brit. Mus., ed. 40, pl. 147 *(nom. nud.)*.

1847. *Naticina* Gray, Proc. Zool. Soc. Lond., pl. 150. Type species by OD *N.papilla* (Gmelin) (non *Naticina* Guilding, 1834).

Shell small to moderate in size, thin and inflated, spire low, body whorl large, sculptured with spiral grooves; aperture semi-ovate but wide, umbilicus deep and axially elongate, parietal callus moderately prominent and partly covering umbilicus, anterior parietal callus narrow and partly folded over edge of umbilicus.

The animal is very large and is unable to withdraw completely into the shell. The operculum is small and corneous.

*Eunaticina* is a group intermediate between *Mammilla* Schumacher and *Sinum* Röding.

**Eunaticina papilla** (Gmelin, 1791) (Fig. 69)

1781. *"Papilla seu Ruma felis* Chemnitz", Syst. Conch. Cab. 5 : 285, pl. 189, fig. 1939 *(non binom.)*.

1791. *Nerita papilla* Gmelin, Syst. Nat., ed. 13, p. 3675 (ref. Chemnitz, *op. cit.*, fig. 1939).

1798. *Albula tranquebarica* Röding, Mus. Bolten., p. 21 (ref. Chemnitz, *op. cit.*, fig. 1939).

1833. *Natica costulata* Quoy & Gaimard, Voy. Astrolabe 2 :235, pl. 66, figs. 20, 21.

1840. *Naticaria cancellata* Swainson, Treat. Malac., p. 346 (ref. Chemnitz, *op. cit.*, fig. 1939).

1874. *Naticina papilla* "Chemnitz", Souverbie & Montrouzier, J. Conchyl. 22 :198, pl. 7, fig. 8 (operculum).

1956. *Sinum papilla* Gmelin, Kaicher, Indo-Pacif. sea-shells, pl. 2, fig. 8.

Shell moderately small, 15-25 mm in height, thin, pyriformly-ovate, body whorl suture deep; white in colour under a thin light brown periostracum. Sculptured with *c.*40-60 spiral grooves and bisected by close-set, fine axial growth lines; in some specimens spiral grooves wide-spaced in others close-set. Parietal callus narrow, folded over umbilicus posteriorly and continuing on columellar wall to base; umbilicus open and deep.

The operculum is corneous, light brown in colour and translucent (*fide* Souverbie & Montrouzier, 1874).

TYPE LOCALITY: Tranquebar.

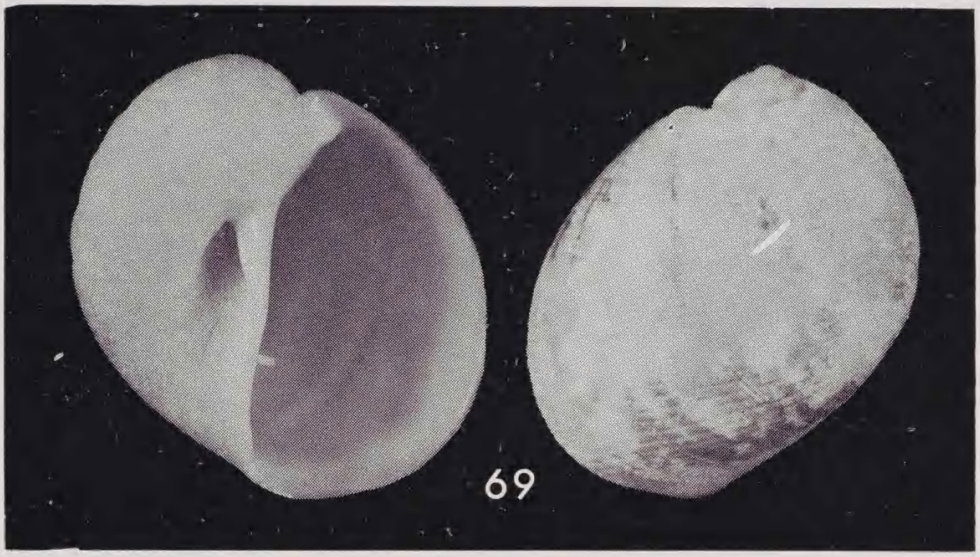



Fig. 69. *Eunaticina papilla* (Gmelin). Tavutha reef, near Vatia wharf, Fiji I.; height 22.5mm.

