Ann. Natal Mus. Vol. 34(2) Pages 317–367 Pietermaritzburg October, 1993

# Turridae (Mollusca: Gastropoda) of southern Africa and Mozambique. Part 6. Subfamily Mangeliinae, section 2.

by

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ABSTRACT

Eight species of the genus *Pseudorhaphitoma* Boettger, 1895, *s. l.*, are recorded from southern Africa and Mozambique; all are new or previously unreported. Type material of 22 extralimital species from the tropical Indo-West Pacific is also figured and discussed.

New species: *Pseudorhaphitoma sienna*, *P. drivasi*, *P. epistomifer*, *P. ethekwini*, *P. obturata*, *P. stipendiarii*.

New name: *Pseudorhaphitoma thielei*, for *Mangelia (Pseudorhaphitoma) anna* Thiele, 1925, *non* Jousseaume, 1883.

New synonymies: *Turrella* Laseron, 1954 = *Pseudorhaphitoma*; *Mangelia (Paraclathurella) maria* Thiele, 1925, and *Cythara deliciosa* Barnard, 1958 = *Pseudorhaphitoma ichthys* (Melvill, 1910).

New southern African records: *Pseudorhaphitoma crudelis* Hedley, 1922, *P. ichthys* (Melvill, 1910).

New combinations (species transferred to *Pseudorhaphitoma*): *Clathurella heptagona* Dunker, 1871; *Clathurella iodolabiata* Hornung & Mermod, 1928; *Mangilia phaea* Melvill & Standen, 1901; *Mangilia perlonga* Melvill, 1899; *Mangilia posidonia* Melvill, 1904; *Mangelia (Pseudorhaphitoma) fuscescens* Thiele, 1925; *M. (P.) albula* Thiele, 1925; *Pleurotoma (Mangilia) mamillata* E. A. Smith, 1888; *Mangelia pyramidalis* Reeve, 1846; *Pleurotoma (Mangilia?) granilirata* E. A. Smith, 1888 [possibly a subjective senior synonym of *Pseudorhaphitoma crudelis* Hedley, 1922]; *Pleurotoma (Mangilia?) scitula* E. A. Smith, 1884; *Pleurotoma (Mangilia) castellata* E. A. Smith, 1888; *Mangilia averina* Melvill & Standen, 1901.

Lectotype designations (and figures): *Mangilia ichthys* Melvill, 1910; *Mangelia (Paraclathurella) maria* Thiele, 1925; *Cythara deliciosa* Barnard, 1958; *Clavatula pyramis* Hinds, 1843; *Pleurotoma (Mangilia?) scitula* E. A. Smith, 1888; *Pleurotoma (Mangilia?) granilirata* E. A. Smith, 1888; *Mangelia (Pseudorhaphitoma) severa* Thiele, 1925, *M. (P.) albula* Thiele, 1925, *M. (P.) cognata* Thiele, 1925, *M. (P.) alma* Thiele, 1925, *M. (P.) fuscescens* Thiele, 1925; *Pleurotoma (Mangilia) castellata* E. A. Smith, 1888.

Neotype designation: *Clathurella heptagona* Dunker, 1871.

Holotypes figured: *Mangilia pyramidalis* Reeve, 1846; *Pleurotoma hexagonalis* Reeve, 1845; *Pleurotoma (Mangilia) mamillata* E. A. Smith, 1888; *Mangilia perlonga* Melvill, 1888; *Mangilia phaea* Melvill & Standen, 1901; *Pseudorhaphitoma crudelis* Hedley, 1922; *P. bipyramidata* Hedley, 1922; *Mangilia averina* Melvill & Standen, 1901.

Syntypes figured: *Mangilia agna* Melvill & Standen, 1896; *Mangilia obeliscus* Reeve, 1846; *Mangilia multigranosa* Schepman, 1913; *Mangelia (Pseudorhaphitoma) tropica*, *M. (P.) albula* and *M. (P.) anna* Thiele, 1925; *Pleurotoma (Mangilia) fortistriata* E. A. Smith, 1888.

Radula figured: *Pseudorhaphitoma sienna* sp. n.

## INTRODUCTION

In this, the second part of my revision of the Mangeliinae of southern Africa and Mozambique, I discuss those species that would conventionally be referred to the

genera *Turrella* Laseron, 1954, and *Pseudorhaphitoma* Boettger, 1895. My introductory comments to Mangeliinae part 1* are also pertinent here.

ABBREVIATIONS

a/l = ratio of aperture length (measured along main shell axis) to total shell length.
b/h = ratio of maximum protoconch breadth to its height.
l/h = ratio of shell breadth to total length.
AMSA = The Australian Museum, Sydney.
BMNH = The Natural History Museum, London.
ISNB = Institut Royal des Sciences Naturelles de Belgique, Brussels.
MCSN = Museo Civico di Storia Naturale 'Giacomo Doria'
MHNP = Muséum National d'Histoire Naturelle, Paris.
NMSA = Natal Museum, Pietermaritzburg.
NMDP = Natal Museum Dredging Programme.
NMWC = National Museum of Wales, Cardiff.
SAMC = South African Museum, Cape Town.
USNM = National Museum of Natural History, Washington D.C.
ZMAN = Zoölogisch Museum, University of Amsterdam.
ZMHB = Zoologisches Museum, Humboldt University, Berlin.

TAXONOMY

## *Pseudorhaphitoma* Boettger, 1895

*Pseudorhaphitoma* Boettger, 1895 [as subgenus of *Clathurella*]: 56. Type species (o.d.) *Mangelia fairbanki* G. & H. Nevill, 1875.
*Pseudoraphitoma* Wenz, 1943: 1440 [incorrect subsequent spelling *sensu* ICZN Article 33 (c).]
*Turrella* Laseron, 1954: 36. (**syn. n.**) Type species (o.d.) *Clathurella tenuilirata* Angas, 1871.

Diagnosis: Shell claviform, small (4–12 mm), with a high spire and more or less short, weakly notched siphonal canal; anal sinus fairly shallow to deep, occupying most of shoulder slope; outer lip usually with a blunt labral tooth just anterior to anal sinus and sometimes with additional denticles anteriorly; inner lip usually with a parietal nodule and occasionally 1-2 denticles on columella; axial ribs moderately strong to high and compressed, often continuous from whorl to whorl, crossed by narrow spiral lirae, often granular or with transverse plicules. Protoconch variable, usually conical with axial riblets on the last whorl (rarely rendered nodular by spiral lirae), sometimes subcylindrical with axial sculpture scarcely developed. Radula (*P. sienna* sp. n.) of short, awl-shaped teeth, with large basal opening, bordered by a collar-like spur (Fig. 1).

Notes: In revising the southern African species, I initially believed that two genera could be recognised, namely *Pseudorhaphitoma s.s.*, with microshagreened interstices (Fig. 3), and *Pseudorhaphitoma auctt.*, containing species characterised by fine spiral lirae bearing transverse granules or plicules. In extreme examples of the

* Erratum in Kilburn (1992: 571): Figure numbers 192 and 193 were accidentally transposed; fig. 192 actually shows the holotype of *Drillia longispira* Smith, 1879, while fig. 193 shows the holotype of *Pleurotoma opalina* Smith, 1882.

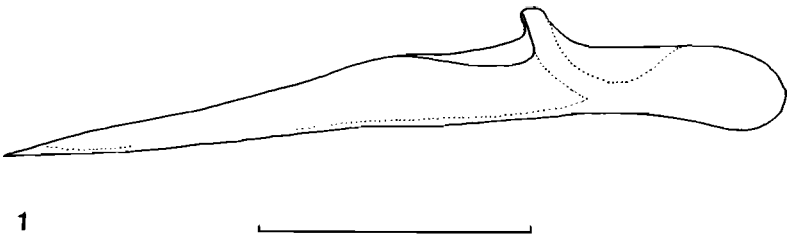



Fig. 1. *Pseudorhaphitoma sienna* sp. n. Marginal plate of radula, example from Benguerua Island, Mozambique, NMSA G4479 (shell destroyed). Scale bar = 50 μm.

latter group these lirae are elevated and tabulate, the transverse plicules flattened but rendering the edges of the lirae serrulated, the projections sometimes even touching so that the intervals appear microfoveolate. However, in a number of species (mainly extralimital) there exists an apparently annectent sculptural state in which the finer spiral threads bear beaded granules. Such species cannot always be referred with confidence to either group. Furthermore, although in *Pseudorhaphitoma auctt.* the axial ribs are typically stronger and more regularly continuous from whorl to whorl, this only represents the extreme end of a character gradient. Moreover, in at least one species (*P. sienna* sp. n.) the axials are continuous or discontinuous according to population or even individual. I have concluded that the dividing line between the two groups is at present too nebulous to permit recognition of separate genera or even subgenera.

Although *Turrella* and *Pseudorhaphitoma* (usually misspelled '*Pseudoraphitoma*') have been maintained as distinct by modern turrid workers (Laseron 1954, Powell 1966), I believe that their respective type species are congeneric. Indeed, the type species of *Pseudorhaphitoma* (see discussion below) resembles that of *Turrella* in all essential features, notably in its microsculpture, the intervals between the main spiral lirae bearing rows of minute granules. Although Powell (1966) restricted *Turrella* to a few species from New South Wales and Tasmania, a number of South African and Indo-Pacific taxa are very similar, as a rule differing from Australian ones only in having a prelabral varix, a labral denticle below the anal sinus and a tendency to develop a parietal nodule. Again, intermediate character states appear to exist, and the group is of doubtful validity. The type species of *Turrella, Clathurella tenuilirata* Angas, 1871, of New South Wales, was well figured by Laseron (1954: pl. 9, figs 179–182).

The true identity of the type species of *Pseudorhaphitoma, Mangelia fairbanki* G. & H. Nevill, 1875, from India and Sri Lanka, needs investigation by someone with access to the types in the Zoological Survey of India and to fresh modern specimens. The purported type illustrated by Hedley (1922: pl. 51, figs 127–129) differs perceptibly from the original figure (G. &. H. Nevill 1875: pl. 7, fig. 2), and in fact topotypic material in old collections contains both examples that agree with the Nevill figure, and others that agree with Hedley's. This indicates either that the species is a variable one, or else that the Nevill type series contains two distinct species. Fortunately, generic identity is not in doubt, as all examples show a similar microshagreened ('frosted') sculpture, and the slightly stronger and more markedly

continuous axial ribbing of the type figured by Hedley is not a useful character at supraspecific level.

An allied genus is *Ithycythara* Woodring, 1928, of the western Atlantic, in which spiral sculpture is lacking (other than a peripheral keel and a few basal threads) or consists of microscopic striae only; the Indonesian *Mangilia septemcostata* Schepman, 1913, somewhat doubtfully referred to *Ithycythara* by Shuto (1970: 43), is certainly not a member of this genus.

