

Results of the Rumphius Biohistorical Expedition to Ambon (1990)



Part 10. Mollusca, Gastropoda, Naticidae

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The 1990 Rumphius Biohistorical Expedition to Ambon (Indonesia) made 44 collecting stations. Twenty-seven species representing 11 genera of the Naticidae (Gastropoda: Caenogastropoda) were collected at 29 stations. This paper provides keys to the genera and species, along with diagnoses and short synonymies of the species. The modern identity of the thirteen naticid species known to Rumphius in his “D’Amboinsche Rariteitkamer” (1705) is determined. Fifty described species of Naticidae are currently known from Malaysia and Indonesia, with 38 known from Ambon itself (this expedition and older museum collections).

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Materials and methods

Strack (1993) provided full data regarding the 1990 expedition and the habitats of the various stations. The Naticidae were sorted out by H.L. Strack and his colleagues and made available through the Nationaal Natuurhistorisch Museum, Leiden (RMNH). Additional RMNH specimens collected from “Amboina,” apparently all from pre-1940s collectors (the majority were 19th century) were also made available for comparison. These older collections, made over a number of years, included several naticid species not obtained by the expedition in 1990.

Since 1990, I have been engaged in species-level revisions of the tropical Indo-

Pacific Naticidae, entailing the accumulation of considerable data on museum specimens and literature records for the over 120 known species. This report represents a partial extraction of the data with regard to the species collected at Ambon. However, the format of this report is not intended to be a systematic monograph of the included taxa. The synonymies and museum records presented here are considerably abbreviated. The species are illustrated on figures 1-42. However, the expedition specimens of several naticid species were too small or too worn for suitable photography; therefore, I have used photographs of larger USNM specimens.

In addition to the RMNH specimens, I have cited other collections made in Indonesia and Malaysia. The largest such used herein is that housed in the National Museum of Natural History, but several other museums also have significant collections from these regions. The museum abbreviations used are:

AMS	Australian Museum, Sydney.
ANSP	Academy of Natural Sciences of Philadelphia.
BMNH	British Museum (Natural History); now The Natural History Museum.
BPBM	Bernice Pauahi Bishop Museum, Honolulu.
DMNH	Delaware Museum of Natural History.
MCZ	Museum of Comparative Zoology, Harvard University.
NM	Natal Museum, Pietermaritzburg.
RMNH	Rijksmuseum van Natuurlijke Historie, Leiden; now Nationaal Natuurhistorisch Museum.
USBF	U.S. Bureau of Fisheries [dredging stations].
USNM	U.S. National Museum; now National Museum of Natural History, Smithsonian Institution.
ZMA	Zoölogisch Museum Amsterdam.

The cited material from the RMNH is limited to specimens from Ambon; that from the ZMA is limited to several lots from the "Siboga Expedition". These two museums have significant collections from throughout Indonesia which I have not fully examined.

Furthermore, there was an earlier expedition in 1970 to Ambon and adjacent regions in the Moluccas (Wilson, 1978). The sizable collections from this expedition were divided between the USNM, the Western Australian Museum (Perth) and the National Biological Institute of Indonesia. I have obtained the full records from only the first (USNM) collection; it is possible that there are naticid species represented in the second and third collections but not in the USNM component.

There was yet another series of "Rumphius Expeditions", conducted by the National Institute of Oceanology (Indonesia) in 1973 and 1975, which also surveyed the biota of Ambon. The reports on the molluscs (Slack-Smith & Boediman, 1974; Boediman, 1976) listed a total of seven species of Naticidae. All such were also found by the 1990 expedition herein. In some cases, the taxonomy used in these earlier reports no longer represents the currently accepted usages; in addition, those reports did not provide biogeographic data on the species.

Naticids were found at 29 of the 44 stations collected by the 1990 expedition. This leaves 15 stations with no naticids: nine were brackish or freshwater (riverine); one

(No. 9) was the polluted town port; one (No. 11) was primarily rocky or coral substrate; two (Nos. 40 and 44) were not thoroughly sampled (H.L. Strack, pers. comm.); two dredging stations (Nos. 42 and 43), although representing muddy sand, also lacked naticids. It is possible that the latter two stations were too silty or muddy in contrast to the sandy habitats preferred by naticids. Kabat (1998) briefly summarized the ecological habits of naticids.

The 29 stations with naticids varied considerably in the abundance and species diversity represented. Several stations had only one or two naticid species. The most speciose locations were stations 5 (ten species), 23 (nine species), 30 (eight species) and 34 (seven species). These four stations are all characterized by a mixed substrate of coral and clear to muddy sand (Strack, 1993), which represents the optimum naticid habitat. Although naticids are generally not found on coral itself, they can feed on other mollusks associated with corals, presumably while the prey mollusks are moving from one coral block to another.

Table I provides a synopsis of the described naticid fauna of Malaysia and Indonesia, indicating which species are (1) known from Ambon, (2) found by the 1990 expedition, and (3) known to Rumphius.

Table 1. Naticid fauna of Indonesia and Malaysia.

Species	A	B	C	D
<i>Eunaticina linnaeanus</i> (Récluz, 1843)	x	x	0	0
<i>Eunaticina papilla</i> (Gmelin, 1791)	x	x	x	0
<i>Euspira apora</i> (Watson, 1881)	x	0	0	0
<i>Euspira crispata</i> (Thiele, 1925)	x	0	0	0
<i>Mammilla fibrosa</i> (M.E. Gray, 1850)	x	x	x	0
<i>Mammilla maura</i> (Lamarck, 1816)	x	x	0	0
<i>Mammilla melanostoma</i> (Gmelin, 1791)	x	x	x	0
<i>Mammilla melanostomoides</i> (Quoy & Gaimard, 1832)	x	x	x	0
<i>Mammilla priamus</i> (Récluz, 1844)	x	0	0	0
<i>Mammilla sebae</i> (Récluz, 1844)	x	x	x	x
<i>Mammilla simiae</i> (Deshayes, 1838)	x	x	x	0
<i>Natica arachnoidea</i> (Gmelin, 1791)	x	x	x	0
<i>Natica buriasiensis</i> Récluz, 1844	x	x	x	0
<i>Natica fasciata</i> (Röding, 1798)	x	x	x	x
<i>Natica schepmani</i> Thiele, 1925	x	0	0	0
<i>Natica stellata</i> Hedley, 1913	x	x	0	x
<i>Natica vitellus</i> (Linnaeus, 1758)	x	x	0	x
<i>Naticarius alapapilionis</i> (Röding, 1798)	x	x	0	x
<i>Naticarius onca</i> (Röding, 1798)	x	x	x	x
<i>Naticarius orientalis</i> (Gmelin, 1791)	x	x	x	x
<i>Naticarius zonalis</i> (Récluz, 1850)	x	x	x	0
<i>Neverita didyma</i> (Röding, 1798)	x	x	x	0

A = found in Indonesia and (or) Malaysia
 B = found in Ambon
 C = found by the Rumphius Biohistorical Expedition (1990)
 D = species known to Rumphius (1705)

Species	A	B	C	D
<i>Notocochlis cernica</i> (Jousseaume, 1874)	x	x	x	0
<i>Notocochlis gualtieriana</i> (Récluz, 1844)	x	x	x	0
<i>Notocochlis insularum</i> (Watson, 1886)	x	x	x	0
<i>Notocochlis tigrina</i> (Röding, 1798)	x	x	0	0
<i>Polinices albumen</i> (Linnaeus, 1758)	x	x	0	x
<i>Polinices aurantia</i> (Röding, 1798)	x	x	x	x
<i>Polinices candidissima</i> (Le Guillou, 1842)	x	0	0	0
<i>Polinices columnaris</i> (Récluz, 1850)	x	x	0	0
<i>Polinices flemingiana</i> (Récluz, 1844)	x	x	x	0
<i>Polinices mammilla</i> (Linnaeus, 1758)	x	x	x	x
<i>Polinices mellosum</i> (Hedley, 1924)	x	x	x	0
<i>Polinices peselephanti</i> (Link, 1807)	x	x	0	0
<i>Sigatica peleum</i> (Iredale, 1929)	x	x	x	0
<i>Sigatica pomatiella</i> (Melvill, 1893)	x	0	0	0
<i>Sinum halioideum</i> (Linnaeus, 1758)	x	x	0	x
<i>Sinum javanicus</i> (Gray in Griffith & Pidgeon, 1834)	x	0	0	0
<i>Sinum laeovigatus</i> (Lamarck, 1822)	x	0	0	0
<i>Sinum neritoideum</i> (Linnaeus, 1758)	x	x	x	0
<i>Tanea areolata</i> (Récluz, 1844)	x	x	x	0
<i>Tanea euzona</i> (Récluz, 1844)	x	0	0	0
<i>Tanea lineata</i> (Röding, 1798)	x	0	0	0
<i>Tanea mozaica</i> (Sowerby, 1883)	x	x	x	?
<i>Tanea picta</i> (Récluz, 1844)	x	x	0	0
<i>Tanea undulata</i> (Röding, 1798)	x	x	x	x
<i>Tectonatica bougei</i> (Sowerby, 1908)	x	x	x	x
<i>Tectonatica robillardii</i> (Sowerby, 1894)	x	0	0	0
<i>Tectonatica suffusa</i> (Reeve, 1855)	x	x	x	0
<i>Tectonatica violacea</i> (Sowerby, 1825)	x	0	0	0

The Naticidae of Rumphius' Amboinsche Rariteitkamer

Strack (1993) summarized the life and biological contributions made by Georg Eberhard Rumpf [later Rumphius] (1627-1702). Rumphius was a fine biologist whose years spent at Ambon in the "Dutch East Indies" allowed him to make numerous novel observations on the local flora and fauna. In his last three decades, Rumphius completed several major manuscripts on this biota; an accomplishment all the more remarkable considering his blindness during that period.

Rumphius is best known to marine zoologists for his 1705 masterpiece, the "Amboinsche Rariteitkamer", which described and illustrated numerous invertebrates. These descriptions were exceptionally precise and included information on the local names and usages of various species. As this work was "pre-linnaean" the names do not enter into zoological nomenclature, but many of his figures and descriptions were subsequently cited by Linnaeus and later authors (*e.g.*, Gmelin, Röding and Lamarck) as the basis for their new species.

I am indebted to H.L. Strack who has expertly translated the naticid section of Rumphius' treatise (from the Dutch).

Rumphius illustrated eight species of naticids on plates 20 (opercula, Nos. 5 and 6), 22 (shells, figures A-G) and 40 (shell, figure R). He also described but did not illustrate an additional two species.

Eduard von Martens (1902) prepared an annotated synopsis of the 'current' scientific names of the mollusks illustrated by Rumphius. Martens' identifications were based upon (1) his own observations and (2) the citations by later authors (e.g. Linnaeus, Gmelin, Lamarck) to Rumphius' figures. Nearly a century later, most of Martens' identifications remain correct; in some cases the name he used is now a junior synonym of the currently accepted species name, or the species is now classified in a different genus.

The following section briefly discusses the current systematic status of the naticid species known to Rumphius. These conclusions are based on my interpretations of the figures and descriptions in Rumphius which I then compared with Martens' determinations. The systematic section of this paper provides further remarks concerning the species synonymy or other records.

Chapter XI, "Cochlae valvatae: Bia Tsjonckil", pages 75-76.

I. "Valvata laevis prima sive vitellus" (Plate 22 figure A, plate 20 figure 5). This is *Natica stellata* Hedley, 1913, a species frequently confused with *N. vitellus* (Linnaeus, 1758) in the older literature (including Martens, 1902: 114; see also Kabat 1990: 10-12). *N. stellata* is orangish-yellow, with one or two rows of squarish white spots, as described by Rumphius. This species is known from Ambon but was not found by the expedition.

II. "Vitellus pallidus" (not illustrated). The description of Rumphius refers to a pale shell, larger than the preceding species, and with a deeply grooved operculum. This is most probably *Naticarius orientalis* (Gmelin, 1791), a species which was found by the expedition. Martens (1902: 114) noted that Rumphius' description resembled either "*Natica zonaria* Lam." [= *Naticarius alapapilionis* (Röding, 1798)] or *Natica orientalis*, the operculum of which was unknown to him.

III. "Vitellus compressus" (Plate 22 figure B). This species is most likely *Polinices albumen* (Linnaeus, 1758) as noted by Martens (1902: 114); see also Kabat (1990: 19-21). Although the aperture is not illustrated, the shell is too compressed to be the superficially similar *P. peselephanti* (Link, 1807) or *P. columnaris* (Récluz, 1850). All three species are known from Indonesia (including Ambon) and Malaysia, but none were collected by the expedition.

IV. "Valvata quarta" (Plate 22 figure C). Two species are referred to by Rumphius and three may actually be represented. The first species of Rumphius, with variously 1, 2 or 4 rows of black spots, is most likely *Naticarius onca* (Röding, 1798) but may also represent *Tanea mozaica* (Sowerby, 1883). Both species were found by the expedition. Martens (1902: 114) named this figure as *Natica chinensis* (Lamarck, 1816), which is a junior synonym of *Naticarius onca*.