DISTRIBUTION AND ECOLOGY: The species is uncommon in the Fiji Islands, and has been recorded from the north, west and south coasts of Viti Levu. Below low tide level in weedy sand.

## FOSSIL SPECIES

### Subfamily GLOBULARINAE WENZ, 1941

### Genus **Globularia** Swainson, 1840

*Globularia* Swainson, 1840, Treat. Malac., p. 345. Type species by SD (Herrmannsen, 1847) *Natica sigaretina* Lamarck = *Ampullaria sigaretina* Lamarck, 1804. Eocene of Paris Basin.

#### **Globularia (Waluia) edwardsi** Ladd, 1934

1934. *Globularia (Waluia) edwardsi* Ladd, Bern. P. Bish. Mus. Bull. 119 :212, pl. 36, figs. 7,8 & pl. 37, figs. 1, 2 & pl. 38, fig. 1.

TYPE LOCALITY: Quarry south side Walu Bay, Miocene of Viti Levu.

This species is the type species of the subgenus *Waluia* Ladd, 1934, which differs from *Globularia* s.str. in the wide and flaring aperture.

#### **Globularia (Cernina) fijiensis** Ladd & Hoffmeister, 1945

1945. *Globularia (Cernina) fijiensis* Ladd & Hoffmeister, Bern. P. Bish. Mus. Bull. 181 : 358, pl. 51, figs. A, B.

TYPE LOCALITY: Coast between Tubou and Tarakua-wai, Miocene of Lakeba, Lau Islands.

### Genus **Pachycrommium** Woodring, 1928

*Pachycrommium* Woodring, 1928, Carnegie Inst. Washington Pub. 385 : 391. Type species by OD *Amaura guppyi* Gabb. Miocene, Dominican Republic.

**Pachycrommium stockwelli** Ladd & Hoffmeister, 1945

1945. *Pachycrommium stockwelli* Ladd & Hoffmeister, Bern. P. Bish. Mus. Bull. 181 : 359, pl. 51, figs. C, D.

TYPE LOCALITY: Tip of Dukelulu Point, Miocene of Vanua Balavu, Lau Islands.

**Pachycrommium ? pacificum** Ladd & Hoffmeister, 1945

1945. *Pachycrommium ? pacificum* Ladd & Hoffmeister, Bern. P. Bish. Mus. Bull. 181 : 359, pl. 51, figs. E, F.

TYPE LOCALITY: Western end of western lake, Miocene of Oneata, Lau Islands.

## Subfamily SININAE *Woodring*, 1928

### Genus **Sinum** Röding, 1798

*Sinum* Röding, 1798, Mus. Bolten., p. 14. Type species by SD (Dall, 1915) *Sinum haliotoideum* Röding, 1798 = *Helix haliotoidea* Linnaeus, 1758. Recent, ? Western Pacific.

**Sinum lekalekanum** Ladd & Hoffmeister, 1945

1945. *Sinum lekalekanum* Ladd & Hoffmeister, Bern. P. Bish. Mus. Bull. 181 : 357, pl. 50, figs. O, P.

TYPE LOCALITY: Dukelulu Point, Miocene of Vanua Balavu, Lau Islands.

## NOTES ON NATICID NOMENCLATURE

*Natica zebra* Lamarck, 1822 (figd. Abbott, 1962, p.50 and Habe & Kosuge, 1966, pl. 12, fig. 13): the prior name for this species is *Cochlis undulata* Röding, 1798 (ref. Chemnitz, 1781, pl. 187, figs. 1885-86).

*Notocochlis lineata* Gmelin, 1791 (cited by Habe & Igarashi, 1967 and figured by Habe & Kosuge, 1966, pl. 12, fig. 12): the author of *Cochlis lineata* is Röding, 1798. *Nerita lineata* Gmelin,1791 is a species of Neritidae.