Other than the temperate-water Australian species previously included in *Turrella*, the following taxa from the tropical Indo-West Pacific are evidently among those that can be referred to *Pseudorhaphitoma s.l.*: *Clathurella heptagona* Dunker, 1871, from the central Pacific; *Clathurella iodolabiata* Hornung & Mermod, 1928, from the Red Sea; *Mangilia phaea* Melvill & Standen, 1901, from the Persian Gulf; *Mangilia perlonga* Melvill, 1899, from Pakistan; *Mangelia (Pseudorhaphitoma) severa* Thiele, 1925, *M. (P.) cognata* Thiele, 1925, *M. (P.) tropica* Thiele, 1925, *M. (P.) fuscescens* Thiele, 1925, and *M. (P.) albula* Thiele, 1925, from Sumatra; *Mangelia (Pseudorhaphitoma) alma* Thiele, 1925, and *M. (P.) anna* Thiele, 1925, *non* Jousseaume, 1883 [*Pseudorhaphitoma thielei* **nom. n.**], from off Zanzibar; *Pleurotoma (Mangilia) mamillata* E. A. Smith, 1888, and *P. (M.) castellata* E. A. Smith, 1888, from unknown locality; *Mangelia pyramidalis* Reeve, 1846, *M. hexagonalis* Reeve, 1845, and *Clavatula pyramis* Hinds, 1843 (= *Mangelia obeliscus* Reeve, 1846) from the Philippines and Malaysia; *Mangilia agna* Melvill & Standen, 1896, from New Caledonia; *Mangelia tetragona* Gould, 1860, from China; *Mangilia multigranosa* Schepman, 1913, from Indonesia; *Pleurotoma (Mangilia?) granilirata* E. A. Smith, 1888, from unknown locality; *Pleurotoma (Mangelia?) scitula* E. A. Smith, 1884, from the Persian Gulf; *Pseudorhaphitoma crudelis* Hedley, 1922, *P. bipyramidata* Hedley, 1922, *P. informis* Hedley, 1922, *P. axicula* Hedley, 1922, and *P. transitans* Hedley, 1922, from Queensland. A number of other Indo-West Pacific species, such as *Mangilia posidonia* Melvill, 1904, may possibly also be referable here. Type specimens of most of the listed species are figured in the appendix to this paper. In addition, *Pleurotoma (Mangilia) fortistriata* E. A. Smith, 1888, is also included, although the syntypes represent several species, only some of which may possibly belong to the genus *Pseudorhaphitoma*.

Within the group here treated as *Pseudorhaphitoma*, occur several different types of sculpture and protoconch. Although some of these character states appear to form a clear transformation sequence, I see little prospect at this stage of deducing polarity. Moreover it must be stressed that in many cases the only examples seen are in worn state, and SEM study of fresh examples is required to confirm details.

Sculpture:

State 1: In typical members of *Pseudorhaphitoma* (= *Turrella)* the main spiral lirae are smooth or weakly granular, and their intervals show a microsculpture of granules, spirally aligned or on low threads (Figs 3, 14–15). In fresh individuals these granules are erect and rather prickly, and each may bear a chalky cap; however, they are readily blunted by sonication or abrasion, and under SEM may then appear somewhat vesicular in structure (Fig. 19). Typical examples are *P. fairbanki*, *P. sienna* and *P. drivasi*. This sculptural character appears to intergrade with the next.

State 2. The spirally aligned granules are replaced by raised spiral threads, bearing granules or small nodules, sometimes prickly or squamiform when fresh. Examples are *P. epistomifer*, *P. thielei*, *P. scitula*, *P. tropica*, *P. cognata*, *P. alma*, *P. bipyramidata*, *P. albula*, *P. phaea*, *P. perlonga*, *P. heptagona*). In others (eg. *P. agna*, *P. castellata*, *P. tetragona*) the granules may be obsolete or replaced by fine collabral threads.

State 3. Here the granules are axially elongated, rendering the crests of the spiral lirae finely nodose-pliculate (Fig. 41). Examples are *P. ethekwini* sp. n., *P. pyramidalis*, *P. multigranosa*, *P. crudelis*.

State 4. In species such as *P. stipendiarii* sp. n., *P. ichthys* and *P. pyramis* the transverse plicules described above project laterally, so that the edges of the lirae, which are tabulate, appear serrulated (Figs 30, 52–53).

State 5. In the extreme character state (eg. in *P. obturata*, *P. hexagonalis* and probably *P. mamillata*) the plicules project so strongly that the interstices between the spiral lirae appear as series of deeply fenestrated pits, sometimes partially connected spirally, sometimes discrete (Fig. 46).

The protoconch:

Within *Pseudorhaphitoma* can be distinguished three different types of protoconch, although the apex is worn in the type specimens of several species examined.

Type A: Protoconch cylindrical and flat-topped, of fewer than 2 whorls, axial sculpture restricted to a few feeble terminal riblets (Fig. 47). This protoconch form, probably indicative of non-planktonic development, occurs in *P. agna*, *P. mamillata* and *P. tetragona*, and in *P. hexagonalis* and *P. pyramidalis* it appears to be similar (confirmation from unworn examples is required).

Type B: Protoconch conical, of about 2,5–3,5 whorls, the last whorl (at least) axially ribbed (Figs 2, 13, 20, 29). Such a protoconch, which is probably indicative of planktonic development, is the commonest within the group. It has been observed in *P. sienna*, *P. drivasi*, *P. epistomifer*, *P. heptagona*, *P. phaea*, *P. albula*, *P. bipyramidata*, *P. ichthys*, *P. pyramis*, *P. thielei*, *P. tropica*, *P. severa*, *P. fuscescens*, *P. alma*, *P. multigranosa*, *P. granilirata*, and *P. crudelis*; the periphery of the last whorl is angular in some of the above, and in *P. cognata* it bears a peripheral keel.

Type C: Protoconch domed or conical, last whorl with axial ribs cut into granules by spiral lirae (Fig. 51). Observed so far in *P. stipendiarii*, *P. scitula* and *P. perlonga*. Although such protoconch sculpture is also characteristic of the genus *Paraclathurella* Boettger, 1895, members of that genus differ in possessing microcancellate interstitial sculpture on the teleoconch whorls.

The high, continuous axial ribs of *Mangilia alfredi* E. A. Smith, 1904, led to it being referred to *Pseudorhaphitoma* by Kilburn & Rippey (1982: 117). However, its simple spiral threads and total lack of apertural denticles are atypical for *Pseudorhaphitoma* and it appears to belong to a small complex of temperate water South African species which for the present should remain in *Mangelia* (*s.l.*).

All eight species of *Pseudorhaphitoma* known from southern Africa are tropical or subtropical (although an isolated population of one occurs in the warm temperate eastern Cape Province), and will probably prove to be widely distributed across the Indian Ocean.

Key to species of *Pseudorhaphitoma* from southern Africa and Mozambique.

1 Spiral sculpture of main lirae and interstitial rows of microscopic, prickly granules, born on feeble to distinct spiral threads ..... 2
– Spiral sculpture of uniformly fine threads, bearing flattened, transverse plicules ..... 5

2 Intermediary threads nearly as strong as main lirae, only 3–4 per interval; outer lip usually with 5–6 denticles ..... **crudelis**
– Intervals between main lirae with rows of microscopic granules, 4–16 per interval; outer lip with only 1–3 denticles ..... 3

3 Anal sinus not spout-like; interstitial spiral threads very fine, somewhat wider than their intervals; outer lip with only one distinct denticle, columella smooth ..... 4
– Anal sinus somewhat spout-like; interstitial spiral threads coarse, equal to their intervals; in adult state, outer lip with 3 denticles, columella usually with 1–2 ..... **epistomifer**

4 Protoconch with axial ribs only on last whorl; shape clavate-fusiform; littoral .... **sienna**
– Protoconch ribbed on last two whorls; shape biconic-claviform; continental shelf in 40–112 m ..... **drivasi**

5 Protoconch conical or domed, last whorl strongly sculptured ..... 6
– Protoconch cylindrical and flat-topped, superficially smooth (but with minute pustules visible under SEM), last whorl with a few feeble terminal riblets ..... **obturata**

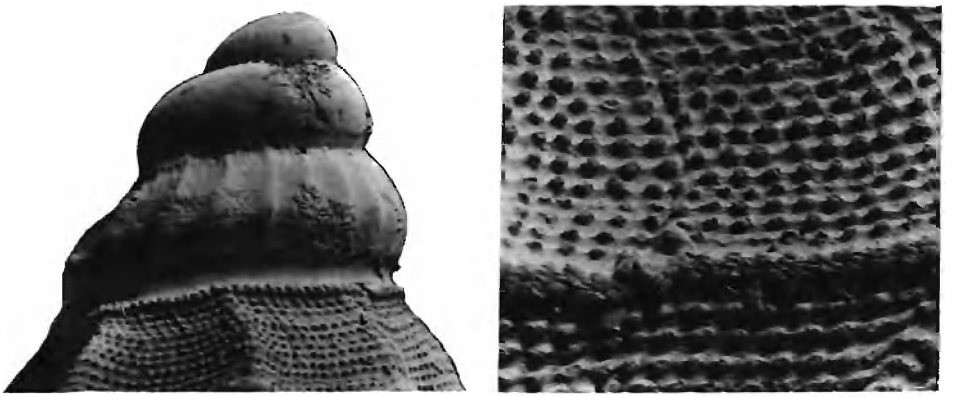
6 Protoconch conical, last whorl axially ribbed..... 7
– Protoconch domed, last whorl with axial ribs cut into granules by spiral threads ..... **stipendiarii**

7 Axial ribs high and steep-sided, terminal rib flaring; base of body whorl oblique; last whorl of protoconch angular with strongly arched axial riblets ..... **ichthys**
– Axial ribs relatively low, with gradually sloping sides, terminal rib relatively narrow; base of body whorl almost straight; last whorl of protoconch gently convex with weakly arched axial riblets ..... **ethekwini**

## **Pseudorhaphitoma sienna** sp. n.

Figs 1–9

Diagnosis (based on all three populations): Shell claviform (b/l 0,34–0,42, a/l 0,30–0,41), left side of base shallowly to strongly concave; axial ribs 7–10 per whorl, continuous to somewhat discontinuous, slightly opisthocline, rather straight but slightly curving at suture, intervals concave, subequal to ribs; spiral lirae only on lower half of each spire whorl, usually projecting markedly where they cross ribs, 2–3 on early whorls (rendering them bicarinate or tricarinate), upper/median keel stronger, body whorl with 10–17 main spiral lirae (2–5 above suture line + 7–18 basal lirae), on rostrum sometimes no stronger than secondary sculpture; secondary




Figs 2–3. *Pseudorhaphitoma sienna* sp. n. **2**, protoconch; **3**, microsculpture. Paratype NMSA G4479 from Benguerua Island. SEM, scale bar = 100 µm.

sculpture of microscopic granular threads between main lirae; outer lip preceded by a moderate to massive varix, lip slightly patulous, with moderately deep, slightly asymmetrically U-shaped anal sinus, usually bordered by a fairly strong denticle, stromboid notch shallow or absent; parietal nodule absent to fairly strong, no other labial denticles. Orange-brown with darker aperture and pale yellowish to dark brown protoconch. Protoconch conical, of 2,6–3 whorls, breadth 0,48–0,65 mm, curved axial riblets on last whorl to half-whorl. Maximum length 10 mm.