“*Canrena lima*” (not illustrated). The second species of Rumphius, with 4 or 5 rows of black or dark brown spots, is probably *Naticarius alapapilionis* (Gmelin, 1791), which was not found by the expedition. Martens (1902: 114) was unable to name this taxon; the Linnaean *N. canrena* (Linnaeus, 1758) is actually a tropical Western Atlantic species.

V. “*Valvata quinta*” (Plate 22 figure D, plate 20 figure 6). This species is *Natica vitellus* (Linnaeus, 1758). In the older literature (including Martens, 1902: 114), this was commonly referred to as *Natica rufa* Born, a junior synonym (see Kabat, 1990: 10-12). Compare with the aforementioned *N. stellata* (the first naticid species of Rumphius). *N. vitellus* is known from Ambon, but it was not found by the expedition.

VI. “*Valvata sexta*” (Plate 22 figure E). This is probably *Natica fasciata* (Röding, 1798). Rumphius referred to the dark colouring, especially the blackened apertural region, which is characteristic of this species. Martens (1902: 114) identified this as “*Natica cinnamomea* Menke”, a junior synonym of *N. fasciata*. This species was obtained by the expedition.

VII. “*Valvata septima sive albula*” (Plate 22 figure F). Rumphius indicated that three species were referred to, all sharing a similar smooth globose shell form with a white or orangish colouration. The first species (and only one illustrated), with a corneous operculum and a white shell is probably the common *Polinices mammilla* (Linnaeus, 1758).

The second species, stated to be similar except for a black spot in the apertural region (presumably on the columella) is likely *Mammilla* cf. *sebae* (Récluz, 1844)

The third species, which is slightly more globular and with orangish colouring, is *P. aurantia* (Röding, 1798). All three species were collected by the expedition.

Martens (1902: 114) arrived at the same identifications for the first and third species; for the second he used “*Natica (Mammilla) melanostoma* Gmelin”, but that species has significantly more shell colouration than does *Mammilla sebae*, which is nearly white and superficially resembles *P. mammilla*, as Rumphius had indicated.

VIII. “*Valvata octava sive tenuis*” (Plate 22 figure G). The apt description of Rumphius of the colour pattern (like little snakes) and the figure are representative of *Tanea undulata* (Röding, 1798). Martens (1902: 115) identified this as *Natica zebra* Lamarck, a junior synonym; he also compared this with *N. areolata* Récluz (also now classified in *Tanea*). *T. undulata* was found by the expedition.

IX. “*Valvata nona sive gothica*” (not illustrated). This species might be *Tectonatica bougei* (Sowerby, 1908). Rumphius refers to both the purplish or violet apertural region, and to the coloured spots which seemed to resemble ‘old Gothic letters’ (but irregular) and the white operculum. All these characters are applicable to this species, one of the few naticids having such apertural colouration and distinctive patterns of

irregular spots. Martens (1902: 115) understandably could not identify this taxon which was not described until 1908. This species was found by the expedition.

Chapter 26, "Conchae Univalviae", page 123.

VIII. "Melknapjes" (Plate 40 figure R). The "milk bowl" of Rumphius is obviously *Sinum haliotoideum* (Linnaeus, 1758), the type species of the genus and a common species in the central and western part of the tropical Indo-Pacific. Martens (1902: 124) identified this as *Sigaretus planulatus* Récluz in Chenu, a junior synonym (Kabat, 1990: 6-9). This species was not found by the expedition; instead one specimen of *S. cf. neritoideum* (Linnaeus, 1758) was collected.

In conclusion, Rumphius had ten paragraphs (or sections) describing what he considered to be 13 species. I have ascertained that presumably 13 or even 14 naticid species were actually available to Rumphius — the one figured on plate 22, figure C, may represent either of two species from the description. Of these 14 species, five were not found by the expedition. In contrast, the expedition obtained 27 species, almost twice those known to Rumphius. Combining (1) the Rumphian naticids¹ with (2) those found by the expedition but not known to Rumphius, and (3) those known from Ambon but neither found by the expedition nor known to Rumphius, adds up to a total of 38 naticid species known from Ambon.

My analyses of the entire Indo-Pacific naticid fauna have determined that 50 described naticid species are known from the countries of Indonesia and Malaysia (together with Singapore and Brunei) (see also Kabat, 1996: 33). This represents about 40% of the Indo-Pacific species level naticid biodiversity. Ambon itself has 76% of the naticid fauna of Indonesia-Malaysia. The 1990 expedition, by collecting 27 of the 38 species known to occur at Ambon, obtained 71% of the Ambon naticid fauna, a quite respectable figure for a single expedition.

Naticidae collected by the 1990 expedition

Marincovich (1977: 212, text-fig. 10) provides helpful illustrations of characters used to describe naticid shells.

Key to genera

- 1. Shell with spiral striae or ribs 2
- Shell without spiral striae or ribs 4
- 2. Shell auriform (low spired) *Sinum* (p. 370)
- Shell globular 3
- 3. Shell nearly spherical; columella straight *Sigatica* (p. 370)
- Shell elongated (pyriform); columella curved *Eunaticina* (p. 352)
- 4. Operculum calcareous; shell usually polychromatic, with complex (variegated)

¹ However, the "Rumphian naticids" may also have originated from islands near Ambon itself, since several species described by Rumphius do not actually occur in Ambon (H.L. Strack, pers. comm.)

- colour patterns 5
- Operculum corneous; shell monochromatic or with simple colour bands 9
- 5. Umbilicus circular to ovate; fused parietal and umbilical calluses *Natica* (p. 357)
- Umbilical region crescent-shaped, parietal and umbilical calluses separated by notch 6
- 6. Semicordate, asymmetrical umbilical callus 7
- Semicircular, symmetrical umbilical callus 8
- 7. Operculum with one-two marginal ribs *Notocochlis* (p. 364)
- Operculum with numerous ribs *Naticarius* (p. 360)
- 8. Umbilicus chink-like, nearly filled by callus *Tectonatica* (p. 374)
- Umbilicus deep, separated from callus *Tanea* (p. 371)
- 9. Shell not glossy, early teleoconch bluish to reddish brown; later teleoconch variable bluish grey margin to sandy brown; well developed umbilical callus *Neverita* (p. 363)
- Shell not as above 10
- 10. Shell glossy, monochromatic *Polinices* (p. 366)
- Shell glossy, polychromatic *Mammilla* (p. 353)

Naticidae Guilding, 1834²

Although “traditional” classifications of this family have recognized four subfamilies — Ampullospirinae, Naticinae, Polinicinae, and Sininae (e.g., Marincovich, 1977) — my unpublished phylogenetic analyses have demonstrated that two subfamilies (Ampullospirinae and Polinicinae) are artificial paraphyletic groups. Since it is beyond the scope of the present paper to resolve the higher level classification of this family, I have simply arranged the naticid genera in alphabetical order, although I have made reference to certain genera as being “naticine” (i.e, belonging to the Naticinae, the only group to have calcareous opercula).

Eunaticina Fischer, 1885

There are several species of the genus *Eunaticina* in the Indo-Pacific region; the two most common and likely to be confused are *E. papilla* (Gmelin, 1791) and *E. linnaeana* (Récluz, 1843). Arakawa & Kira (1957) were the first to properly differentiate these two species: *E. papilla* is pyriform, with a long, narrow aperture whereas *E. linnaeana* is more globose with a proportionately wider aperture. Furthermore, their radulae are distinct and although their geographical distributions broadly overlap, their actual habitats do not. *E. papilla* lives in 20-40 meter depths while *E. linnaeana* lives in shallower depths from tidal flats to c. 20 meters (see also Majima, 1989: 68, 69). Empty shells of both species can be found washed up in shallow habitats, such as the specimen of *E. papilla* obtained by the expedition. Both species have been recorded from Borneo and various islands in Indonesia (including Ambon itself), but only *E. papilla* was actually obtained by the expedition.

² Most authors, including myself (Kabat, 1990: 424), have attributed this family name to Forbes, 1838. However, J.-P. Rocroi (in litt. Jan. 1993) has kindly informed me that Guilding (1834: 29) established this name four years prior to Forbes.

Eunaticina papilla (Gmelin, 1791)
(fig. 1)

“Papilla seu Ruma Felis” Chemnitz, 1781: 285, pl. 189 fig. 1939.

Nerita papilla Gmelin, 1791: 3675.

Sigaretus papilla (Gmelin, 1791). Reeve, 1864: pl. 4, figs. 19a, b.

Sinum (*Eunaticina*) *papilla* (Gmelin, 1791). Arakawa & Kira, 1957: 8.

Eunaticina papilla (Gmelin, 1791). Majima, 1989: 68, text-figs. 15.36, 23.1a-d; pl. 10 fig. 16 [further synonymy].

“*Eunaticina* (*Eunaticina*) *linnaeana*” (Récluz, 1843). Kilburn, 1976 [partim]: 878, fig. 21 [right specimen; left specimen is *E. linnaeana* (Récluz, 1843)].

The expedition collected one specimen of this species at station 30. This species is known from the western Indian Ocean to Southeast Asia, the Philippines northwards to Japan, Indonesia, tropical Australia, and from Vanuatu (New Hebrides) and New Caledonia in Melanesia. It is not known further east in the Pacific Ocean.

Other Malaysian and Indonesian records.— **Malaysia:** Sandy Plain, Sandakan, Borneo [USNM 657768, 666745]; Marudu Bay, Borneo [USNM 632290]; USBF 5580, 162 fms, Sibutu Id., Darvel Bay, Borneo [USNM 287019]; Singapore [AMS]; **Indonesia:** Ambon [RMNH]; Welkomst Bay, Java [USNM 260904, 260905].

Mammilla Schumacher, 1817

The expedition collected five of the nine Indo-Pacific species of this genus at Ambon. The common *M. maura* (Lamarck, 1816), with Indonesian records from Ambon, Sumatra and Irian Jaya [specimens in ANSP, MCZ, RMNH and USNM], was not found by the expedition. The rare *M. priamus* (Récluz, 1844) is known from several old museum records from the “Moluccas”, but no modern collections from Indonesia or Malaysia have been made.

Key to species of *Mammilla* known to occur at Ambon:

- 1. Shell orangish to chocolate brown *M. maura*
- Shell white with spots or bands 2
- 2. Columella thin and concave; three rows of irregular dark brown spots on whitish whorls *M. melanostomoides*
- Columella thicker and nearly straight; colouration not as above 3
- 3. Colouration of broken, wavy axial lines, forming irregular maculations ... *M. simiae*
- Colouration of solid spiral bands or spots 4
- 4. Colouration of 2-3 rows small brown spots and streaks on outer whorl ... *M. sebae*
- Colouration of solid bands 5
- 5. Columella dark brown; shell greyish white with three pale brown to grey spiral bands *M. melanostoma*
- Columella pale orange brown; shell yellowish white with irregular reddish brown axial lines and medial white band *M. fibrosa*

Mammilla fibrosa (M.E. Gray, 1850)
(figs 2-3)

“Naticæ fibreuse” Souleyet, 1841: caption to pl. 35 figs. 8-11.

Natica fibrosa “Eydoux” M.E. Gray, 1850: 82, pl. 122 fig. 4 [name and figure only; illustration redrawn from Souleyet, 1841].

Natica fibrosa Souleyet, 1852: 581, pl. 35 figs. 8-11. Yen, 1942: 210, pl. 16 fig. 94.

Natica filosa Reeve, 1855: pl. 17 figs. 72a, b. Not *Natica filosa* Philippi, 1845 [Eastern Atlantic].

Natica sebae (Récluz, 1844), *sensu* Reeve, 1855: pl. 17 fig. 74.

Natica melanostoma var. *fibrosa* Souleyet, 1852. Tryon, 1886: 51, pl. 21 fig. 17.

Mammilla plumatilis Iredale, 1936: 312, pl. 23 fig. 18.

Polinices (*Mammilla*) *mammatus* (Röding, 1798), *sensu* Cernohorsky, 1972: 101, pl. 27, fig. 3.

The expedition collected one specimen, tentatively referred to this species, at station 34. This species is known from Southeast Asia, the Philippines northwards to Japan, tropical Australia, Indonesia and Papua New Guinea. In addition, single lots are known from Suva, Fiji and Pago Pago, Samoa.

Other Malaysian and Indonesian records.— **Malaysia:** (none); **Indonesia:** 50-52 fms, Udjir Id., Wokir, Aru Ids. [USNM 747397]; Keledjitan, Java [USNM 260909]; 4 fms, Cape Mantoewoeri, Koeroedoi Id., Irian Jaya [ANSP 206882]; Halmahera Id., Moluccas [USNM 837255]; Lho-Seumaweh, Sumatra [USNM 710245].

Mammilla melanostoma (Gmelin, 1791)
(figs 4-5)

“Mamma Aethiopiassae” Chemnitz, 1781: 278, pl. 189 figs. 1926-1927.

Nerita melanostoma Gmelin, 1791: 3674.