*Natica maculosa* Lamarck, 1822 (figd. Abbot, 1962, p.50): the prior name is *Cochlis tigrina* Röding, 1798, Mus. Bolten., p. 147 (ref. Chemnitz, 1781, pl. 187, fig. 1892). Other synonyms are *Natica maculata* Perry, 1811 (non *Nerita maculata* v.Salis, 1793), *Natica javana* Lamarck, 1822 and *N.pellistigrina* Dunker, 1882 & auctt..

*Natica alba* Gray, 1827 (non *Polinices albus* Montfort, 1810) [figd. Rippingale & McMichael, 1961, pl. 11, fig. 3): the prior name is *Nerita peselephanti* Link, 1807 (ref. Chemnitz, 1781, pl. 190, figs. 1922-23). Other synonyms are *Natica peselephantis* Deshayes in Deshayes & Edwards,1838 and *Mamillaria lactea* Swainson, 1840.

*Natica millepunctata* Lamarck 1822 (figd. Nordsieck, 1968, pl. 16, fig. 63-10) : the prior name is *Nerita stercusmuscarum* Gmelin, 1791 (ref. Chemnitz, 1781, pl. 187, fig. 1894). Other synonyms are *Cochlis milleporia* Röding, 1798 and *Natica guttata* Link, 1807.

*Nerita cruentata* Gmelin,1791 (considered by some authors to be a variant of *N.stercusmuscarum* Gmelin; figd. Nordsieck, 1968, pl. 17, fig. 63-12 as *Naticarius maculatus* v. Salis). Synonyms of the species are *Nerita maculata* v. Salis, 1793, *Cochlis fanel* Röding,1798, *C.stercusmuscarum* Röding,1798, *Natica maculata* Sowerby, 1825, *N.adspersa* Menke, 1829, *N.fanel* Récluz, 1844 and *Nerita hebraea* auctt.

*Natica orientalis* (Gmelin,1791): synonyms of the species are *Albula vitellus* Röding, 1798 (non *Nerita vitellus* Linnaeus, 1758), *Cochlis explanata* Röding, 1798, *Natica eburnea* Deshayes in Deshayes & Edwards, 1838 and *N.eburnea* Philippi,1852.

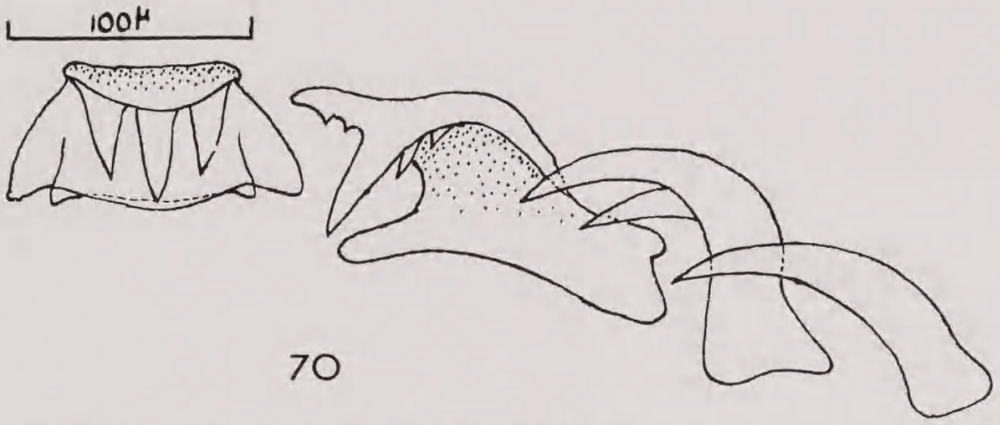



Fig. 70. *Natica chemnitzii* Pfeiffer. San Carlos Bay, Guaymas, Mexico; half-row of radula.

*Acknowledgements.* Specimens of Naticidae received from Fiji collectors for examination are gratefully acknowledged. The author would like to thank Dr. A. W. B. Powell for the loan of his Naticidae collection, Dr. C. A. Fleming, N.Z. Geological Survey, Lower Hutt, for literature notes on *Natica tectula*, and Dr. J. D. Taylor, Department of Zoology, British Museum (Nat.Hist.), London, for photographs of the holotype of *N.pseustes*.

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## INDEX TO THE FAMILY NATICIDAE IN THE FIJI ISLANDS