Description (Durban Bay population): Shell claviform (b/l 0,34–0,41, a/l 0,32–0,38 ) with a moderately produced base and fairly acute, more or less orthoconoid spire; teleoconch whorls about 6,5 in number; suture moderately shallow, occasionally undulating, whorls convex, early whorls somewhat bicarinate, the upper keel forming a distinct median angle, but a slight bulge posterior to this (not corresponding to a spiral lira) may give the ribs a somewhat tricarinate appearance; shoulder slope not concave, no subsutural ridge; siphonal canal short, oblique, its termination obliquely truncate, not indented, left side of base shallowly to fairly strongly concave, fasciole weakly developed. Aperture narrowly oblong, greatest width slightly posterior to median; inner lip almost straight, only slightly convex medially, callus thin, flat, microscopically granulose, with a fairly strong to weak parietal tubercle in posterior angle of aperture; outer lip slightly patulous with a sharp edge, weakly crenulated in side-view by the terminations of the spiral lirae, preceded by a strong to massive varix which constricts the aperture internally; interior of lip with only a single feeble to fairly prominent nodule immediately anterior to the entrance to the anal sinus; anal sinus moderately deep, slightly asymmetrically U-shaped, occupying greater part of shoulder slope, stromboid notch shallow or absent.

Sculptured by strong axial ribs, more or less continuous from whorl to whorl, crossed by thin, wide-set spiral lirae, which project as narrow nodules where they cross the axials; intervals between spirals covered by dense, granulose microspiral threads. Axial ribs subequal to their intervals (which are concave), slightly

opisthocline, rather straight except for a slight curvature below suture, where they are relatively weak, on body whorl terminating at base of rostrum; crests of ribs angularly rounded, sides of ribs rather steeply sloping; 7–8 ribs on all teleoconch whorls. Lower half of early whorls crossed by two thin, weakly granulose spiral lirae, rendering them feebly bicarinate, later whorls with an additional 2-4 lirae developing above suture; body whorl with 13–17 main spiral lirae (2–4 above line of suture, plus 10–14 on base), becoming weaker but still distinct on rostrum. Secondary spiral threads occupying all intervals between main spirals and covering shoulder slope; thin, close, 5–12 in number between main lirae on later spire whorls; bear microscopic granules.

Orange-brown [but probably somewhat faded], aperture and columella usually darker, apex dark orange-yellow to brownish-orange.

Protoconch conical, of about 3 whorls, 1st whorl depressed, whorls rounded, smooth, except for last whorl, which bears curved axial riblets, and a weak peripheral and anterior spiral ridge near termination; breadth 0,63–0,65 mm, height 0,53–0,65 mm (b/h 1,00–1,19).

Dimensions: 9,8 x 3,2 mm (holotype); 10,0 x 3,4 mm (largest paratype).

Algoa Bay population: As above, but b/l 0,34–0,41, a/l 0,36–0,41; parietal nodule slight or (more frequently) absent, lip varix fairly narrow to narrow, nodule anterior to sinus weak or absent; axial ribs usually discontinuous, 8–10 per whorl, their crests somewhat less angular, more protractively curved below suture; main spiral lirae 2–3 on early whorls, the upper one weak when present, 3–5 on penultimate whorl, plus 12–18 on base of body whorl. Orange-brown, apex sometimes tinged with yellowish. Protoconch of about 2,6 whorls, last whorl with axial ribs; breadth 0,58–0,65 mm (b/h 0,83–1,09). Maximum size 9,9 x 3,8 mm.

Mozambique population: As in Durban population, but outer lip less strongly shouldered, b/l 0,35–0,42, a/l 0,34–0,41, axial ribs 7–8 per whorl, continuous; spiral lirae not projecting where they cross ribs, 2 on early whorls (rendering them somewhat bicarinate), upper keel stronger, body whorl with 10–11 spiral lirae (3 above line of suture + 7–8 basal lirae), those on rostrum no stronger than secondary spirals; outer lip preceded by a massive varix, stromboid notch often rather deep; parietal nodule fairly strong. Light brown to brownish-orange, apex dark orange-brown. Protoconch of 2,6 whorls, breadth 0,48–0,55 mm (b/h 0,94–1,28), ribbed only on last half-whorl. Maximum size 7,1 x 3,0 mm.

Range: Southern Mozambique to Algoa Bay, shallow littoral.

Type material: Holotype NMSA B1902/T78, Durban Bay, shallow dredgings, B. J. Young. Paratypes 1–30, NMSA E1124/T77, same data. Paratypes 31–33, NMSA A8604/T83, Port Elizabeth, harbour dredgings, F. Graeve. Paratype 34, NMSA K4262/T75, channel north of Benguerua Island, Bazaruto Archipelago, Mozambique, dredged in about 12 m at HST, on sand and *Thalassodendron*, R. Kilburn and P. & E. Roscoe; paratypes 35–48, NMSA G4479/T76, same data; radula slide M239 (shell destroyed).

Notes: The intritacalx-like layer that covers the microsculpture of living examples of *P. sienna* is lost soon after death (or during sonication). Several hundred specimens


Figs 4–9. *Pseudorhaphitoma sienna* sp. n. **4–5**, Holotype, NMSA B1902/T78, 9,8 x 3,2 mm; **6**, paratype, NMSA E1124/T77, Durban Bay dredgings, 7,4 x 2,5 mm; **7–8**, paratype NMSA K4262/T75, Benguerua Island, 6,6 x 2,6 mm; **9**, paratype NMSA A8604/T83, Port Elizabeth, 9,3 x 3,5 mm.

were collected from reclamation dumps in Durban Bay; although most are faded and slightly worn, some retain the intritacalx. A small series collected from similar dumps in Port Elizabeth harbour and a live-taken sample from the Bazaruto Archipelago appear to represent populations of the same species, although small morphological differences (presumably attributable to isolation) initially led me to consider them distinct species. The tropical Mozambique sample (Figs 7–8) is rather constant in characters, differing from the typical Durban form chiefly in its darker, slightly larger protoconch (which bears axial ribs on its last half-whorl only) and in its spiral ridges becoming so weak on the rostrum as to merge with the intermediary microstriae. Members of the temperate-water Algoa Bay population (additional material seen in F. Graeve collection) are exceedingly variable, but generally differ (Fig. 9) from typical *sienna* in the more or less discontinuous, often more oblique axial ribs, relatively weak lip varix and frequent lack of both parietal and labral nodules.

Of comparable species, *P. iodolabiata* (Hornung & Mermod, 1928) from the Red Sea is a much smaller, apparently paler species with a more conical protoconch and axial ribs which do not become arcuate below the suture; examination of the holotype in the MCSN collection failed to reveal details of microsculpture, as the shell surface has been badly corroded by efflorescence ('Byne's Disease'). *P. heptagona* (Dunker, 1871) from Western Samoa (see Appendix) differs from *sienna* in shape, in its pale yellowish colour, and in possessing spiral lirae that extend higher up each whorl. *P. severa* (Thiele, 1925) and *P. fuscescens* (Thiele, 1925), two somewhat doubtfully distinct species from Sumatra, differ in their much smaller size, much stronger spiral lirae (which render the whorls prominently bicarinate), and narrower anal sinus; also, in these two species the ribs on the last protoconch whorl terminate slightly above its suture, rendering the profile somewhat angular (from examination of the types, Thiele's figures err in showing the ribs as reaching the suture, as in *sienna*).

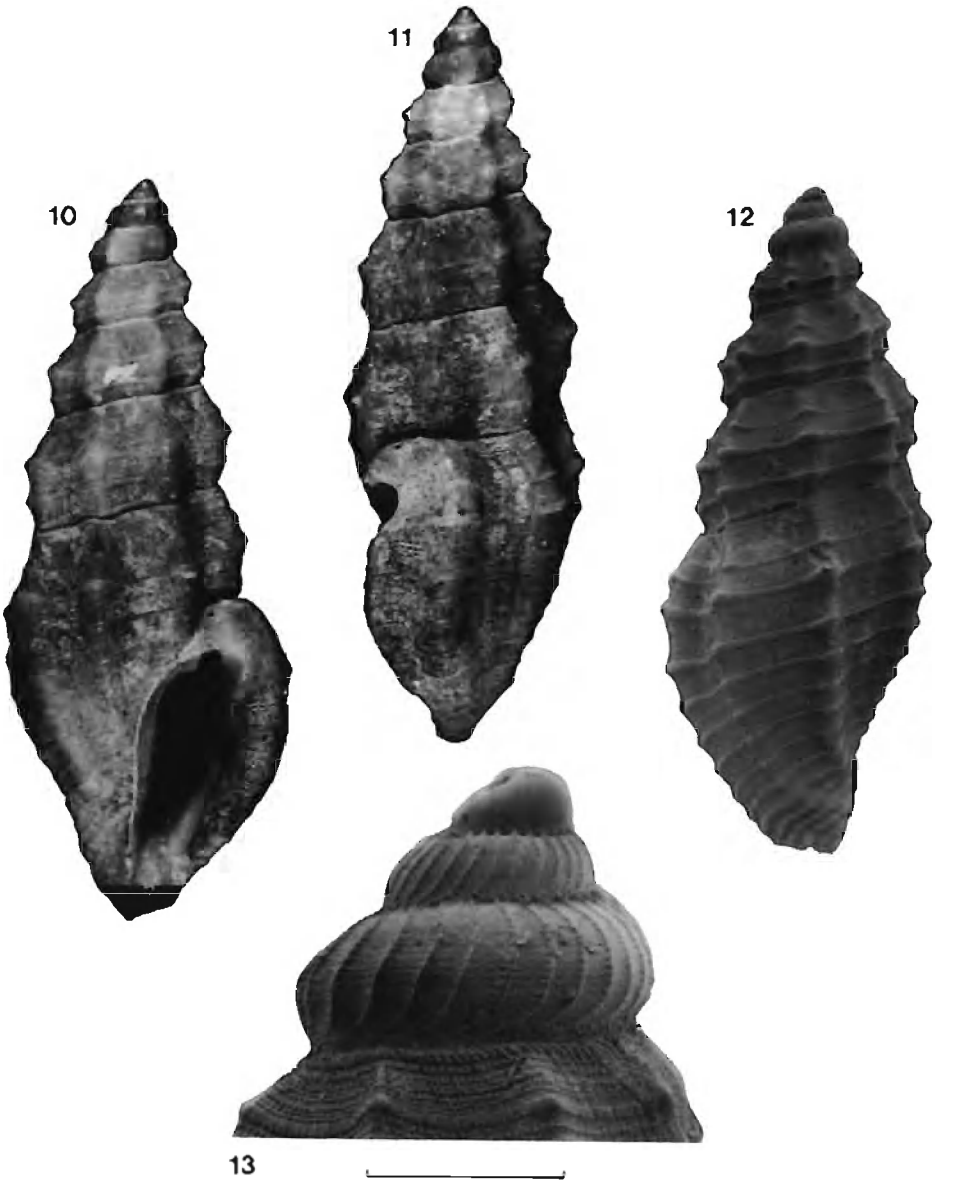
Etymology: Italian *[terra di] sienna*: rich reddish-brown pigment/earth.