Nerita melanostoma var. *zeta* Gmelin, 1791: 3675. Reference cited: Rumphius (1705), pl. 22, fig. E [dorsal view, indeterminate].

Natica melanostoma (Gmelin, 1791). Deshayes, 1838: 631; Philippi, 1852 [partim]: 30, pl. 4 figs. 5, 6 [not 15, 16: *M. mammatus* (Röding, 1798)]; Tryon, 1886: 50, pl. 21 figs. 13-14.

Natica opaca Récluz, 1851: 199.

Natica melanostoma Gmelin var. *lactea* Philippi, 1852: 31.

Natica melanostoma (Gmelin, 1791) var. *zonata* Philippi, 1852: 31, pl. 4 figs. 5, 6.

Natica melanochila Philippi, 1852: 56, pl. 9 fig. 3.

Natica succineoides Reeve, 1855: pl. 17 figs. 73a, 73b.

Polinices melanostoma (Gmelin, 1791). Cernohorsky, 1970: 177.

Polinices (*Mammilla*) *melanostomus* (Gmelin, 1791). Cernohorsky, 1971: 197, figs. 62-65; 1972: 101, pl. 26 fig. 8.

Polinices melanostomus (Gmelin, 1791). Cernohorsky, 1978: 44; Kay, 1979: 208, figs. 73C, D [not 73A, B: *Mammilla sebae* (Souleyet, 1852)].

Polinices (*Mammilla*) *mammatus* (Röding, 1798), *sensu* Powell, 1979: 156.

The expedition collected this species, by far the most abundant of its genus, at five stations (15, 17, 27, 30, 34). The species is known from across the entire Indo-Pacific region except that the Japanese records are limited to Okinawa (Ryukyus). However, in Hawaii, easternmost French Polynesia and the Pitcairn Islands, *M. melanostoma* is less abundant than is *M. simiae* (Deshayes, 1838).

Other Malaysia and Indonesia records.— **Malaysia:** Bedok Beach, Singapore

[USNM 611727]; Mandi Darrah Id., Borneo [USNM 633472]; Sibuan Id., Borneo [USNM 657514]; **Indonesia**: Ambon [RMNH]; Koeta [Kuta] Beach, Bali [USNM 609967]; Bali [BPBM 237986]; Boela, Ceram, Celebes [USNM 347917]; Morotai [AMS C.68911]; Morissa, Jorontali, Celebes [MCZ 243764]; Hollandia, Irian Jaya [USNM 612000]; Babi Id., Aru Ids., Moluccas [USNM 755447]; Kajoa Id., Moluccas [USNM 746389]; Labuan Olendir, Selaru, Tanimbar, Moluccas [USNM 747617]; Pulau Siburu, Sumatra [USNM 654690].

Mammilla melanostomoides (Quoy & Gaimard, 1832)
(figs 6-7)

Natica melanostomoides Quoy & Gaimard, 1832: 229, pl. 66 figs. 4-8.

Natica melanostomoides emend. Quoy & Gaimard, 1832. Deshayes, 1838: 652; Gray, 1850: 82; Philippi, 1852: 58, pl. 9 fig. 5.

Natica melanostoma Gmelin var. *subpicta* Philippi, 1852: 31.

Natica macrostoma Philippi, 1852: 55, pl. 9 fig. 1.

Natica melanostoma var. *melanostomoides* Quoy & Gaimard, 1832. Tryon, 1886: 50, pl. 22 fig. 21.

Polinices (Mammilla) melanostomoides (Quoy & Gaimard, 1832). Cernohorsky, 1971: 199, figs. 66-67; 1972: 102, pl. 27 fig. 4; Powell, 1979: 156.

The expedition collected this species at four stations (17, 18, 26 and 36). It is among the rarer of the "widespread" Indo-Pacific species of *Mammilla*, being known from scattered locations in the Indian Ocean, more abundantly from Philippines, Indonesia and Papua New Guinea, with a few records from Queensland, New Zealand, the Solomon Islands and Fiji.

Other Malaysian and Indonesian records.— **Malaysia**: Sabang, Jesselton, Borneo [USNM 658340]; **Indonesia**: Keledjitan, Java [USNM 260908]; Koeta [Kuta] Beach, Bali [ANSP 196688; MCZ 208692; USNM 609969]; Bali [AMS C.60925; ANSP 319705; MCZ 155181]; Karakelang Id., Moluccas [MCZ 239121]; Biak, Irian Jaya [AMS C.105180]; Hollandia, Irian Jaya [USNM 612001]; Manokwari, Irian Jaya [ANSP 249682].

Mammilla sebae (Récluz, 1844)
(figs 8-9)

"Natices de Seba" Souleyet, 1841: caption to pl. 35 figs. 6, 7.

Natica sebae Récluz, 1844: 214, ex Souleyet MS. Philippi, 1853: 123, pl. 18 fig. 1.

Natica zanzebarica Récluz, 1844: 213. Philippi, 1853: 125, pl. 18 fig. 3.

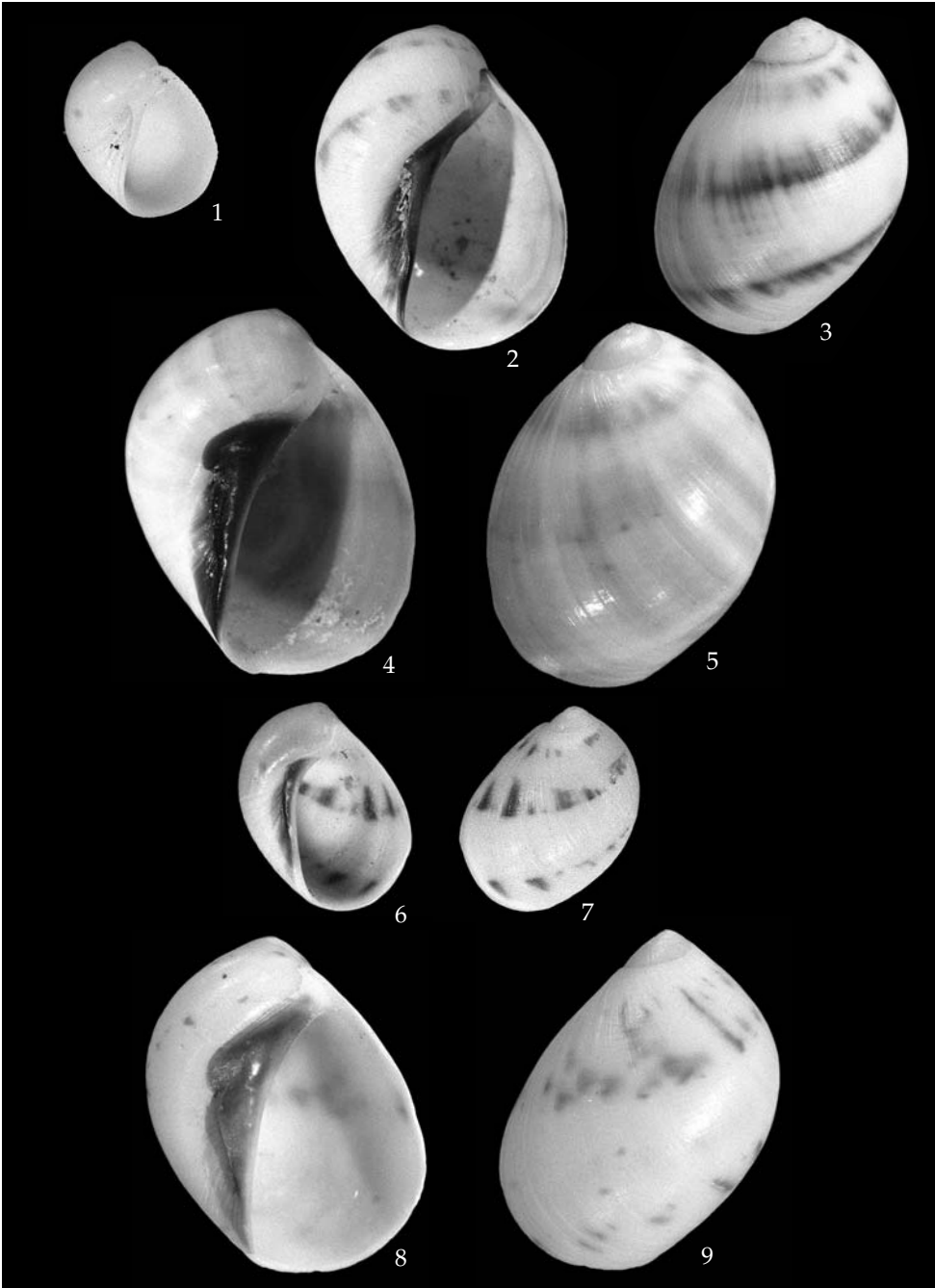
Natica melanostoma (Gmelin, 1791) var. *maculata* Philippi, 1852: 31.

Natica melanostoma (Gmelin, 1791) var. *subfasciata* Philippi, 1852: 31.

Natica sebae "nobis" Souleyet, 1852: 579-80. Apparently Souleyet was unaware that Récluz (1844) had already described this species (see also Kilburn, 1976: 861-862; Kabat, *et al.*, 1997: 23).

The expedition collected this moderately common species at four stations (1, 4, 34 and 38). This species is known from the Indian Ocean, Southeast Asia, Philippines, Indonesia, tropical Australia, and eastwards into Melanesia.

Other Malaysian and Indonesian records.— **Malaysia**: (none); **Indonesia**: Ambon [MCZ 242668]; Koeta [Kuta] Beach, Bali [USNM 703472]; Batjan Id., Moluccas [MCZ 242676]; Tengah Id., Moluccas [MCZ 239117]; 20-25 fms, Roemwakon, Aeri Id.,



Figs. 1-9, Naticidae. 1, *Eunaticina papilla* (Gmelin, 1791), Stn 30; 10.0 × 8.6 mm. 2-3, *Mammilla fibrosa* (M.E. Gray, 1850), Stn 34; 22.0 × 17.3 mm. 4-5, *Mammilla melanostoma* (Gmelin, 1791), Stn 17; 25.0 × 20.9 mm. 6-7, *Mammilla melanostomoides* (Quoy & Gaimard, 1832), Stn 17; 11.7 × 10.2 mm. 8-9, *Mammilla sebae* (Récluz, 1844), Stn 1; 27.9 × 23.6 mm.

Geelvink Bay, Irian Jaya [ANSP 205608]; 25-48 ft, Dauwi, Wamsoi Ids., Irian Jaya [ANSP 255248]; 5 miles NW of Rani Id., Schouten Ids. [ANSP 207595].

Mammilla simiae (Deshayes, 1838)
(figs 10-11)

“Ruma Simiae” Chemnitz, 1781: 285, pl. 189 fig. 1938.

Nerita melanostoma Gmelin var. *delta* Gmelin, 1791.

Natica sigaretina Menke, 1828: 26. Menke, 1830: 46. A junior homonym of *Natica sigaretina* J. Sowerby, 1824 [Tertiary, Europe].

Natica simiae Deshayes, 1838: 652. Philippi, 1852: 35, pl. 4 fig. 17; Reeve, 1855: pl. 17 figs. 76a, b; pl. 22 figs. 98a, b; Tryon, 1886: 51, pl. 21 figs. 19-20.

Natica samarensis Récluz, 1844: 214. Philippi, 1853: 149.

Mammilla propesimiae Iredale, 1929a: 340, pl. 38 fig. 5.

Polinices simiae (Deshayes, 1838). Kay, 1979: 210, figs. 73G, H.

Polinices (Mammilla) simiae (Deshayes, 1838). Cernohorsky, 1971: 199, fig. 68; 1972: 102, pl. 27 fig. 2; Powell, 1979: 156, pl. 32 figs. 14, 15.

The expedition collected this species at station 35. This common species is found throughout the Indo-Pacific; its range broadly overlaps with that of *M. melanostoma* (Gmelin, 1791), except that *M. simiae* is abundant in several areas where *M. melanostoma* is absent or only known from single records: Japan proper, eastern French Polynesia, the Pitcairn Islands and Hawaii.

M. simiae is apparently the only Indo-Pacific naticid known to occur in the Eastern Pacific, with stray populations found at Isla del Coco (“Cocos Island”, 5°32’N, 87°4’W), c. 500 km southwest of Costa Rica (Hollmann, 1996); Clipperton Island (10°18’N, 109°11’W), c. 1110 km southwest of Mexico; and Isla Ladrões, Golfo di Chiriquí, Panama (7°53’N, 82°28’W), c. 50 km south of western Panama (Chaney, 1996: 82). However, it is not known to be an established species on the mainland of tropical west America; instead, the congeneric *M. caprae* (Philippi, 1850) is found from Mexico to Peru and the Galápagos Islands (Marincovich, 1977: 299-300).