### **Pseudorhaphitoma drivasi** sp. n.

Figs 10–15

*Mangelia heptagona* (*non* Dunker, 1871); Melvill, 1917: 171, pl. 9, figs 14, 14a.

Diagnosis: Shell biconic-claviform (b/l 0,38–0,46, a/l 0,30–0,42), left side of base very shallowly concave; axial ribs 7 per whorl, continuous, slightly opisthocline, rather straight but very slightly curving at suture, intervals flat or concave, sometimes wider than ribs; main spiral lirae largely on lower two-thirds of each spire whorl, projecting somewhat where they cross ribs, 3 on early whorls (rendering them somewhat tricarinate), the median keel strongest, body whorl with 4–6 main lirae + 9–14 on base, those on rostrum no weaker than elsewhere; interstices with spiral rows of microscopic, prickly granules; outer lip preceded by a massive varix, lip slightly incurved, with moderately deep, asymmetrically U-shaped anal sinus, bordered internally by a low to fairy strong denticle, sometimes with traces of additional lip denticles; stromboid notch shallow or absent; parietal nodule strong to absent, no columellar denticles. Pale buff to orange-brown, axial ribs sometimes




Figs 10–13. *Pseudorhaphitoma drivasi* sp. n. **10–11**, Holotype, NMSA D4397/T79, 6,3 x 2,7 mm; **12**, dorsal view of paratype NMSA D9042/T82, SEM, 4,9 x 2,9 mm; **13**, SEM of protoconch of same paratype, scale bar = 300 µm.

paler, early whorls and aperture often lilac tinged. Protoconch a cyrtoconoid sinusigera of 3,3 whorls, breadth 0,60–0,75 mm, axial ribs and extremely fine spiral striae on all except 1st whorl. Maximum length 8 mm.

Description: Shell biconic-claviform (b/l 0,38–0,46, a/l 0,30–0,42) with a moderately

produced base and fairly acute, orthoconoid to slightly cyrtoconoid spire; teleoconch whorls nearly 6 in number; suture moderately shallow, occasionally undulating, whorls convex, early whorls somewhat tricarinate, the median keel usually forming a slight midwhorl angle, shoulder slope not concave, no subsutural ridge; siphonal canal short, slightly oblique, its termination obliquely truncate, not indented, left side of base very shallowly concave, fasciole weakly to moderately developed. Aperture narrowly oblong, greatest width slightly posterior to median; inner lip almost straight, only slightly convex medially, callus thin, flat, microscopically granulose, with a parietal tubercle (sometimes obsolete) in posterior angle of aperture; outer lip in adult somewhat inwardly curved with a sharp edge, weakly crenulated in side-view by the terminations of the spiral lirae, preceded by a massive varix which constricts the aperture internally, and bears a single low to sharp nodule immediately anterior to the entrance to the anal sinus (faint traces of feeble denticles may be present anteriorly); anal sinus moderately deep, asymmetrically U-shaped, occupying lower two-thirds of shoulder slope, stromboid notch shallow or absent.

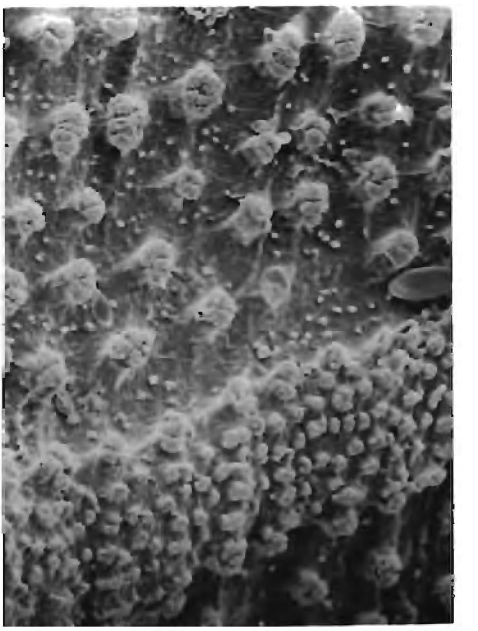
Sculptured by strong axial ribs, continuous from whorl to whorl, crossed by thin, wide-set spiral lirae, which project slightly where they cross the ribs, and whose intervals are covered by rows of dense, microscopic granules, one row of which forms a line of tiny prickles at suture. Axial ribs equal to / narrower than their intervals (at least some of which are flat-bottomed), slightly opisthocline, rather straight except for a very slight curvature below suture, where they weaken somewhat, on body whorl terminating on rostrum; crests of ribs angularly rounded, slightly compressed; 7 ribs per whorl throughout teleoconch. Each whorl crossed by three thin, weakly granulose to smooth spiral lirae, the median one strongest, the upper one sometimes weak; a fourth lira begins to show above suture on 3rd whorl; on body whorl, intermediary lirae may develop by interpolation, with 4–6 lirae above line of suture, plus 9–14 on base, continuing onto rostrum without decreasing in strength. Secondary spiral threads occupying all intervals between main spirals and covering shoulder slope; interstices covered by spirally aligned microscopic granules, usually appearing as if based on spiral threads, 4–16 in number between main lirae on later spire whorls; granules rounded with rugose tips, which in live individuals bear a rather chalky cap; under SEM main spiral lirae are seen to bear a much finer, denser, and more irregular zone of pustules.

Colour pale buff to orange-brown, axial ribs sometimes paler, aperture and apical whorls often tinged with lilac.

Protoconch cyrtoconoid, of about 3,3 whorls, 1st whorl (protoconch I stage) tilted and smooth, subsequent whorls (protoconch II) rounded and bearing opisthocline, curved axial riblets, and extremely fine spiral striae (visible only on SEM), axial riblets numbering about 23 on penultimate whorl, 17–20 on last, last half-whorl with a weak angle at periphery, lip sinusigerous; breadth 0,68–0,75 mm, height 0,65–0,78 mm (b/h 0,96–1,15) in South African examples, 0,60 x 0,60 mm in Réunion paratype.

Dimensions: 6,3 x 2,7 mm (holotype), 8,0 x 3,0 mm (largest paratype); 4,1 x 1,8 mm (Réunion paratype).

Range: Persian Gulf and Réunion Island to continental shelf of eastern Transkei, 40–112 m.



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Figs 14–15. *Pseudorhaphitoma drivasi* sp. n. Microsculpture of teleoconch of paratype NMSA D9042/T82: **14**, scale bar = 135 µm, **15**, scale bar = 38 µm.

Type material (all NMSA): Holotype D4397/T79, off Durban Bluff (29°52,3'S: 31°09,0'E), 80–90 m, grey sandy mud, NMDP. Paratype 1, D8411/T81, SE of Kosi Bay, Zululand, 50 m, fine sand, shells, NMDP. Paratype 2, D9042/T81, off Hully Point, Zululand, 40 m, fine sand, NMDP. Paratypes 4–5, E5554/T86, off Island Rock, Zululand, 62 m, sandstone, coral, marine growths, NMDP. Paratype 6, D4526/T80, off Point Durnford, Zululand, 112 m, dredged A. Connell. Paratype 7, B4021/T80, Leadsman Shoal, Zululand, 100 m, dredged A. Connell. Paratypes 8–9, D4417/T81, off Cooper Lighthouse, Durban Bluff, 88 m, firm grey muddy sand, NMDP. Paratype 10, E5681/T87, off Durban, 110–120 m, coarse muddy sand, NMDP. Paratypes 11–15, C1725/T85, off Mbotyi, Transkei, 50 m, mixed sand, mud, abundant worm-tubes, NMDP. Paratype 16, K1487/T84, off Possession, Réunion Island, 54 m, in hand-dredged sand, J. Drivas.

Additional material: Persian Gulf (BMNH 74.1.19.14: Pelly).

Notes: This species is well characterised by its shape and protoconch. Although Persian Gulf material was identified by Melvill as *Clathurella heptagona* Dunker, 1871, the neotype of that (see Appendix and Figs 54–55) is somewhat narrower, with a much smaller protoconch (breadth 0,43 mm against 0,60–0,75 mm for *drivasi*), the base of its body whorl is more rapidly tapering, the ribs in t/s have markedly more sloping sides, the rib intervals are more concave and the secondary spiral threads are much finer.

*Pseudorhaphitoma bipyramidata* Hedley, 1922, from Queensland, New Caledonia and (reportedly) the Persian Gulf, is also similar, but according to the types (AMSA C.42345) has extremely fine microsculpture, and, in its adult state, two well-developed columella denticles. *P. pyramidula* Laseron, 1954, from New South Wales is more biconical, with a very different protoconch (Laseron 1954: Fig. 221). Finally, it must be mentioned that two eroded specimens from Sri Lanka in the BMNH type collection (No. 1904.9.26.3–4), labelled as syntypes of *Mangelia fulvocincta* G. & H. Nevill, 1875, are also rather similar to *drivasi*, although their whorls lack any trace of a peripheral angle, the main spirals are weak and vestiges of the protoconch indicate it to be smaller. However, these supposed types bear scant resemblance to the original figure of *fulvocincta* (G. & H. Nevill, 1875: pl. 7, fig. 1), which probably belongs to the crassispirine genus *Haedropleura* Bucquoy, Dautzenberg & Dollfus, 1883.

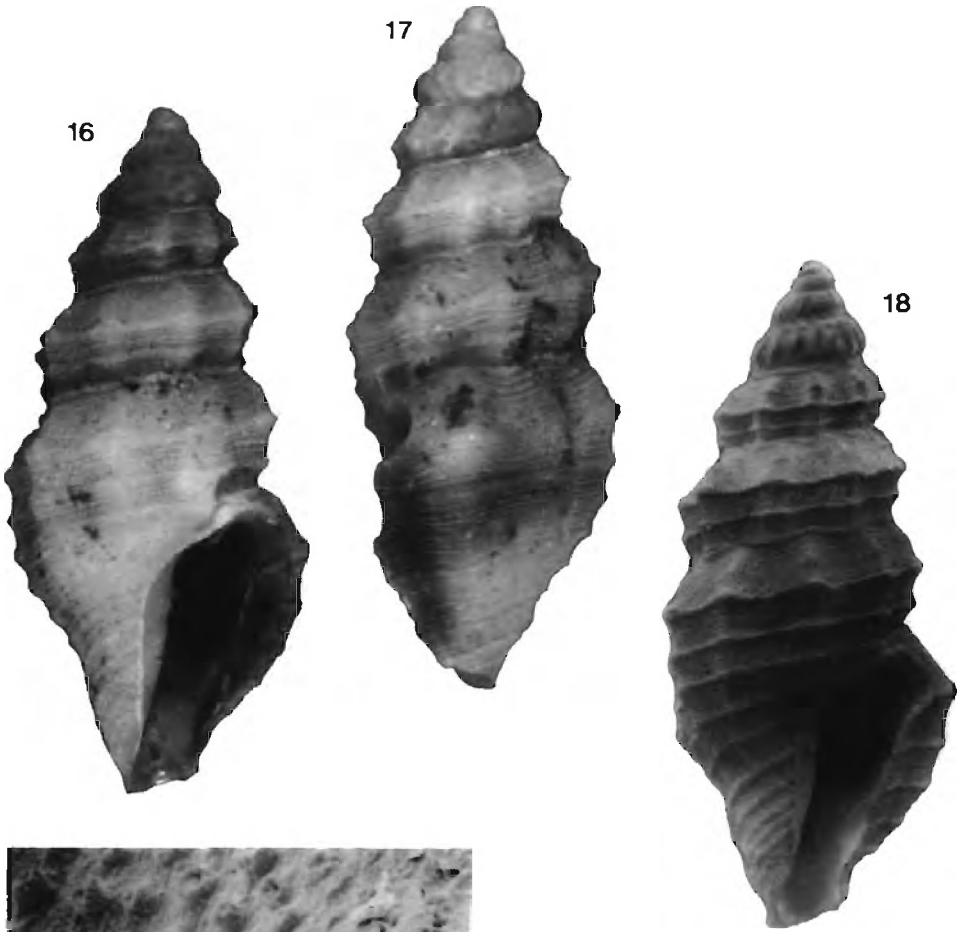
Etymology: Named after Jean Drivas, specialist on the shells of Réunion Island.

**Pseudorhaphitoma epistomifer** sp. n.

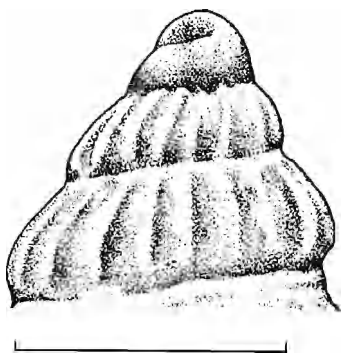
Figs 16–20

Diagnosis: Shell biconic-claviform (b/l 0,41–0,48, a/l 0,34–0,43), left side of base distinctly concave; axial ribs 8–9 per whorl, usually discontinuous, slightly opisthocline, rather straight but very slightly curving at suture, intervals concave, sometimes wider than ribs; main spiral lirae largely on lower two-thirds of each spire whorl, projecting somewhat where they cross ribs, 3 per whorl, upper one becoming feeble on later whorls, but another lira developing above suture, peripheral lira strongest; body whorl with 4-6 main lirae + those on rostrum, which are variable and sometimes irregular; secondary sculpture of relatively coarse microscopic granular threads, 5-7 between each pair of main lirae; outer lip preceded by a strong varix, projecting at anal sinus, which is moderately deep and asymmetrically U-shaped, lip incurved, internally with 3 denticles in adult, posteriormost one fairy strong, stromboid notch shallow; parietal nodule strong to absent, columella generally with 1–2 median denticles in adult. Brownish white with yellowish apex, sometimes with a diffuse median zone of yellowish-brown, interior and edge of outer lip sometimes with a dark brown blotch. Protoconch a cyrtoconoid sinusigera, of 3,3 whorls, later ones with a distinct but rounded angle near base, axial ribs on all except 1st whorl; breadth 0,60–0,75 mm. Maximum length 4,2 mm.

Description: Shell biconic-claviform (b/l 0,41–0,48, a/l 0,34–0,43) with a moderately produced base and fairly acute, orthoconoid to slightly cyrtoconoid spire; teleoconch whorls up to about 3,8 in number; suture moderately shallow, more or less undulating, whorls convex, somewhat tricarinate, the median keel forming a slight midwhorl angle, shoulder slope not concave, suture usually bordered by a thin, granulose ridge; siphonal canal short, slightly oblique, its termination obliquely truncate, only slightly indented, left side of base distinctly concave, fasciole weakly to moderately developed. Aperture narrowly oblong, greatest width slightly posterior to median, curving strongly to right to form a wide, spout-like anal canal; inner lip almost straight, only slightly convex medially, callus thin, flat, with a weak to strong parietal tubercle in posterior angle of aperture and as a rule (when fully adult) 1–2








Figs 16–20. *Pseudorhaphitoma epistomifer* sp. n. **16–17**, Holotype, NMSA S6052/T271, 3,3 x 1,5 mm. **18–19**, SEM of paratype, NMSA S1174/T798: **18**, entire shell, 3,2 x 1,4 mm; **19**, microsculpture on shoulder area of teleoconch whorl, scale bar = 86 µm. **20**, Protoconch of same specimen, scale bar = 430 µm.

weaker denticles on mid-columella; outer lip curved inward in adult, edge sharp, weakly crenulated in side-view by the terminations of the spiral lirae, preceded by a strong to massive varix which constricts the aperture internally, and bears a single low to sharp nodule immediately anterior to the entrance to the anal sinus, and 1-2 smaller denticles at mid-lip level (in adults); anal sinus moderately deep, slightly asymmetrically and roundedly U-shaped, occupying almost entire shoulder slope, stromboid notch shallow but distinct.

Sculptured by moderately strong axial ribs, usually (but not always) markedly discontinuous from whorl to whorl, crossed by thin, well-raised and wide-set spiral lirae, which project where they cross the ribs (but do not form nodules); intervals with relatively coarse intermediary threads (somewhat too strong to be termed microspiral), bearing prickly granules. Axial ribs equal to / narrower than their rounded intervals, slightly opisthocline, sometimes becoming orthocline on last whorl, rather straight except for a very slight curvature below suture, where they weaken somewhat, on body whorl terminating above rostrum; crests of ribs slightly angularly rounded, not compressed, with unequally sloping sides; 8–9 ribs per whorl throughout teleoconch. First whorl with two main spiral lirae on its lower half (upper one forming a slight peripheral keel), and 5–6 finer and more irregular threads on the adapical half; on 2nd whorl a third, but interrupted, main lira develops at mid shoulder slope on crests of axials, and intervals between main lirae are covered with secondary threads; by penultimate whorl a 4th main lira usually partially shows above suture, but the uppermost lira is retained only as a slight angle on the rib crests; base of body whorl with 4–6 main spiral lirae (plus intermediary threads) and an additional 4–6 fine rostral threads, which may be ill-defined or alternately weaker and stronger. Intermediary threads of uniform strength, equal in width to their intervals, main intervals with 5–7 threads.

Colour brownish-white, body whorl sometimes with a broad, pale yellowish-brown median zone, protoconch tinged with pale yellowish, interior and edge of outer lip sometimes with a dark orange-brown blotch.

Dimensions: 3,3 x 1,5 mm (holotype); 4,2 x 1,7 mm (largest paratype).

Protoconch conical, of about 3,4 whorls, 1st whorl (protoconch I stage) sharp, strongly tilted and smooth; from 2nd whorl (protoconch II stage) on, periphery of whorl almost angular and a little above suture, and thin, slightly opisthocline, barely curved axial ribs are present; these ribs project slightly above suture, and weaken at base of whorl, 13–18 on last whorl; breadth 0,65–0,70 mm, height 0,63–0,78 mm (b/h 0,90–1,03).

Distribution: Continental shelf from northern Natal to western Transkei, mostly on muddy sand in 50–150 m (empty shells).

Type material (all NMSA: NMDP): Holotype S6052/T271, off Durban (29°50,2'S: 31°12,3'E), 95 m, fine, slightly muddy sand. Paratypes: NATAL: S1316/T800, same data as holotype, 11; S1174/T798, off Durban, 80–90 m, grey sandy mud, 16; E1236/T799, ditto, 80–85 m, firm grey sandy mud, 15; E6720/T793, ditto, 100 m, very fine muddy sand, 2; S1183/T792, ditto, 75 m, sandy mud, shell rubble, 9; S114/T794, off Tongaat Bluff, 150 m, sandy mud, 1. TRANSKEI: C765/T795, off Waterfall Bluff, 80–90 m, fine mud, 1; S1301/T797, off Mgazi River, 48 m, mud, 3;

S6191/T843, off Mgazi River, 92 m, coarse sand and rubble, 4; E8260/T796, off Qora River mouth, 100 m, coarse sand, some sponge rubble, 9.

Notes: This small species is abundant in the same dredge samples as *Pseudorhaphitoma ichthys*, although fresh examples are uncommon and no live individuals are known. It is particularly prolific off Durban in 60–100 m. Its occurrence in a sample from 250 m off Tongaat is probably the result of drift. In most respects it resembles *P. drivasi* in miniature, but rarely appears to occur sympatrically with that; apart from its much smaller adult size and fewer teleoconch whorls, *P. epistomifer* differs from *drivasi* in possessing a widely spout-like anal sinus, additional denticles on both lips in most adults, coarser, more widely spaced interstitial spirals, largely discontinuous axial ribs and other details. The prickly granules borne by the interstitial threads are evidently vesicular, as when worn they often take on the form of a low cone with an apical pit.

The sinusigera-style protoconch is indicative of teleplanic development, and it is probable that *P. epistomifer*, like *P. drivasi*, is widely distributed in the tropical Indian Ocean. I have, however, been unable to recognise it among the identifiable species so far described, save possibly for one of the syntypes of *P. albula* Thiele, 1925 (*q.v.*).

Etymology: L. *epistomifer* = spout-bearing (from *epistomium*).

*Pseudorhaphitoma ichthys* (Melvill, 1910) **comb. n.**

Figs 21–30

*Mangilia ichthys* Melvill, 1910: 13, pl. 2, figs 22, 22a; *idem*, 1917: 172; Trew, 1987: 46. Type locality: off Astola Island, Makran coast [Pakistan], 90 fathoms.