Other Malaysian and Indonesian records.— **Malaysia:** (none); **Indonesia:** Ambon [MCZ 242675]; 6-8 fms, Tg Lelar, Trangan, Aru Ids. [USNM 747433]; 27-40 fms, Wasir Id., Aru Ids. [USNM 747214, 747296]; Sanur Beach, Bali [AMS]; Bali [BPBM 233665]; 14-26 fms, Tg Tutuhuhur, Piru Bay, Ceram Id. [USNM 746694]; 20 fms, Du Rowa, Kai Ids. [USNM 746967]; Batjan Id., Moluccas [MCZ 242667]; Pulau Melila, Sumatra [USNM 661992]; Maru Bay, Sarawak [ANSP 255837]; Biak, Irian Jaya [ANSP 206280]; Hollandia, Irian Jaya [USNM 611999]; Middleburg Id., Irian Jaya [AMS C.71617].

Natica Scopoli, 1777

The expedition collected three species of this pan-tropical genus, along with two unidentifiable lots. The first species is represented by one lot; the other two were found at six and nine stations, respectively.

In addition, several other species of *Natica* s. str. are known from Indonesia, including the type species *Natica vitellus* (Linnaeus, 1758) and *N. stellata* (Hedley, 1913). Both species were known to Rumphius; their presence in Ambon is corroborat-

ed by older museum collections [RMNH]. Further deep water collecting would likely obtain specimens of these other species of *Natica* s. str., as well as several other naticid genera discussed herein.

In the older literature, most species of the Naticinae were classified as “*Natica*”, but more recent studies have recognized other full genera. Specifically, the genera *Naticarius*, *Notocochlis*, *Tanea* and *Tectonatica* are used herein for certain naticine species. Thus the traditional subfamily Naticinae (the only naticids to have calcareous opercula) is represented by five genera and fourteen identified species in this report.

Key to species of *Natica* s. str. known from Ambon

- 1. Colour patterns irregularly reticulate or netted 2
- Colour patterns solid or symmetrical 3
- 2. Shell white with variegated axial lines; protoconch bluish grey *N. buriasiensis*
- Shell yellow-orange with irregular reddish brown maculations; protoconch reddish brown *N. arachnoidea*
- 3. Protoconch dark reddish brown; teleoconch chestnut brown with 2 pale white spiral bands *N. fasciata*
- Shell light orangish white to reddish brown 4
- 4. Colouration of 1-2 spiral rows of white squarish spots on orange teleoconch *N. stellata*
- Colouration of 1-2 spiral rows of white bands *N. vitellus*

Natica arachnoidea (Gmelin, 1791)
(fig. 12)

“*Nerita lineis rufis subtilissimus*” Chemnitz, 1781: 271, pl. 188 figs. 1915-1916.
Nerita arachnoidea Gmelin, 1791: 3674.
Natica arachnoidea (Gmelin, 1791). Lamarck, 1822: 203; Philippi, 1850: 25, pl. 3 figs. 18-19.
Natica raynoldiana Récluz, 1844: 212. Tryon, 1886: 20, pl. 3 fig. 57.
Natica raynaudiana “Récluz” Reeve, 1855: pl. 13 figs. 56a, 56b. Sowerby, 1883: 90, pl. 7, fig. 88. Error (or emendation?) for *Natica raynoldiana* Récluz, 1844.
Natica crassa Schepman, 1909: 212. A junior homonym of *Natica crassa* Nyst, 1845.
Uber schepmani Finlay, 1927: 499. Replacement name for *Natica crassa* Schepman, 1909.
Natica (*Natica*) *arachnoidea* (Gmelin, 1791). Cernohorsky, 1971: 177, figs. 14-17; 1972: 95, pl. 24 fig 7; Kilburn, 1976: 833, fig. 1d.

The expedition collected one lot of this species from station 37. This species is moderately common in the Indo-Pacific, ranging from the western Indian Ocean to Fiji and the Marshall Islands, but it does not occur further eastwards in the Pacific Ocean.

Other Malaysian and Indonesian records.— **Malaysia:** Pulau Sudong, Malaysia [AMS]; Singapore [MCZ 208715]; Sarawak River mouth, Borneo [MCZ 208716]; Balambangan, Sabah [AMS C.16719]; **Indonesia:** Ambon [MCZ 87440; RMNH]; Kaipoei, Koeroedo Id. [ANSP 206655]; Hollandia, Irian Jaya [USNM 611993].

Natica buriasiensis Récluz, 1844
(figs 13-16)

- Natica buriasiensis* Récluz, 1844: 212. 7 fathoms, Burias Id., Philippines. Philippi, 1853: 133, pl. 18 fig. 17; Reeve, 1855: pl. 27 fig. 128; Sowerby, 1883: 95, pl. 8 fig. 131; Tryon, 1886: 29, pl. 8 fig. 58.
- Natica trailli* Reeve, 1855: pl. 29 figs. 137a, 137b. Malacca. Tryon, 1886: 19, pl. 3 fig. 50.
- ? *Natica atypha* Watson, 1881: 254. Challenger St. 188, 28 fms., 9°59'S, 139°42'E, S of Cape York, S.W. of Papua. Holotype, BMNH 1887.2.9.1354. Watson, 1886: 438, pl. 27 figs. 2a-2c.
- Natica pseustes* Watson, 1881: 255. Levuka, Fiji. Holotype BMNH 1887.2.9.1361. Watson, 1886: 444, pl. 27 figs. 3a-3c; Loch, 1988a: 8-9, 6 figs.
- Natica (Eunatica) telal-jaraneae* Melvill, 1901: 552, pl. 9 fig. 2. Aden, Yemen. Holotype BMNH 1902.12.30.123 [figured, Loch, 1988a].
- Natica supraornata* Schepman, 1909: 212-3 pl. 13 fig. 4. Siboga Stat. 274, 57 meters, near Aru Ids., 5°28.2'S, 134°53.9'E. 3 syntypes, ZMA 3.09.058.
- Natica kempi* Preston, 1916: 90, figs. 3, 3a, 3b. Port Blair, Andaman Islands. Type material presumably in Zoological Survey of India (Calcutta).
- Naticarius lavendula* Woolacott, 1956: 73, figs. 1, 4. Brampton Id., 20°49'S, 149°17'E, Queensland, Australia. Holotype, AMS C61859 [also figured by Loch, 1988a]; 10 paratypes, AMS C.152932.
- Natica (Natica) pseustes* Watson, 1881. Cernohorsky, 1971: 182, fig. 27.
- Natica (Natica) roscoei* Kilburn, 1976: 839, figs. 4a-4b, 7c, 12a. Bazaruto Archipelago, southern Mozambique. Holotype, NMG4907/T1950 and 4 paratypes, NM G4498/T1950.

Natica buriasiensis was the most common of the three species of *Natica* s. str. to be collected by the expedition: it was found at stations 1, 5, 23, 28, 29, 31, 32, 33 and 34.

This common but often overlooked species is primarily found in the Indian Ocean and the western part of the tropical Pacific Ocean; there are only a few records from Micronesia and none from Polynesia. Loch (1988a) has clarified some of the significant confusion in the literature regarding this species and its synonyms. As the synonymy of this species has not been fully presented, I include a complete synopsis of its junior synonyms. Loch (1988a) recognized *Natica pseustes* as the oldest name for this protean species but I have determined that *N. buriasiensis* is an yet earlier name.

Other Malaysian and Indonesian records,— **Malaysia:** Kuantan [AMS]; **Indonesia:** Bali [AMS]; 6-12 fms, E of Mios Woendi Id., Padaido Ids. [ANSP 205787]; USBF 5642, 37 fms, Buton Strait, Celebes [USNM 279897]; 10 fms, N of Kai Dulah Id., Moluccas [USNM 747084]; 12 fms, W of Tg Derehi, Trangan, Aru Ids., Moluccas [USNM 755673]; 2 fms, N of Labuan Olendir, Selaru, Tanimbar, Moluccas [USNM 747648]; 7-8 fms, 3 miles SE Saberbaba, Japen Id., Geelvink Bay, Irian Jaya [ANSP 303378]; N of Ambai Village, Japen Id. [ANSP 207307].

Natica fasciata (Röding, 1798)
(fig. 17)

"Papilla seu Ruma Lupi" Chemnitz, 1781: 286, pl. 190 figs. 1940-1941.

Nerita melanostoma Gmelin var. *epsilon* Gmelin, 1791: 3674.

Albula fasciata Röding, 1798: 21.

Natica solida Blainville, 1825: 251. Tryon, 1886: 45, pl. 20 fig. 98.

Natica cinnamomea Menke, 1830: 47, 169. Philippi, 1852: 27, pl. 3 figs. 22-23.

Natica lupinus Deshayes, 1838: 648.

Natica (Natica) fasciata (Röding, 1798). Cernohorsky, 1971: 178, figs. 18-20.

The expedition collected this species at stations 4, 5, 16, 20, 26 and 27. This species is a primarily continental-margin taxon with some more distant records; it is known from India, China, Okinawa, the Philippines, Indonesia, Australia eastwards to New Caledonia, with a few records from Fiji, Belau (Palau) and the Caroline Islands.

Other Malaysian and Indonesian records.— **Malaysia:** Pulau Sudong, Singapore [AMS]; Mersing [AMS]; Kudat Bay, North Borneo [USNM 632135]; **Indonesia:** Pombo Id., Haruku Strait, E of Ambon [USNM 746580]; Ambon [RMNH]; Rouw Id., Aoeri Ids. [MCZ 215365]; Sawai, Ceram, Celebes [RMNH]; Nuhu Jaan, Elat Bay, Nuhu Tjut, Kai Ids. [USNM 747145]; Tg Nuan, Jamdena Strait, Tanimbar Ids. [USNM 747575]; Tg Tuwau, Selaru, Tanimbar Ids. [USNM 747657]; Jayapura, Irian Jaya [USNM 611997].

Naticarius Duméril, 1806

The expedition collected three species (but only four lots total) of this common, pan-tropical naticine genus. *Naticarius alapapilionis* (Röding, 1798), a species known to Rumphius and represented by older museum records from Ambon [RMNH], was not collected by the expedition.

Key to species of *Naticarius* known from Ambon.

- 1. Shell creamy white *N. orientalis*
- Shell with solid or spotted colour patterns 2
- 2. Shell with 4-5 spiral rows of small reddish brown spots; protoconch white *N. onca*
- Shell not as above 3
- 3. Shell with 2-3 reddish brown spiral rows overlying pale yellowish brown whorl; protoconch white *N. zonalis*
- Shell with 2-3 spiral rows of white lines with reddish-brown bars overlying reddish brown whorl *N. alapapilionis*

Naticarius onca (Röding, 1798)
(figs 18-19)

“Pavimentum Chinense” Chemnitz, 1781: 264, pl. 187 figs. 1887-1889.
Nerita canrena Linnaeus var. *psi* Gmelin, 1791: 3670. References cited included Rumphius (1705), pl. 22, fig. C.
Cochlis onca Röding, 1798: 147.
Cochlis pavementum Röding, 1798: 147.
Natica litterata Link, 1807: 140.
Natica chinensis Lamarck, 1816: 11, pl. 453, figs. 3a, 3b. Lamarck, 1822: 204; Deshayes, 1832: 604; 1838: 644; Philippi, 1850: 19, pl. 2 figs. 15-18; Reeve, 1855: pl. 19 figs. 82a, 82b; Tryon, 1886: 20, pl. 3 figs. 53, 54.
Nerita candida Wood, 1825: 169, pl. 35 fig. 2a.
Natica pavementum (Röding, 1798). Récluz, 1844: 208; Philippi, 1853: 132, pl. 18 fig. 16; Reeve, 1855: pl. 28 fig. 132.
Natica cailliaudi Récluz, 1850: 392, pl. 8 fig. 9.
Natica pavementum “Récluz” (Röding, 1798). Tryon, 1886: 27, pl. 7 figs. 38-39.

Natica (*Naticarius*) *onca* (Röding, 1798). Cernohorsky, 1971: 186, figs. 33-35; Cernohorsky, 1972: 96, pl. 25 fig. 6; Kilburn, 1976: 844.

The expedition collected this species only at station 17. It is known from the western Indian Ocean eastwards to Samoa, with one questionable museum record from Tahiti.

Other Malaysian and Indonesian records.— **Malaysia:** Mandi Darrah Id., North Borneo [USNM 632155, 633470]; Balambangan, Sabah, Borneo [AMS C.16723]; **Indonesia:** Ambon [MCZ 87446]; Pulau Bai, Batu Ids., Sumatra [USNM 654493]; 14-26 fms, Tg Tutuhuhu, Piru Bay, Ceram [USNM 746684]; 20 fms, N of Du Rowa, Kai Ids., Moluccas [USNM 746944]; Labuan Olendir, Selaru, Tanimbar Ids., Moluccas [USNM 747640]; Mios Woendi Id., Schouten Ids. [MCZ 302474]; 15-40 ft, Noekori Id., Schouten Ids. [ANSP 277616].

Naticarius orientalis (Gmelin, 1791)
(fig. 20)

“*Nerita subfulva*” Chemnitz, 1781: 268, pl. 188 figs. 1898-1899.

“*Nerita eburnea, candidissima*” Chemnitz, 1781: 268, pl. 188 fig. 1904.

Nerita orientalis Gmelin, 1791: 3673.

Albula vitellus (Linnaeus, 1758), *sensu* Röding, 1798: 20.

Cochlis explanata Röding, 1798: 146.

Natica eburnea Deshayes, 1838: 646. Philippi, 1851a: 22-23, pl. 3 figs. 3, 4, 9. A junior homonym of *Natica eburnea* Cristofori & Jan, 1832.

Natica orientalis (Gmelin, 1791). Reeve, 1855: pl. 16 figs. 69a-d; Tryon, 1886: 43, pl. 20 figs. 1, 2.

Natica (*Naticarius*) *orientalis* (Gmelin, 1791). Kilburn, 1976: 844, fig. 6.

The expedition collected this species only at station 16. This species is the largest-sized Indo-Pacific representative of *Naticarius* and is comparable in size to its tropical Western Atlantic congener *N. canrena* (Linnaeus, 1758). However, *N. orientalis* is significantly rarer in museum collections (than is *N. canrena*) and is found primarily in deep water dredgings. Its range spans the Indo-Pacific, with a conspicuous gap between New Caledonia and the Marquesas Islands. In Micronesia, it is only known from Belau (Palau) and Kwajalein in the Marshall Islands; in Polynesia, only from the Marquesas.

Other Malaysian and Indonesian records.— **Malaysia:** Singapore [AMNH 23144, 49241]; **Indonesia:** Batjan Id., Moluccas [MCZ 302479]; Ternate Id., Moluccas [USNM 837227]; USBF 5624, 288 fms, off Makyan Id., Moluccas [USNM 239297].

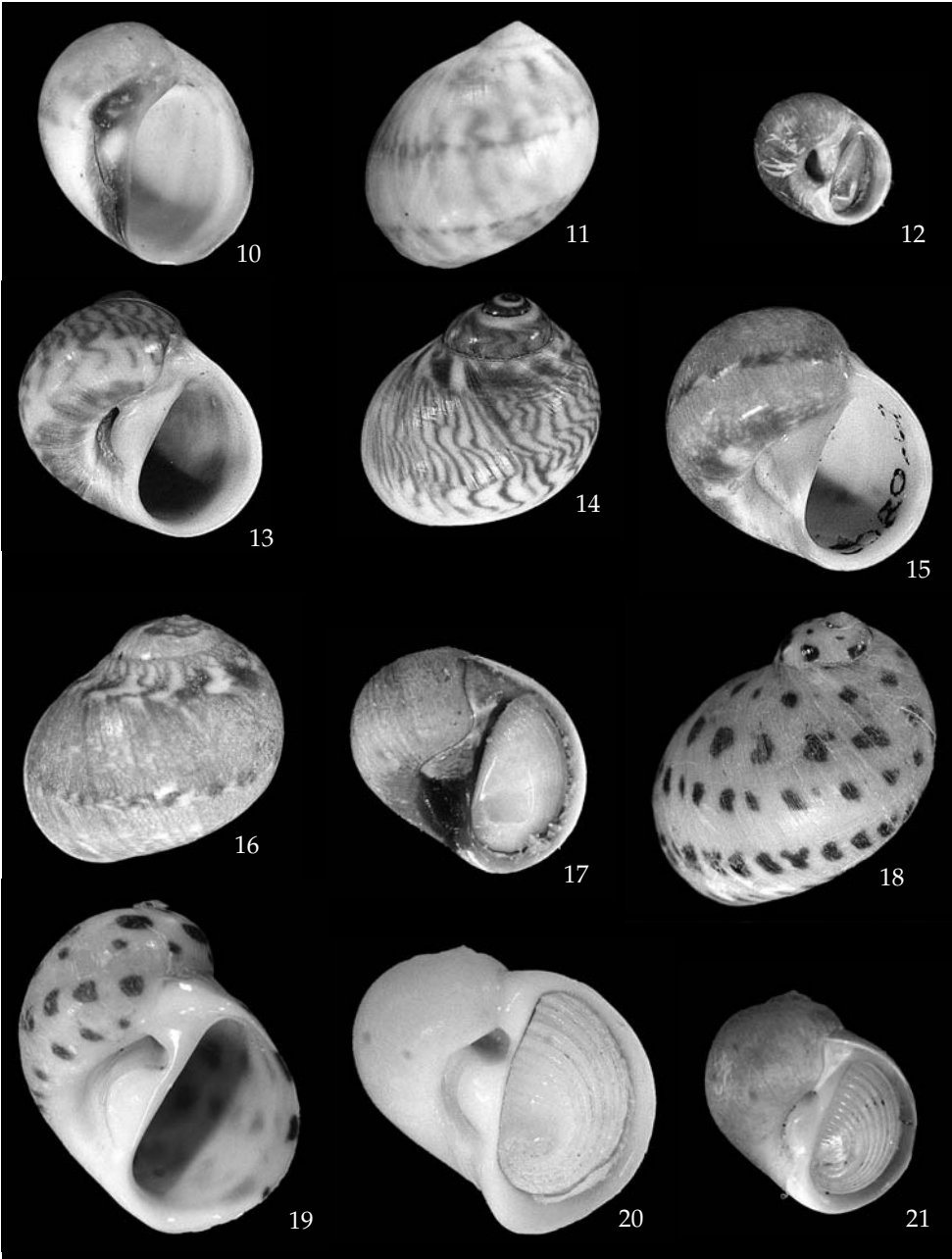
Naticarius zonalis (Récluz, 1850)
(fig. 21)

Natica zonalis Récluz, 1850: 386, pl. 14 figs. 9-10. Tryon, 1886: 29, pl. 8 fig. 61.

Natica nukahivensis Jardin, 1859: 188, 193. **Syn. nov.** Noukahiva (Nuku Hiva, Marquesas Islands). Type material presumed lost (P. Bouchet, *in litt.*).

Natica nucahivensis [sic] Jardin, 1859. Tryon, 1886: 54, 90 (list only).

Natica (*Naticarius*) *zonalis* Récluz, 1850. Cernohorsky, 1971: 187, figs. 37-40; 1972: 97, pl. 25 fig. 8.



Figs. 10-21, Naticidae. 10-11, *Mammilla simiae* (Deshayes, 1838), Stn 35; 21.7 × 19.1 mm. 12, *Natica arachnoidea* (Gmelin, 1791), Stn 37; 6.9 × 7.6 mm. 13-14, *Natica buriasiensis* Récluz, 1844, USNM 243265, Dupolog, Philippines; 15.6 × 15.1 mm. 15-16, *Natica buriasiensis* Récluz, 1844, USNM 694128, Barrow Island, Western Australia; 18.0 × 17.1 mm. 17, *Natica fasciata* (Röding, 1798), Stn 16; 12.5 × 12.9 mm. 18-19, *Naticarius onca* (Röding, 1798), Stn 17; 22.5 × 19.8 mm. 20, *Naticarius orientalis* (Gmelin, 1791), Stn 16; 22.8 × 24.1 mm. 21, *Naticarius zonalis* (Récluz, 1850), Stn 31; 12.3 × 11.6 mm.

The expedition collected *N. zonalis* only at station 31. This rare species is not known from the Indian Ocean except at Western Australia. This species is found in the Central Pacific from Singapore eastwards to the Marquesas Islands. As for *N. orientalis*, there is a significant biogeographic gap in the locality records between Fiji and the Austral, Tuamotus, Marquesas and Gambier Islands. In other words, *N. zonalis* is not known from easternmost Melanesia (Samoa, Tonga) and westernmost Polynesia (Cook Islands and Society Islands); nor is it known from Micronesia other than Belau (Palau). I have newly synonymized Jardin's species name, which appears to have been overlooked in this century, with *N. zonalis*.

Other Malaysian and Indonesian records.— **Malaysia:** Pulau Sudong, Singapore [AMS]; Sentosa Id., Singapore [AMS]; **Indonesia:** 7-8 fms, 3 miles SE Samberba, Japen Id., Geelvink Bay, Irian Jaya [ANSP 303377].

Neverita Risso, 1826

The genus *Neverita* is represented by one common species in the Indo-Pacific, *N. didyma* (Röding, 1798). Some authors have recognized separate species or subspecies for temperate-water specimens from Japan and southern Australia. Majima (1989) has demonstrated that the Recent Japanese "species" of *Neverita* are all conspecific; the status of the Australian nominal "species" requires further study. This species has also been classified in the genus *Glossaulax* Pilsbry, 1929, which was described for an Eastern Pacific species. My unpublished phylogenetic analyses of the genera of Naticidae indicate that *Neverita* and *Glossaulax* are congeneric.

Neverita didyma (Röding, 1798)
(figs 22-23)

"*Nerita umbilicata livida*" Chemnitz, 1781: 246, pl. 186 figs. 1856-1859 [figures and description do not differentiate between *Neverita didyma* (Röding, 1798) and the Eastern Pacific *N. reclusiana* (Deshayes, 1838)].

Nerita glaucina Linnaeus, 1758 *partim*. Gmelin, 1791: 3671. Rejected as a *nomen dubium* by Kabat (1990: 21).

Albula didyma Röding, 1798: 20.

Neverita (*Glossaulax*) *didyma* (Röding, 1798). Cernohorsky, 1972: 100, pl. 26 fig. 3.

Glossaulax didyma didyma (Röding, 1798). Majima, 1989: 53, pl. 6 figs. 4-18, pl. 7 figs. 1-5 [further synonymy].

The expedition collected this species only at station 23, which is surprising considering its abundance elsewhere. This species is known from the Indian Ocean to Southeast Asia, Philippines, Japan and Korea, and temperate-tropical Australia. However, *N. didyma* is primarily a "continental margin species" — that is, it is less common on offshore Asian islands and indeed is not known from Melanesia, Micronesia or Polynesia.

Other Malaysian and Indonesian records,— **Malaysia:** Singapore [USNM 17256, 17258, 405761]; North Bonggi, North Borneo [USNM 632160]; 10 miles northwest mouth of Kinbatangan River, North Borneo [USNM 657829]; Sandakan, North Borneo [USNM 657900]; Tanjong Aru, Jesselton, North Borneo [USNM 658588]; **Indonesia:** Ambon [RMNH]; Pruput, Java [USNM 260934]; Tamandjaija, Java [USNM 260933].

Notocochlis Powell, 1933

This common pan-tropical genus rivals *Natica* s.str. in its abundance and speciation. *Notocochlis* was fairly late in being recognized as a distinct generic taxon and even today most popular sources place the included species in “*Natica*”, despite the phylogenetic differentiation of these two genera. The expedition collected three species, along with seven unidentifiable lots. The two common species, *N. cernica* and *N. gualtieriana*, are difficult to recognize from worn or juvenile specimens, hence my inability to identify those seven lots. *N. tigrina* (Röding, 1798), a primarily continental-margin species, is known from Ambon in old museum collections [RMNH] but was not found by the expedition.

Key to species of *Notocochlis* known from Ambon

- 1. Shell with numerous reddish brown dots (polka-dot pattern) *N. tigrina*
- Shell colouration not as above 2
- 2. Teleoconch yellowish white with two spiral rows of squarish reddish brown maculations; protoconch yellowish brown *N. insularum*
- Teleoconch and protoconch not as above 3
- 3. Protoconch reddish brown; teleoconch glossy white with irregular undulating axial brown lines, partially interrupted by two-three narrow spiral white bands across which the axial lines may form prosocyrct chevrons *N. cernica*
- Protoconch dull white to bluish grey. Teleoconch colouration polymorphic; usually:
 - (1) bluish-greenish grey with several irregular narrow spiral and axial bands;
 - (2) white with five-six spiral rows of reddish brown oblong maculations;
 - (3) solid reddish to purplish brown with some axial markings as in (1) or;
 - (4) various combinations of 1-3 *N. gualtieriana*

Notocochlis cernica (Jousseaume, 1874)
(fig. 24)

Natica cernica Jousseaume, 1874: 19, pl. 2 figs. 13, 14. Mauritius. 7 syntypes, MNHN. Tryon, 1886: 24, pl. 5 fig. 96; Drivas & Jay, 1988: 42, pl. 6 fig. 13.

Natica jousseaumei Euthyme, 1885: 239. **Syn. nov.** New Caledonia. Type material lost (P. Bouchet, *in litt.*).

Natica nebulosa Schepman, 1909: 209, pl. 13 fig. 2. Siboga St. 240, 9-45 m, Banda. Holotype, ZMA 3.09.056.

Notocochlis sagittata hancockae Powell, 1971: 215, fig. 7. Urupukapuka Island, Bay of Islands, North Island, New Zealand. Holotype, AIM. Powell, 1979: 154, pl. 32 fig. 10.

Natica (Natica) cernica Jousseaume, 1874. Kilburn, 1976: 832, figs. 1a-c.

Natica ochrostigmata Rehder, 1980: 64, pl. 8 figs. 13-15. **Syn. nov.** Launiupoko, Maui, Hawaii (and elsewhere in Hawaii, Line Islands, Cook Islands, Samoa and Easter Island). Holotype, USNM 339159; numerous paratypes (USNM and ANSP).