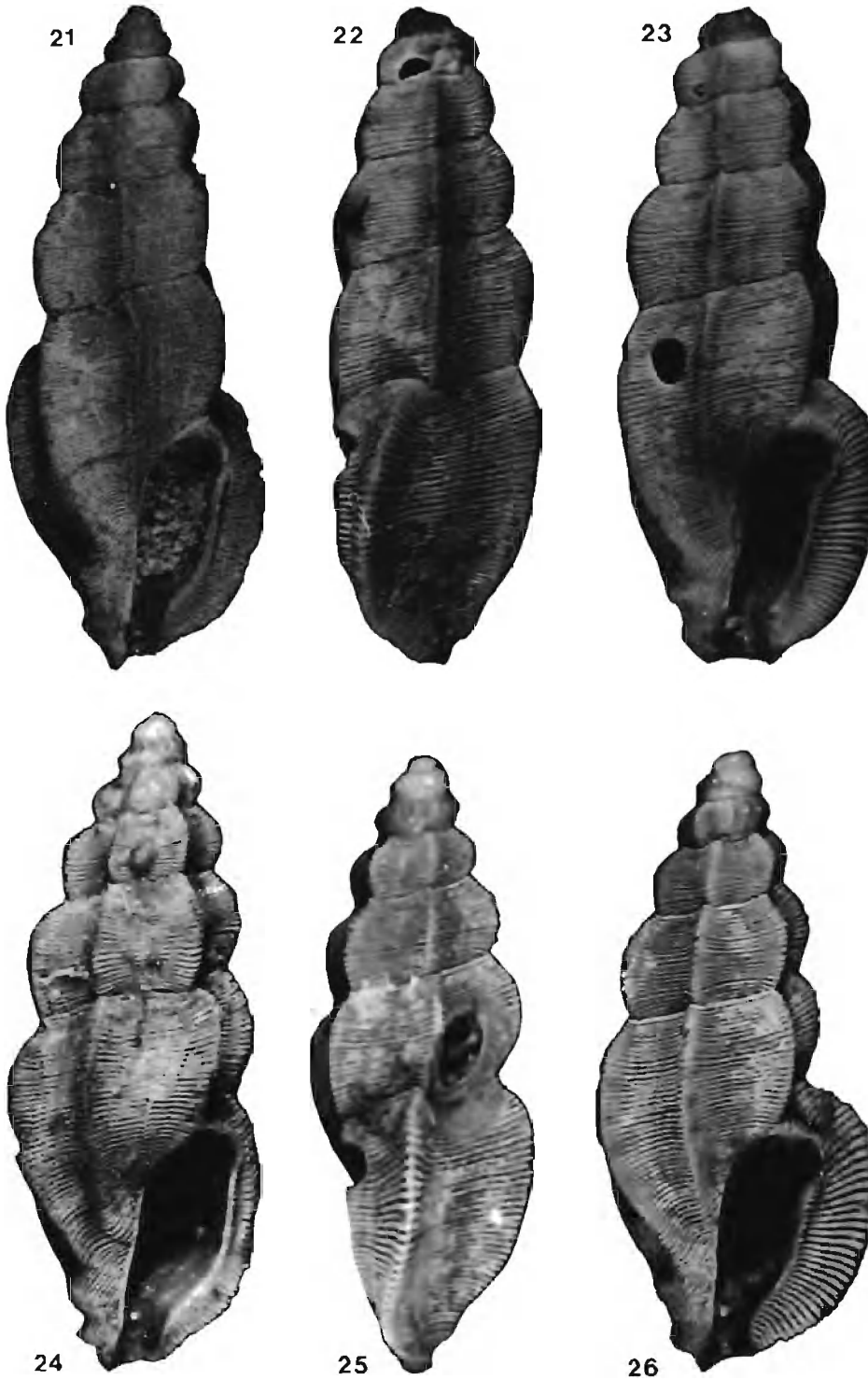
*Mangelia (Paraclathurella) maria* Thiele, 1925: 248 (214), pl. 27 (39), fig. 10. (**syn. n.**) Type locality: 5°55,8'S: 39°1,2'E, 50 m.

*Cythara deliciosa* Barnard, 1958: 151, Fig. 24. (**syn. n.**) Type locality: off Umhloti [= Mdloti] River, Natal, 40 fathoms.

*Eucithera [sic] deliciosa*; Giles & Gosliner, 1983: 29.

Diagnosis: Shell claviform, b/l 0,36–0,48, a/l 0,27–0,42, base rather short, siphonal canal fairly narrow, its termination obliquely truncate and moderately shallowly indented; whorls strongly convex, with slight shoulder; aperture narrowly oblong, outer lip smooth or with a small swelling below anal sinus, parietal region with or without a tiny nodule; anal sinus moderately deep; axial ribs rather high and steep-sided, with angular crests, straight to weakly sinuous, terminating at edge of columella callus, 6 (very rarely 7) per whorl; spiral threads tabulate with crenulated sides, 22–29 on penultimate whorl, equally fine but with deeper intervals on rostrum. Light or pinkish brown, sometimes with a subsutural spot in each rib interval, apex pale, aperture margin orange-tinged. Protoconch conical, last 1,5 whorls with arcuate axial riblets; diameter 0,70–0,80 mm. Maximum length 4,8–8,6 mm.

Description (local material): Shell claviform with a rather short base and fairly blunt, more or less cyrtoconoid spire; b/l 0,36–0,48, a/l 0,27–0,42; teleoconch whorls about 4,5 in number; suture shallow, not noticeably undulating; rib profile strongly convex, periphery median on early whorls, posterior on later ones, where they form a slight, rounded shoulder; shoulder slope not concave, no subsutural ridge; siphonal canal moderately short, rather straight and fairly narrow, its termination obliquely truncate, fairly shallowly indented, left side of base shallowly concave (sharply notched by rib




Figs 21–26. *Pseudorhaphitoma ichthys* (Melvill, 1910). **21**, Lectotype NMWC 1955.158.474, 6,2 x 2,4 mm; **22–23**, lectotype of *Mangelia (Paraclathurella) maria* Thiele, 1925, ZMHB colln, 4,4 x 1,8 mm; **24**, lectotype of *Cythara deliciosa* Barnard, 1958, SAMC A8692, 5,6 x 2,4 mm; **25–26**, example from off Cooper Lighthouse, Durban, 88 m, NMSA D4416, 5,2 x 2,4 mm.

intervals), fasciole weak but distinct. Aperture narrowly oblong, curved strongly to right at level of anal sinus, inner lip almost straight, only slightly convex medially, callus fairly thin, flat and smooth, its outer margin slightly free; parietal callus filling posterior angle of aperture, but not forming a tubercle; outer lip preceded by a wide varicoid rib, edge of lip slightly incurved, with a sharp edge, rather straight in side-view, stromboid notch slight or absent; internally smooth, sometimes with a slight tubercle just anterior to anal sinus; anal sinus moderately deep and rather narrow, symmetrically U-shaped.

Sculptured by strong, erect, almost lamelliform axial ribs, continuous from whorl to whorl, crossed by fine, dense spiral lirae, whose summits bear the vestiges of flattened granules. Axial ribs much narrower than their intervals (which are strongly concave), their crests angular, their sides steep and shallowly concave; orientation slightly opisthocline, straight to slightly sinuous, extending strongly from suture-to-suture, on body whorl terminating at edge of labral shield; 6 ribs on all teleoconch whorls (very rarely 7). Entire surface covered by thin, close, tabulate spiral lirae, subequal in width to their interstices, but bearing weak, flattened plicules which project laterally as crenules and partially roof over the interstices save for series of partial or complete foveolations; 1st whorl with 14–15 lirae, penultimate whorl with about 22–29, base of body whorl with 37–41, on rostrum these lirae become round-topped with deeper intervals than elsewhere.

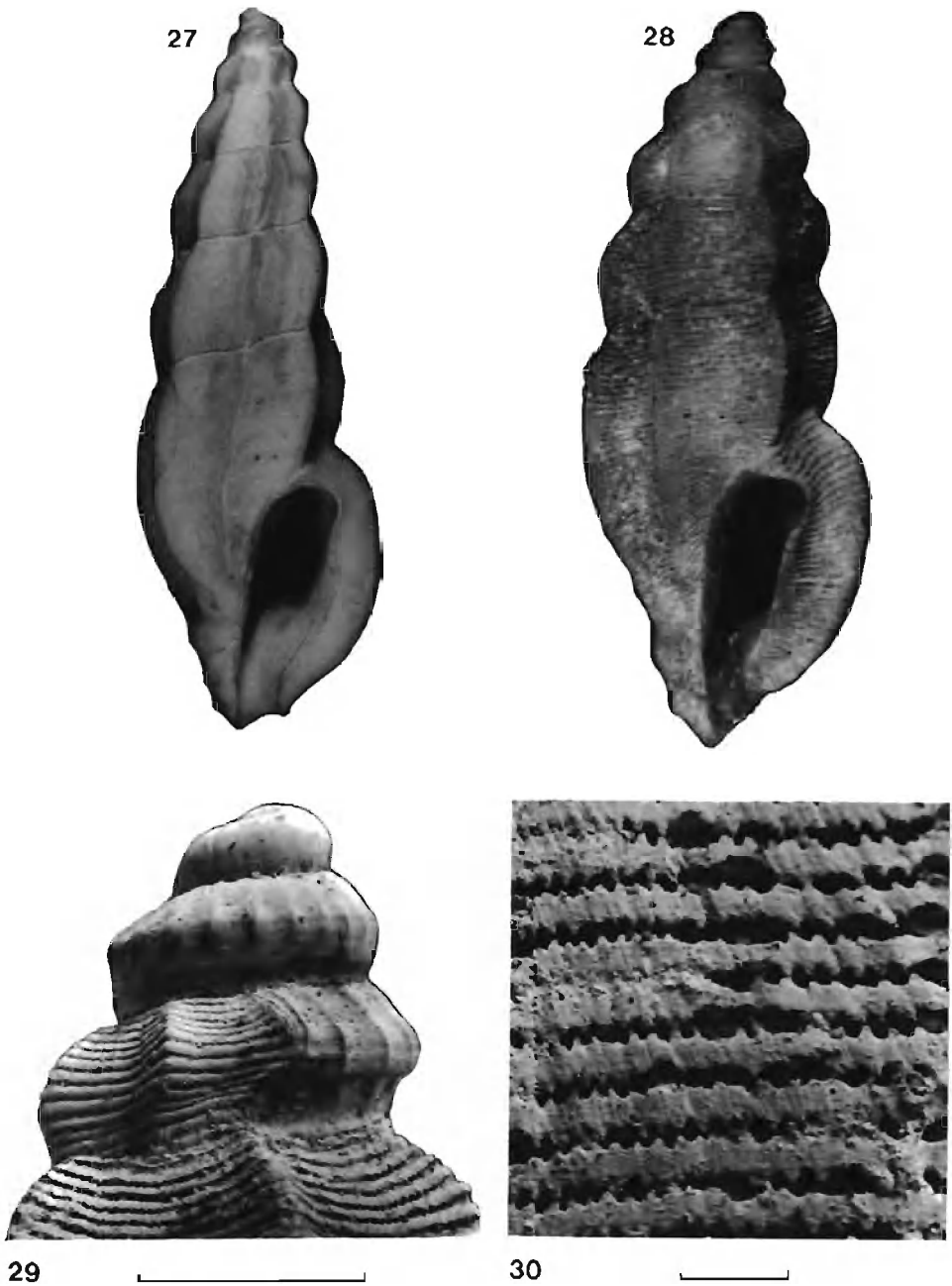
Fresh individuals light brown or pinkish-brown, with slightly paler ribs, rib intervals sometimes with a row of subsutural brown spots, aperture margin tinged with orange, apex pale; dead shells dull greyish-brown.