This species has had a quite confused nomenclatural history; Jousseaume’s easily recognizable taxon was long overlooked in favor of other, erroneously applied

names. Many authors have used "*Natica sagittata* Menke, 1843" for various Indo-Pacific records; in fact, Menke's species is endemic to Australia and is instead referable to the genus *Tanea*.

More recently, Loch (1990: 7) used *Natica lemnisciata* Philippi, 1852 as the oldest name for this species. However, my unpublished studies of the Western Atlantic Naticidae have determined that *lemnisciata* is actually a junior synonym of the tropical amphiatlantic *Notocochlis marochiensis* (Gmelin, 1791). Therefore, I have delineated the junior synonyms of *N. cernica* herein for the reader's convenience; two are herein newly synonymized.

The expedition collected *N. cernica* at stations 5, 17, 27 and 32. It is more common in deeper waters; thus the expedition obtained a larger number of its shallow water congener *N. gualtieriana*. The range of *N. cernica* covers the entire Indo-Pacific except for the Persian Gulf, Tuvalu (Ellice Islands), Tonga and Niue, although these gaps may represent collecting artifacts. It is broadly sympatric with *N. gualtieriana*, although there may be differentiation in depth preferences. Further research is needed to determine the actual habitat overlap of these two common species.

Other Malaysian and Indonesian records.— **Malaysia:** Batu Feringyi, Penang [AMS]; Port Dickson [AMS]; **Indonesia:** Bali [AMS]; Sawai, Ceram, Celebes [RMNH]; Pulau Stupai, Mentawai Ids., SW of Sumatra [USNM 655150]; Middleburg Id., Irian Jaya [AMS]; Mios Woendi Id., Padaido Ids. [ANSP 205749]; Noekori Id., Padaido Ids. [ANSP 205945].

Notocochlis gualtieriana (Récluz, 1844)
(fig. 25)

"*Neritae Maroccanæ*" Chemnitz, 1781: 270, pl. 188 figs. 1905-1910 [description and figures combine *Notocochlis gualteriana* (Récluz, 1844), the Eastern Pacific *N. chemnitzii* (Pfeiffer, 1840), and the tropical amphiatlantic *N. marochiensis* (Gmelin, 1791)].

Not "*Nerita gualtieriana*" Chemnitz, 1781: 273, Vignette 44 [page 237], Lit. A, B, C; "Ex Museo Lib. Bar. de Boul."; = *Helix (Iberus) gualtieriana* Linnaeus, 1758 [Gastropoda Pulmonata; Spain].

Natica gualteriana Récluz, 1844: 208. Récluz, 1850: 396; Philippi, 1852: 71, pl. 11 fig. 8; Reeve, 1855: pl. 25 figs. 114a, 115b; Hedley, 1913: 298; Cernohorsky, 1978: 44; Kay, 1979: 207, figs. 72E, F, 82B.

Natica tessellata Philippi, 1849b: 158. Philippi, 1852: 48, pl. 7 fig. 7.

Natica antoni Philippi, 1851b: 48. Philippi, 1853: 144, pl. 19 fig. 8; Tryon, 1886: 26, pl. 6 fig. 25.

"*Natica lurida*" Philippi, 1836. Philippi, 1852: 79, pl. 12 figs. 3-4 [*partim*; Philippi described this species from the Mediterranean and later (1852) extended to Indo-Pacific specimens].

Natica locellus Reeve, 1855: pl. 28 fig. 134. Tryon, 1886: 24, pl. 6 fig. 2 ["possibly a variety of *marochiensis*"].

Natica asellus Reeve, 1855: pl. 29 fig. 136a-b. Tryon, 1886: 24, pl. 6 fig. 34.

Natica gualtieriana emend. Récluz, 1844. Melvill & Standen, 1899: 172.

Natica (Polinices) burnupi Smith, 1903: 385, pl. 15 fig. 11.

Natica balteata Sowerby, 1914: 5, figd.

Natica nemo Bartsch, 1915: 139, pl. 13 figs. 6, 9, 12.

Cochlis migratoria Powell, 1927: 560, pl. 33 figs. 3-6.

Cochlis vafer Finlay, 1930: 232 (not figured).

Natica (Natica) gualtieriana Récluz, 1844. Cernohorsky, 1971: 180, figs. 21-25; 1972: 95, pl. 24 fig. 9.

Natica (Notocochlis) gualteriana Récluz, 1844. Kilburn, 1972: 408, fig. 6.

Natica (Natica) gualteriana Récluz, 1844. Kilburn, 1976: 835.

Notocochlis gualteriana (Récluz, 1844). Majima, 1989: 77, pl. 12 fig. 21.

This species is commonly known in the older literature as "*Natica marochiensis* (Gmelin, 1791)" which is actually a tropical amphi-Atlantic species. Hedley (1913: 299) was among the first to explicitly differentiate these two taxa; nonetheless the name "*marochiensis*" remained indiscriminately applied to the Indo-Pacific species for some time. I have provided an extensive synonymy to indicate the other junior synonyms of this species.

The expedition collected *N. gualtieriana* at stations 1, 5, 6, 14, 18, 27, 29, 30, 31, 34, 35 and 36, making it the most abundant naticine species found. This species is known from the entire tropical Indo-Pacific, except that it is not known from Nauru, Niue, Phoenix Islands or Easter Island. These gaps may represent collecting artifacts, not the actual absence of this species.

Other Malaysian and Indonesian records.— **Malaysia:** Lang Kawi Id. [USNM 778589, 778617]; Sekudu Id., Strait of Johore [USNM 660691]; Bohaydulong Id., North Borneo [USNM 658032]; Tanjung Aru, Jesselton, North Borneo [USNM 658550, 658664]; Kudat Bay, North Borneo [MCZ 235540; USNM 632156]; Marudu Bay, North Borneo [USNM 632289]; Sandakan, North Borneo [USNM 657977, 658116]; Sianati, North Borneo [USNM 633508]; Sibuan Id., North Borneo [USNM 657513]; **Indonesia:** Hitu Peninsula, Ambon [RMNH]; Ambon [MCZ 87441, 87449; RMNH]; Batavia, Java [MCZ 158733]; Keledjitan, Java [USNM 260898]; Pruput, Java [USNM 260935]; Tanmandjaija, Java [USNM 260931]; Pulau Siburu, SW of Sumatra [USNM 654751]; Sanding Id., Mentawai Ids. [USNM 655250]; Gomomo Id., Pitt Pass, Celebes [USNM 243192]; Morotai, Halmahera Ids. [USNM 542519]; Pombo Id., Haruku Straits [USNM 746579]; Tomahu Id., Moluccas [USNM 243190]; Tg Tuwau, Selaru, Tanimbar Ids., Moluccas [USNM 747660]; Biak, Schouten Ids. [USNM 602366]; Mios Woendi, Schouten Ids. [USNM 542703]; Jayapura, Irian Jaya [USNM 611994, 611995].

Notocochlis insularum (Watson, 1886)
(figs 26-27)

Natica insularum Watson, 1886: 440, pl. 28 fig. 2. *Challenger* station 192, 140 fms, 5°49'15"S, 132°14'15"E, Ki [= Kai] Islands, Indonesia.

The expedition collected *N. insularum* at stations 3 and 16. This uncommon subtidal species is also known from USBF *Albatross* stations in the Philippines, South China Sea, Malaysia and Indonesia [USNM records].

Other Malaysian and Indonesian records.— **Malaysia:** USBF 5358, 39 fms, off Sandakan Light, Borneo [USNM 285734]; **Indonesia:** USBF 5626, 265 fms, off Kayoa Id., Molucca Pass [USNM 239307]; USBF 5642, 37 fms, Buton Strait, Celebes [USNM 279780], *Challenger* 192, 140 fms, Kai Kepulauan [BMNH 1887.2.9.1357, holotype].

Polinices Montfort, 1810

There are eight species of *Polinices* which are found in the western part of the tropical Pacific; the expedition obtained three (Table 1). Some authors have recognized *Mammillaria* as a separate genus from (or subgenus of) *Polinices*. My phylogenetic analyses of the naticid genera have not demonstrated any substantive characters

by which these two taxa can be separated as genera (see also Majima, 1989: 42-43). The three species sometimes referred to *Mammillaria* are *albumen* (Linnaeus, 1758) [known to Rumphius], *columnaris* (Récluz, 1850) and *peselephanti* (Link, 1807). All three are known from Ambon but none were found by the expedition.

The expedition found four of the remaining five common Indo-Pacific species invariably referred to the traditional genus *Polinices*; the rare *P. candidissima* (Le Guillou, 1842) is not known from Ambon.

Key to species of *Polinices* (including “*Mammillaria*”) known from Ambon

- 1. Well developed umbilical callus and deep umbilicus; shell aperture quite prosocline [“*Mammillaria*”] 2
- Umbilicus shallow to chink-like; shell aperture slightly prosocline 4
- 2. Shell orangish brown, extremely prosocline *P. albumen*
- Shell whitish to pale yellow-orange 3
- 3. Shell white, umbilicus deeper *P. columnaris*
- Shell yellowish to orange, sometimes with white spiral band; umbilicus shallower *P. peselephanti*
- 4. Shell yellow to golden brown; protoconch and early teleoconch white ... *P. aurantia*
- Shell white 5
- 5. Umbilicus open, shallow groove *P. flemingiana*
- Umbilicus chink like, sealed 6
- 6. Operculum pale brown; protoconch reddish-black *P. mammilla*
- Operculum blackish; protoconch white *P. mellosum*

Polinices aurantia (Röding, 1798)
(fig. 28)

“Mamma Veneris citrina” Chemnitz, 1781: 283, pl. 189 figs. 1934-1935.
Nerita melanostoma Gmelin var. *beta* Gmelin, 1791: 3674.
Albula aurantium Röding, 1798: 21.
Natica aurantia (Röding, 1798). Deshayes, 1832: 599; 1838: 632; Philippi, 1852: 34, pl. 4 figs. 13, 14; Tryon, 1886: 42, pl. 15 figs. 39-41.
Natica straminea Récluz, 1844: 211. Published in synonymy of *Natica aurantia* “Lamarck” (Röding, 1798), but validated by use prior to 1961 (Tryon, 1886: 42; see also Kabat, *et al.*, 1997: 23).
Natica sulphurea Récluz, 1844: 211. Published in synonymy of *Natica aurantia* “Lamarck” (Röding, 1798).
Natica deiodosa Reeve, 1855: pl. 9 figs. 35a-b.
Uber labyrinthum Hedley, 1924: 156, pl. 27 fig. 6.
Polinices aurantius (Röding, 1798). Cernohorsky, 1971: 194; 1972: 99, pl. 25 fig. 12.

The expedition collected this species at stations 16 and 26. This species is known from the central part of the Indo-Pacific: Hong Kong, Philippines, Japan, Malaysia and Indonesia, tropical Australia, Papua New Guinea, and eastwards in Melanesia to New Caledonia and Fiji; however, it is not found in the Indian Ocean or in Polynesia.

Other Malaysian and Indonesian records.— **Malaysia:** Singapore [ANSP 37262; USNM 89309]; Balundungan Id., Sarawak [ANSP 262593; USNM 632824]; S. Banggi,

Karakul, Sarawak [USNM 632825]; Kudat Bay, Sarawak [ANSP 255652; USNM 632157]; Mandi Darrah Id., Sarawak [USNM 632823; 633471]; Manukum Id., Jesselton, Sarawak [USNM 657862]; Sibuan Id., Sarawak [USNM 657654]; **Indonesia**: Ambon [RMNH]; Joba Id., north of Aru, Moluccas [USNM 755380]; Noekori Id. [AMS C.82895]; Rou Id., Aeri Ids., Irian Jaya [ANSP 208802]; Wararasow Shoal, Konori Id., Irian Jaya [AMS C.83060]; Timor [AMS C.139712].

Polinices flemingiana (Récluz, 1844)
(fig. 29)

Natica flemingiana Récluz, 1844: 209. Récluz, 1852: 171, pl. 7 figs. 2, 2'; Philippi, 1853: 126, pl. 18 fig. 7; Tryon, 1886: 50, pl. 16 figs. 51, 53.

Natica galactites Philippi, 1851b: 47. Philippi, 1853: 138, pl. 19 fig. 10.

? *Natica virginea* Philippi, 1852: 81, pl. 12 fig. 7. Is a junior homonym of *Natica virginea* Récluz, 1850 [= the Eastern Pacific *Polinices uber* (Valenciennes, 1832)].

Polinices (Polinices) flemingianus (Récluz, 1844). Cernohorsky, 1971: 193, figs. 46, 51-53.

Polinices flemingiana (Récluz, 1844). Cernohorsky, 1972: 98, pl. 25 fig. 11.

The expedition collected this common species at nine stations (3, 5, 17, 21, 26, 27, 35, 37 and 39); only *P. mammilla* was more abundant at Ambon. The range of *P. flemingiana* covers the Indo-Pacific, albeit it is rarely found in the Indian Ocean, Micronesia or Polynesia. It is abundant in the western Pacific Ocean, tropical Australia, and Melanesia.

Other Malaysian and Indonesian records.— **Malaysia**: Palau Hantu [USNM 660827]; Palau Tekukor [USNM 660869]; Sekudu Id., Johore Strait [USNM 660745]; 10 miles NW of Kinbatangan River mouth, North Borneo [USNM 657837]; Bohaydulung Id., N Borneo [ANSP 295459]; Telok Asam, Sarawak [ANSP 245570]; Kampong Terbacea, Singapore [ANSP 275605]; Sentosa Id., Singapore [AMS C.132172]; Singapore [USNM 701333]; **Indonesia**: Samur Beach, Bali [AMS C.60938, C.115721]; Bali [ANSP 196690, 319642; USNM 609968]; Pulau Bai, Sumatra [USNM 654554]; Greater Toba Id., Buton Strait, Celebes [USNM 243206]; Balikpapan, South Borneo [AMS C.106157]; Keledjitan, Java [USNM 260907]; Hollandia, Irian Jaya [USNM 611998]; Biak, Irian Jaya [AMS C.77893]; Middleburg Id., Irian Jaya [AMS C.71617].

Polinices mammilla (Linnaeus, 1758)
(fig. 30)

Nerita mammilla Linnaeus, 1758: 776, # 627. Cited references included: Rumphius (1705), pl. 22, fig. "E" [(corrected to "F" in Linnaeus (1764)].

Natica mamilla [sic] (Linnaeus, 1758). Deshayes, 1832: 599; 1838: 630; Philippi, 1852: 31, pl. 4 figs. 7, 8; Reeve, 1855: pl. 7 figs. 27a-b; Sowerby, 1883: 85, pl. 456 figs. 29, 30; Tryon, 1886: 49.

Mamillaria tumida Swainson, 1840: 345.

Natica pyriformis Récluz, 1844: 211. Philippi, 1852: 60, pl. 9 fig. 8; Reeve, 1855: pl. 5 fig. 16.

Polinices (Polinices) tumidus (Swainson, 1840). Cernohorsky, 1971: 191, figs. 45, 47-50; 1974: 172, fig. 44; Kilburn, 1976: 856, fig. 15.

Polinices tumidus (Swainson, 1840). Cernohorsky, 1972: 98, pl. 25 fig. 10; Kay, 1979: 210, figs. 73I, J.

Polinices mammilla (Linnaeus, 1758). Kabat, 1990: 16, figs. 3A, 3B (further synonymy).

The expedition collected *P. mammilla* at eighteen stations (1, 3, 4, 5, 6, 7, 14, 16, 18, 20, 21, 23, 26, 27, 30, 34, 35 and 36). This is the most common species of *Polinices*; its range extends throughout the Indo-Pacific except that it appears to be absent (in Polynesia) from the Cook Islands, Tuamotus, Marquesas, the Pitcairn Islands and Easter Island.

Other Malaysian and Indonesian records.— **Malaysia:** Kuah, Lang Kawi Id. [USNM 778618]; Domaring, Sarawak [USNM 303234]; Kudat Bay, Sarawak [USNM 632154]; Sandakan, Sarawak [USNM 658145]; Sibuan Id., Sarawak [USNM 708117]; Tagarak Id., Sarawak [USNM 2343060]; Tanjong Aru, Jesselton, Sarawak [USNM 658488]; St. John's Id. [USNM 660778, 660780]; Kampong Kemaman, Malaya [AMS C.124522]; Pulau Singat Besar, Malaya [AMS C.138511]; Perhentian Besar, Malaya [AMS C.82856]; **Indonesia:** Hitu Peninsula, Ambon [RMNH]; Ambon [RMNH]; Bali [AMS C.60926]; Sembuga, Kalimantan, Borneo [AMS C.124733]; Macassar, Celebes [USNM 124881]; Gomono Id., Pitt Pass, Celebes [USNM 243191; 746442]; Piru, Ceram [RMNH]; Morotai, Halmahera Ids. [USNM 542536]; Jayapura, Irian Jaya [USNM 611992]; Sawa Bay, Komodo [NHRM]; Keledjitan, Java [USNM 260915, 260916]; Palaboean Ratue, Java [USNM 260928]; Pruput, Java [USNM 260936]; Tamandjajja, Java [USNM 260930]; Tg Tutuhuhur, Piru Bay, Ceram, Moluccas [USNM 746630]; Jajoa Id., Moluccas [USNM 746410]; Labuan Olendir, Selaru, Moluccas [USNM 746643, 746644]; Du Rowa, Kai Ids., Moluccas [USNM 746958]; Nujanat Id., Tanimbar, Moluccas [USNM 747680]; Wasir Id., Aru Ids., Moluccas [USNM 747880]; Kampong, Aru Ids., Moluccas [USNM 755617]; Seroei Village, Japen Id. [ANSP 206314]; Oeriu Id., Padaido Ids. [ANSP 205863]; Biak Id., Schouten Ids. [USNM 600562]; Rani Id., Schouten Ids. [AMS; ANSP 206718, 207093]; Bankoelau, Sumatra [USNM 363864]; Pulau Bai, Batu Group, Sumatra [USNM 654478]; Pulau Masa, Sumatra [USNM 654645]; Pulau Melila, Sumatra [USNM 654419]; Pulau Siburu, Sumatra [USNM 654681, 654828]; Timor [AMS]; Biak, Irian Jaya [AMS C.77893]; Manokwari, Irian Jaya [AMS C.86198].

Polinices mellosum (Hedley, 1924)
(fig. 31)

Uber mellosum Hedley, 1924: 158, pl. 22 fig. 5.

Polinices tawhitirahia Powell, 1965: 163, pl. 22 figs. 1-3. Powell, 1967: 185, fig. 2; 1979: 155, pl. 32 figs. 12, 13.

The expedition collected *P. mellosum* only at station 23. This seemingly rare species is probably combined with *P. mammilla* in most museum collections and literature records, since the two species are superficially similar. However, fresh specimens have quite distinct opercula (nearly black in *mellosum*; paler brown in *mammilla*) and distinct protoconchs (white in *mellosum*, reddish to black in *mammilla*). Unfortunately, worn and empty shells cannot be differentiated by these two characters.

Other Malaysian and Indonesian records.— **Malaysia:** (none); **Indonesia:** Hitu Peninsula, Ambon [RMNH]; Taber Fane, mouth of Maikoor River, Aru Ids. [USNM 755623]; 14-26 fms, Tg Tutuhuhur, Piru Bay, Ceram [USNM 746630]; Pulau Bai, Batu Group, off Sumatra [USNM 654478]; 5 ft, E side of Ree Id., Tajanou, Kai Ids. [USNM 746731]; 5-10 ft, N end of Du Rowa, Kai Ids. [USNM 746989]; between Lalin and

Kajoa Ids. [USNM 746414]; S end of Kajoa Id. [USNM 746385]; 3 fms, Gomumu Id., S of Obi Id., Moluccas [USNM 746442]; 5-10 ft, Pombo Id., Haruku Straits [USNM 746577]; Labuan Olendir, Selaru, Tanimbar [USNM 747617, 747643]; Nujunat Island, Egeron Straits, Tanimbar [USNM 747680].

Sigatica Meyer & Aldrich, 1886

This often overlooked genus can be readily recognized by its spiral striae and globular shell; other naticids with strong spiral striae have either an auriform shell—*Sinum*—or a pyriform, elongate shell—*Eunaticina*. Previously, Indo-Pacific representatives were assigned to *Gemmaeosinum* Iredale 1929: see Kilburn (1988); Loch (1988b). Kabat (1991: 430, 436) synonymized *Gemmaeosinum* with *Sigatica*, originally described for a Tertiary species from the southeast region of the United States, and now also known from the Recent fauna of the tropical Atlantic and Eastern Pacific.

Sigatica peleum (Iredale, 1929)

(fig. 42)

Gemmaeosinum peleum Iredale, 1929b: 279, pl. 31 fig. 12. Michaelmas Cay, Queensland, Australia. Loch, 1988b: 8, figd.

Eunaticina (Gemmaeosinum) peleum (Iredale, 1929). Kilburn, 1988: 525, fig. 5.

The expedition collected three specimens of this species at stations 23 and 30. A fourth specimen from station 3, tentatively referable to *Sigatica*, is too worn to be identified with certainty. The congeneric *S. pomatiella* (Melvill, 1893) (figs. 40-41), perhaps the most common Indo-Pacific member of this genus, has one record from Malaysia [Northern Borneo] and may also occur in the Moluccas.

These two species of *Sigatica* can be readily differentiated by their thin, sharply incised spiral striae: *S. peleum* has about 30 striae extending across the entire outer whorl, whereas *S. pomatiella* has only 7-10 striae in the subsutural and umbilical regions. They can also be differentiated by the shape of the umbilical callus: *S. peleum* has a large triangular to bluntly rounded callus which projects over the central portion of the umbilicus; *S. pomatiella* has a narrow callus which barely extends over the umbilicus. The operculum of *S. peleum* is yellowish brown; that of *S. pomatiella* is reddish brown.

Other Malaysian and Indonesian records.— **Malaysia:** (none); **Indonesia:** USBF 5642, 37 fms, 4°31'40"S, 122°49'42"E, Buton Strait, Celebes [USNM 279829].

Sinum Röding, 1798

This genus is fairly common along the continental margins and near-shore islands of the tropical Indo-Pacific, with about eight to ten Indo-Pacific species currently recognized.

Species not collected by the expedition include *Sinum haliotoideum* (Linnaeus, 1758), known in Malaysia and Indonesia primarily from Borneo and Java, with one record from Ambon [RMNH]; *S. javanicus* (Gray in Griffith & Pidgeon, 1834); and *S.*

laevigatus (Lamarck, 1822). The latter two species are more common in Malaysia and Indonesia than is *S. haliotoideum*, but they are not known from Ambon. Further research is needed to clarify the systematic status of the various Indo-Pacific "species" of *Sinum*. It is possible that *S. javanicus* may be a junior synonym of *S. neritoideum*.

Sinum neritoideum (Linnaeus, 1758)
(fig. 32)

Helix neritoidea Linnaeus, 1758: 775, # 619.

Sigaretus neritoideus (Linnaeus, 1758). Reeve, 1864: pl. 1 figs. 5a, b; Sowerby, 1882: 40, pl. 441 fig. 1; pl. 442 figs. 16, 17; Weinkauff, 1883: 18, pl. 3 figs. 7-11.

Sinum neritoideum (Linnaeus, 1758). Kabat, 1990: 5, figs. 1A, 1B [redescription, additional synonymy].

The expedition collected one specimen, tentatively referred to this species, at station 41. *S. neritoideum* is an uncommon species limited to the central part of the Indo-Pacific: South and Southeast Asia to Japan, Indonesia, Papua New Guinea, tropical Australia and New Caledonia.

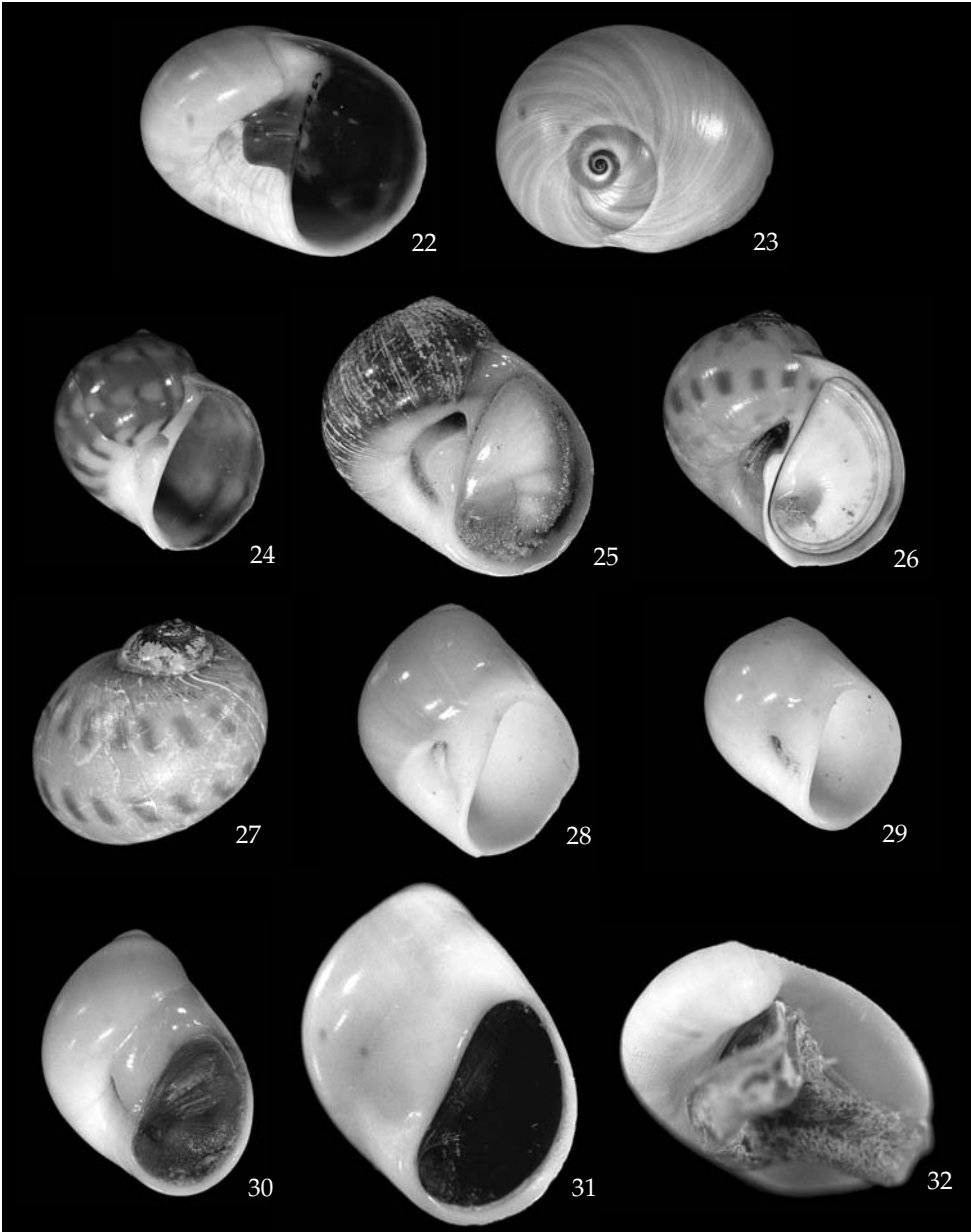
Other Malaysian and Indonesian records.— **Malaysia:** Jesselton, Sabah [USNM 824326]; Singapore [AMS C.40304]; **Indonesia:** Sawai, Ceram, Celebes [RMNH]; Keledjitan, Java [USNM 260913]; "Java" [AMS C.81746; USNM 306309].