Protoconch conical, of about 2,5–3,0 whorls, 1st whorl depressed, later whorls with a peripheral angle, initially smooth, last 1,5 whorls with opisthocline, arcuate axial riblets, which project at periphery and number 18–23 on last whorl, and also several weak spiral ridges; breadth 0,55–0,80 mm, height 0,58–0,75 mm (b/h 1,07–1,28).

Dimensions: 6,4 x 2,8 mm, 4,8 x 1,9 mm; up to 8,6 mm length (protoconch missing).

Range: Persian Gulf to eastern Transkei, in southern Africa found between 45 and 90 m (rarely littoral), mostly in muddy sand/sandy mud.

Regional locality records (all NMSA: NMDP, unless otherwise stated): TRANSKEI: off Whale Rock (31°57.9'S, 29°14,3'E), 58–60 m, mixed sand and mud (C7194); off Ubombo, 80 m, mixed sand and mud, shell debris (C7692); off Mbotyi, 50 m, mixed sand, mud, worm tubes (C1727); off Waterfall Bluff, 80–90 m, fine mud, worm tubes (C7776). NATAL: between Umgababa and Umzimbazi Rivers, 70 m, fine sand (D3560); S.E. of Umzimbazi River, 65 m, fine sand (E5924); off Durban Bluff, 80–90 m, grey sandy mud (D4394); off Durban, 80–85 m, firm grey muddy sand (E1291, D3943); do, 80–90 m, grey sandy mud (D4442); Durban Bay, shallow dredgings (E1127, B311: B. J. Young). ZULULAND: off Sodwana Bay, 50 m, shell sand (E5920); off Gypsy Hill, 65-70 m, broken shell (E5897, E5899); do, 52 m, fine sand (E5761); off Hully Point, 60 m, shell rubble (E5919); off Boteler Point, 50 m, coral rubble, dead lithothamnion (E1599); off Kosi Bay, 45 m, red algae, sponges (E5442); do, 50 m, coarse sand, shells (E5921); S.E. of Kosi Bay, 50 m, coarse sand,




Figs 27–30. *Pseudorhaphitoma ichthys* (Melvill, 1910). **27**, Slender form, Durban Bay, NMSA E1127, 8,7 x 3,0 mm; **28**, example from Nacala, northern Mozambique, 40–60 ft, NMSA G4043, 4,8 x 1,9 mm; **29**, SEM of protoconch, scale bar = 500 µm; **30**, microsculpture of teleoconch, scale bar = 100 µm.

shells (E5621). NORTHERN MOZAMBIQUE: Nacala harbour dredgings, coral sand in 40–60 ft (NMSA G4043: sand sample leg. F. Steiner)

Type material: Six syntypes of *Mangilia ichthys* are NMWC 1955.158.474; the figured syntype, BMNH 1912.8.16.107, is here designated as lectotype (Fig. 21). One syntype of *Cythara deliciosa* is BMNH 1962321, six syntypes SAMC A8692 [one of the original 'unworn' specimens cited by Barnard appears to have been replaced with a worn fragment]; a lectotype measuring 5,6 x 2,4 mm is here designated, SAMC A38042 (Fig. 24). Two syntypes of *Mangelia (Paraclathurella) maria* in ZMHB; the figured adult (which has lost most of its protoconch) is here designated lectotype (Figs 22–23). The juvenile syntype of *M. maria*, whose protoconch was figured by Thiele, represents a different species (evidently *Pseudorhaphitoma stipendiarii*, *q.v.*), in which the ribs do not rise nearly as high below the suture, the spiral lirae have strongly serrulated margins and the last whorl of the protoconch is nodose-cancellate.

Notes: Although common in muddy substrata off Durban, no live examples appear to be represented in the large samples collected during the NMDP.

I have compared local material with syntypes of *M. ichthys*, *C. deliciosa* and *M. maria*, and apart from a little variation in proportions, can find no differences. The type locality of *maria* (the Zanzibar/Pemba area of Tanzania) provides a geographic link between the type localities of the other two. Barnard erred in describing *deliciosa* as possessing 7 ribs; like practically all the present material, the types have only 6. The species varies in relative breadth, in convexity of rib profile, and in height of spire. Offshore specimens tend to be small and squat (b/l 0,40–0,48, a/l 0,35–0,42), whereas a large, narrow form (b/l 0,36–0,39, a/l 0,27–0,33) occurs in Durban Bay and at a few stations off Zululand. This form, which may occasionally develop 7 axial ribs per whorl, may appear superficially extremely similar to *P. pyramidalis* (Reeve, 1846), but has finer spiral sculpture and a different protoconch, and occurs together with intermediate examples linking it to typical *ichthys*. *M. maria* appears to represent a small, moderately narrow East African form, with a slightly smaller protoconch (breadth 0,55 mm in lectotype) and usually a tiny parietal nodule. A specimen of this form from Nacala, northern Mozambique, has an intact protoconch of breadth 0,58 mm, height 0,45 mm (b/h 1,28); adult dimensions 4,8 x 1,9 mm.

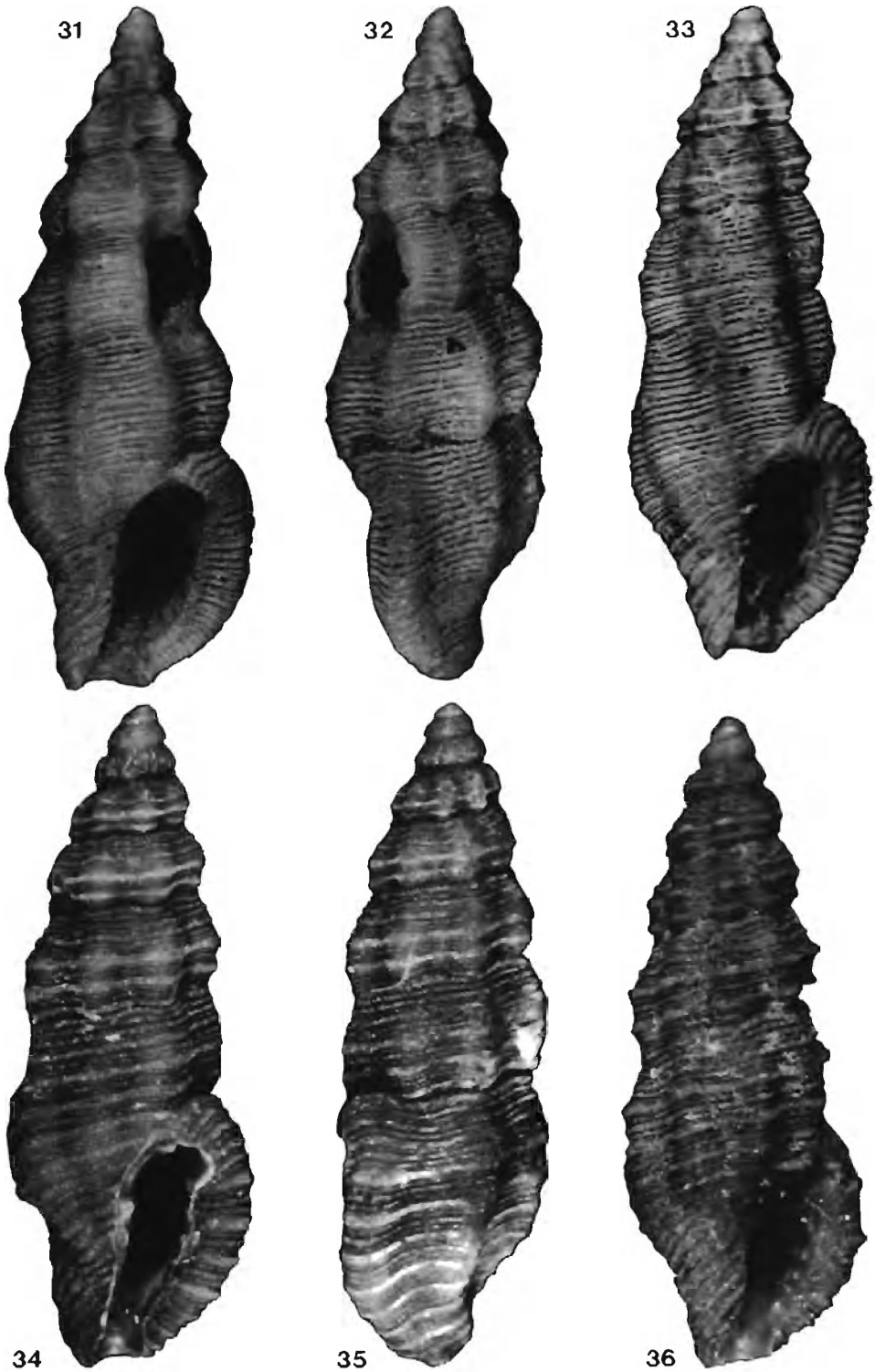
### *Pseudorhaphitoma crudelis* Hedley, 1922

Figs 31–35

?*Pleurotoma (Mangilia?) granilirata* E. A. Smith, 1888: 314. Type locality unknown.

*Pseudorhaphitoma crudelis* Hedley, 1922: 309, pl. 51, fig. 133. Type locality: Albany Passage, Cape York Peninsula, Queensland, 4–14 fathoms [= 7–26 m].