Tanea Marwick, 1931

The expedition collected three species (nine lots) of this distinctive but uncommon genus, along with an additional three unidentifiable lots. As for *Notocochlis*, it is difficult or impossible to identify extremely worn specimens of this genus to the species level. This genus is limited to the tropical Indo-Pacific, and several new species remain to be described, most from the outer margins of the Indo-Pacific. In addition to the three species herein, *T. picta* (Récluz, 1844) is known from Ambon in old museum collections [RMNH].

Key to species of *Tanea* known to occur at Ambon

- 1. Colouration of wavy axial orangish brown lines; protoconch pale orange to white *T. undulata*
- Shell colour not as above 2
- 2. Colouration of several spiral rows of small reddish brown spots on white whorl *T. mozaica*
- Colouration not as above; whorl yellowish to orange brown 3
- 3. Pale yellowish-orangish whorls with 3-4 spiral white bands crossed by wavy white axial lines leaving irregular squarish maculations; protoconch reddish brown to pale yellow *T. areolata*
- Orangish brown whorls with 1-3 thin spiral white bands containing prosocyr (chevron) maculations *T. picta*



Figs. 22-32, Naticidae. 22-23, *Neverita didyma* (Röding, 1798), USNM 658588, Kota Kinabalu (Jesselton), Sabah, North Borneo, Malaysia; 20.3 × 24.6 mm. 24, *Notocochlis cernica* (Jousseaume, 1874), Stn 27; 12.1 × 11.5 mm. 25, *Notocochlis gualtieriana* (Récluz, 1844), Stn 14; 15.8 × 14.6 mm. 26-27, *Notocochlis insularum* (Watson, 1886), USNM 239307, USBF 5626, 0°07'30" N, 127°29'00" E, Kayoa Island, Molucca Pass, Indonesia, 265 fms; 23.0 × 21.6 mm. 28, *Polinices aurantia* (Röding, 1798), Stn 16; 24.0 × 20.6 mm. 29, *Polinices flemingiana* (Récluz, 1844), Stn 39; 17.7 × 16.0 mm. 30, *Polinices mammilla* (Linnaeus, 1758), Stn 14; 22.4 × 17.3 mm. 31, *Polinices mellosum* (Hedley, 1924), RMNH, Hitu Peninsula, 1 km W of Hila, Ambon; 33.0 × 26.0 mm. 32, *Sinum neritoideum* (Linnaeus, 1758), Stn 41; 14.5 × 17.3 mm.

Tanea areolata (Récluz, 1844)
(fig. 33)

Natica areolata Récluz, 1844: 206. Philippi, 1852: 67, pl. 11 fig. 2; Tryon, 1886: 25, pl. 6 fig. 23; Cernohorsky, 1978: 44.

Natica areolata Récluz, 1844 var. Philippi, 1853: 137, pl. 19 fig. 8 [a pale form].

Natica (*Natica*) *areolata* Récluz, 1844. Cernohorsky, 1971: 182, figs. 26, 28-30; 1972: 95, pl. 24 fig. 10.

Tanea areolata (Récluz, 1844). Kilburn, 1976: 853, fig. 14; Majima, 1989: 80, pl. 12 figs. 23-24.

This species was originally described from “Amboina” [Ambon] and the Philippines. The expedition collected it from stations 5, 20, 21 and 23. This species is known from the western Indian Ocean to the Marshall Islands and Samoa, although there are many “gaps” in its distribution. These gaps may simply reflect the rarity of this species and its primarily subtidal habitat.

Other Malaysian and Indonesian records.— **Malaysia:** Perhentian Besar [AMS C.82856]; Pulau Sudong [AMS]; **Indonesia:** Hitu Peninsula, Ambon [RMNH]; Sanur Beach, Bali [AMS]; Bali [ANSP 319694; MCZ 302467]; Jayapura, Irian Jaya [USNM 611996]; Abroeki Isle, Aoei Ids. [ANSP 208578]; Roemwakon Isle, Aoei Ids. [ANSP 255436, 284159].

Tanea mozaica (Sowerby, 1883)
(figs 34-35)

Natica mozaica Sowerby, 1883: 92, pl. 462 figs. 133, 134. Type locality unknown; type material BMNH 1883.10.24.32. Tryon, 1886: 19, pl. 3 figs. 51, 52; Habe & Kosuge, 1966: 34, pl. 12 fig. 1.

This rare species has probably been confused with *Naticarius onca* in the literature and in museum collections. The two species are superficially similar since both have 3-5 spiral rows of reddish to brownish spots on a white teleoconch. However, the spots of *T. mozaica* are smaller and more irregularly distributed. Their opercula are quite distinct: *N. onca* has numerous ribs across the entire outer opercular surface whereas *T. mozaica* has the typical *Tanea* pattern of 2 narrow ribs at the outer margin. Both species should be compared with the little-known “*Natica*” *paucimaculata* Sowerby, 1914, which has a similar pattern of colored spots, but its precise generic placement and opercular morphology is unknown (Everson, 1995).

The expedition collected *T. mozaica* at stations 1, 6 and 23. It is more common at Ambon than expected given its rarity in museum collections and paucity of literature records. Further collecting is needed to determine its actual distribution in the Indo-Pacific.

Other Malaysian and Indonesian records.— **Malaysia:** (none); **Indonesia:** 14-26 fms, off Tg Tutuhuhur, Piru Bay, Ceram, Moluccas [USNM 746684].

Tanea undulata (Röding, 1798)
(fig. 36)

“Zebra in familia Neritarium” Chemnitz, 1781: 263, pl. 187 figs. 1885-1886.

Nerita canrena Linnaeus var. *chi* Gmelin, 1791: 3670. References cited included Rumphius (1705), pl. 22, fig. G.

Cochlis undulata Röding, 1798: 147.

Natica zebra Lamarck, 1822: 203. Deshayes, 1832: 603; 1838: 643; Philippi, 1849a: 18, pl. 2 figs. 13, 14; Reeve, 1855: pl. 13 figs. 53a-53b; Tryon, 1886: 16, pl. 2 fig. 32.

This species was long known as "*Natica zebra*", a junior synonym. The expedition collected *T. undulata* at stations 5 and 6. It is known from the Indian Ocean eastwards to Papua New Guinea and the Solomon Islands, although it is only commonly represented in museum holdings from the Philippines.

Other Malaysian and Indonesian records.— **Malaysia:** Singapore [USNM 824292]; **Indonesia:** Ambon [MCZ 87445]; Nusa, Lesser Sunda Ids. [DMNH 165630]; Balam-bangan, Borneo [AMS C.16721].

Tectonatica Sacco, 1890 cf.

Tectonatica was described for a late Neogene fossil species from Italy. This genus was subsequently extended to the Recent Western Atlantic fauna for the small temperate-tropical *T. pusilla* (Say, 1822) and has also been used for several larger tropical Indo-Pacific species. Whether these Indo-Pacific species are in fact congeneric with the Atlantic species requires further research. In the meantime, I retain the usage of "*Tectonatica*" for two species collected by the expedition. In addition to these two species (represented by only three lots total), an additional four unidentifiable lots were obtained. Two other species of this genus are known from Indonesia and Malaysia, *T. robillardi* (Sowerby, 1894) and *T. violacea* (Sowerby, 1825) but neither is known from Ambon.

The two species of *Tectonatica* known from Ambon can be readily differentiated: *T. suffusa* has (1) a pale white shell; (2) a diagnostic purplish columella and umbilical region; and (3) a reddish purple protoconch. *T. bougei* has (1) a creamy white shell with irregular reddish to brownish maculations; (2) a white columellar region; and (3) a reddish brown protoconch.

Tectonatica bougei (Sowerby, 1908)
(figs. 37-38)

Natica bougei Sowerby, 1908: 17, pl. 1 fig. 3. Hedley, 1923: 312; Cernohorsky, 1978: 44; Kay, 1979: 207, figs. 72C, D.

Natica (Tectonatica) bougei Sowerby, 1908. Cernohorsky, 1971: 188, figs. 41-43; 1972: 98, pl. 25 fig. 2.

The expedition collected this species only at station 5. This species is known from the islands of the Western Indian Ocean (but not Eastern Africa proper) eastwards to French Polynesia and Hawaii. It is not known from South and Southeast Asia, except for Ambon (this expedition) and one record from Irian Jaya [= western New Guinea].

Other Malaysian and Indonesian records: **Malaysia:** (none); **Indonesia:** Konori Id., Padaido Ids., Irian Jaya [ANSP 205283].



Figs. 33-42, Naticidae. 33, *Tanea areolata* (Récluz, 1844), Stn 20; 12.9 × 13.7 mm. 34-35, *Tanea mozaica* (Sowerby, 1883), USNM 746684, off Tg Tutuhuhur, Piru Bay, Ceram, Moluccas, Indonesia, 14-26 fms; 11.0 × 10.5 mm. 36, *Tanea undulata* (Röding, 1798), USNM 243329, USBF 5181, 11°36'40" N, 123°26'35" E, Antonia Island, off northeast Panay, Philippine Islands, 26 fms; 20.3 × 21.8 mm. 37-38, *Tectonatica bougei* (Sowerby, 1908), USNM 878274, east of Avarua, Rarotonga, Cook Islands; 11.5 × 10.4 mm. 39, *Tectonatica suffusa* (Reeve, 1855), Stn 5; 6.3 × 6.0 mm. 40-41, *Sigatica pomatiella* (Melvill, 1893). USNM 443269, Back Bay, Bombay [Mumbai], India. Whole shell and detail of umbilical region. 42, *Sigatica peleum* (Iredale, 1929). USNM 279829, USBF 5642, 4°31'40" S, 122°49'42" E, Buton Strait, Celebes. Detail of umbilical region. Scales 1 mm.

Tectonatica suffusa (Reeve, 1855)
(fig. 39)

Natica suffusa Reeve, 1855: pl. 29, fig. 139. Sowerby, 1883: 92, figs. 129-130; Tryon, 1886: 44, pl. 19 fig. 87.

Natica nucula Reeve, 1855: pl. 29 fig. 140.

Natica labrotincta Sowerby, 1900: 127, pl. 11 fig. 4.

The expedition collected this species at stations 5 and 30. This species is quite rare in museum holdings; scattered records from the Indo-Pacific are probably not indicative of its actual range. It is known from the Maldives, Okinawa, eastern Indonesia, Queensland, Papua New Guinea, Solomon Islands, New Caledonia and Belau (Palau)

Other Malaysian and Indonesian records.— **Malaysia:** (none); **Indonesia:** Maransabadi, Aeri Ids. [MCZ 215355]; Ambai Id., near Japen Id. [ANSP 207402]; Cape Tepai, Japen Id. [ANSP 205138]; Seroei Village, Japen Id. [ANSP 210710]; Mios Woendi Id., Padaido Ids. [ANSP 205916]; Noeuori Id., Padaido Ids. [ANSP 206156]; Rani Id., Schouten Ids. [ANSP 207055, 247627]; Abroeki, Irian Jaya [AMS].

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