Diagnosis (based on both Queensland and local material): Shell narrowly claviform, b/l 0,36–0,38, a/l 0,33–0,37, base moderately produced, left side distinctly concave, siphonal canal rather narrow, its termination somewhat oblique and shallowly indented; whorls moderately to distinctly convex, with slightly angular periphery; aperture narrow, outer lip with 5–6 weak to strong denticles, inner lip generally with 1–2 median denticles; anal sinus moderately deep and narrow; axial ribs rather low,




Figs 31–36. *Pseudorhaphitoma crudelis* Hedley, 1922, and *P. granilirata* (E. A. Smith, 1888). **31–35**, *P. crudelis*: **31–32**, holotype AMSA C.103542, 5,5 x 2,0 mm; **33**, paratype, AMSA C.168396, 5,4 x 2,0 mm; **34–35**, example from Zululand, NMSA S5998, off Liefeldt's Rocks, 50 m, 5,1 x 1,9 mm. **36**, *P. granilirata*, lectotype, BMNH 74.5.26.60, 5,8 x 2,1 mm.

with roundedly angular crests, straight, continuing onto base of rostrum, 7 per whorl on later whorls; spiral sculpture of raised, fairly close lirae, bearing dense, transversely pliculate granules, lirae 17–25 in number on penultimate whorl, 3-4 per whorl slightly to markedly stronger than others, rostral threads mostly coarse. Pale buff to light orange-brown. Protoconch conical, last whorl bearing arcuate axial riblets; diameter 0,53–0,60 mm. Maximum length 6,0 mm.

Description (based on local material): Shell narrowly claviform (b/l 0,37–0,38, a/l 0,34–0,37) with a moderately produced, strongly tapering base and fairly acute, more or less orthoconoid spire; teleoconch whorls about 5,2 in number; suture moderately shallow, not undulating, early whorls rounded, not bicarinate, later whorls slightly angular, shoulder slope not concave, no distinct subsutural ridge; siphonal canal short, oblique, rather narrow but expanding anteriorly, its termination obliquely truncate, shallowly indented, left side of base moderately to strongly concave, fasciole distinct. Aperture narrowly oblong, slightly constricted by denticles; inner lip almost straight, with a fairly thin callus bearing 1–2 median tubercles and a fairly strong parietal tubercle in posterior angle of aperture; outer lip with a sharp edge, not crenulated in side-view, preceded by a fairly massive varix; interior of lip with a series of 5–6 small, rounded denticles plus a stronger, more angular one posteriorly at entrance to anal sinus; anal sinus moderately deep, slightly asymmetrically U-shaped, fairly narrow, occupying greater part of shoulder slope, stromboid notch shallow.

Sculptured by moderately strong axial ribs, continuous from whorl to whorl, crossed by thin, wide-set main spiral lirae, bearing transverse granules, with weaker secondary threads (bearing prickly granules) in their intervals and on shoulder slope. Axial ribs equal to/wider than their intervals (which are asymmetrically concave), orthocline, straight, but very slightly protractive below suture, where they are relatively weak, on body whorl terminating on rostrum; crests of ribs angularly rounded, sides of ribs rather steeply sloping; 8 ribs on 1st teleoconch whorl, 7 on penultimate one.

First teleoconch whorl with its lower two-thirds occupied by 3 main lirae, separated by a weaker secondary thread and another 4 below suture; from about 4th whorl, upper main lira weakens, but another becomes visible above suture, and the subsutural lirae become almost as strong; interval between each pair of main lirae with 3–4 secondary threads, so that penultimate whorl bears a total of about 18 spirals (including 3 main lirae), and base of body whorl shows ca. 27–36, of which 10–14 are main lirae, those on rostrum being relatively thick and rounded.

Uniform light orange-brown.

Protoconch conical, of about 3 whorls, 1st whorl depressed, whorls rounded, slightly worn but evidently smooth, except for last 1,5 whorls, which bear arcuate axial riblets; breadth 0,58–0,60 mm, height 0,55-0,60 mm (b/h 1,00–1,02).

Dimensions: 5,1 x 1,9 mm (holotype); 6,1 x 2,3 mm (largest paratype).

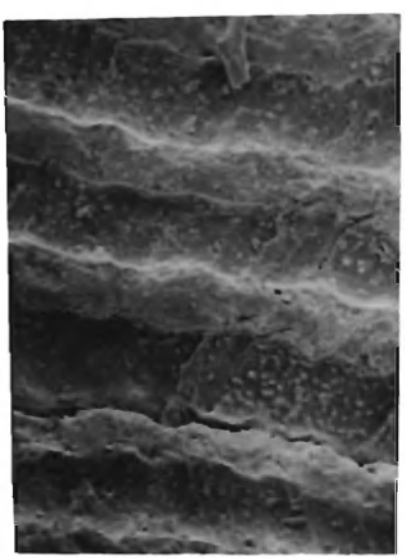
Distribution: Northern Zululand (dead in 50 m) to Queensland and Papua New Guinea in 7–48 m.

Type material: Holotype of *P. crudelis* (Figs 31–32) and 14 paratopotypes AMSA C.168396.

Local material (all NMSA): ZULULAND: N. E. of Liefeldt's Rocks, 50 m, coral








Figs 37–41. *Pseudorhaphitoma ethekwini* sp. n. **37–38**, Holotype NMSA D161/T110, 6,9 x 2,6 mm; **39**, SEM of paratype shell, NMSA E5795/T111, 6,1 x 2,5 mm; **40**, protoconch of latter, scale bar = 380 µm; **41**, SEM of sculpture (slightly worn) on penultimate whorl, scale bar = 60 µm.

rubble, medium sand, *Lithothamnion* (S5998, S1267: NMDP); off Kosi Bay, 50 m, shell sand (A6011, ex CSIR Water Research bottom sample).

Notes: At first I was inclined to regard Zululand material (Figs 34–35) as representing a new species, as this differed rather widely from the type figure of *P. crudelis* in both sculpture and apertural features. However, having examined a series of paratopotypes of that species I find that individual variation (see Fig. 33) transcends most of the observed differences, and that the small remaining discrepancies are ones of degree. Thus, Zululand examples are apparently darker in colour (type specimens are almost colourless), possess stronger denticles on the inner lip (somewhat weaker to absent in Queensland shells), the aperture is generally less constricted, early teleoconch whorls are less distinctly bicarinate, and there are two orders of spiral lirae on the later whorls (secondary and main spirals are almost equal in most types of *crudelis*).

I am almost convinced that *Pleurotoma granilirata* E. A. Smith, 1888 (Fig. 36, also see Appendix), is an earlier name for *crudelis*. However, the presence of 8 axial ribs in the types of the former, and only 7 in all examined examples of *P. crudelis*, cannot be ignored.

*P. multigranosa* (Schepman, 1913) from Indonesia is very similar, but much larger (8,5–12 mm) with coarser and more strongly granulose spiral lirae, and 6 axial ribs instead of 7.

### **Pseudorhaphitoma ethekwini** sp. n.

Figs 37–41

Diagnosis: Shell narrowly claviform, b/l 0,38–0,58, a/l 0,36–0,37, base rather strongly produced, siphonal canal wide, its termination almost straight and fairly shallowly indented; whorls moderately convex, with slightly angular periphery; aperture narrow, outer lip with an internal ridge, ending in a small swelling below anal sinus; anal sinus rather shallow; axial ribs rather low, with roundedly angular crests, weakly sinuous, continuing onto base of rostrum, 6 per whorl on later whorls; spiral threads fine and of uniform strength, threads and interstices weakly micropliculate, 25–30 threads on penultimate whorl, equally fine on rostrum. Brownish-white to light orange-brown, columella and apex orange-tinged. Protoconch narrowly and bluntly conical, last whorl bearing arcuate axial riblets; diameter 0,60–0,68 mm. Maximum length 7,1 mm.

Description: Shell narrowly claviform (b/l 0,38–0,58, a/l 0,36–0,37) with a strongly produced but broad base and fairly acute, more or less orthoconoid spire; teleoconch whorls about 4,7 in number; suture shallow, inconspicuously undulating, whorl profile moderately convex with a slightly angular periphery situated at approximately midwhorl, not forming a distinct shoulder; shoulder slope very shallowly concave, no subsutural ridge; siphonal canal short, somewhat oblique and wide, its termination truncate but almost straight, fairly shallowly indented, left side of base shallowly concave (not notched by rib intervals), fasciole weak. Aperture narrow and somewhat sinuously parallel-sided, curved strongly to right at level of anal sinus, columella almost straight, only slightly convex medially; labial callus fairly thin, flat and smooth, its outer margin slightly free on columella; parietal callus filling

posterior angle of aperture with a rounded pad, but not forming a distinct tubercle; outer lip preceded by a thick, moderately narrow varicoid rib; edge of lip fairly sharp, not incurved, bordered internally by a weak, parallel ridge, which terminates anterior to anal sinus in a slight swelling, but without distinct denticles; lip gently convex in side-view, anal sinus rather shallow and asymmetrically U-shaped; stromboid notch slight.

Sculptured by strong but fairly low axial ribs, continuous from whorl to whorl, crossed by very fine, dense spiral lirae of uniform strength, whose intervals bear inconspicuous, microscopic collabral plicules, which render the summits of the lirae obscurely granular. Axial ribs narrower than their intervals (which are gently concave), their crests roundedly angular in T/S, their sides sloping; orientation slightly opisthocline, weakly sinuous, extending strongly from suture-to-suture, on body whorl continuing some distance onto rostrum; 8–10 axial ribs on 1st teleoconch whorl, 6–7 on 2nd, 6 on remaining whorls. Entire surface covered by thin, sharp, close spiral lirae, narrower than or subequal in width to their interstices, 12 lirae on 1st teleoconch whorl, penultimate whorl with 25–30, base of body whorl with approximately 38–40 lirae, not becoming coarser on rostrum. Interstices with extremely fine pustules, only visible under SEM at a magnification of 300 X or more.

Brownish-white to light orange-brown, apex and columella tinged with darker orange.

Protoconch narrowly conical, of 2,5 rather weakly rounded whorls, nucleus somewhat immersed; smooth except for last whorl, which bears thin, somewhat arcuate, slightly opisthocline axial riblets; breadth 0,60–0,68 mm, height 0,63–0,68 mm (b/h 0,95–1,00).

Dimensions: 6,9 x 2,6 mm (holotype); 7,3 x 2,5 mm, 6,1 x 2,6 mm (paratypes).

Range: Durban Bay to southern Mozambique.

Type material: Holotype NMSA D161/T110, Durban Bay, Natal, shallow dredgings, B. J. Young. Paratype 1, NMSA E5795/T111, same data. Paratype 2, NMSA K6934/T321, Santa Carolina Island, Bazaruto Archipelago, southern Mozambique, south sandbank, R. K.

Notes: The two Durban Bay types are markedly more biconic than the Mozambican one. The species appears very similar to *P. informis* (Hedley, 1922) from Queensland and New South Wales, but in that the shape is even more biconical and spiral threads are coarser and fewer, being particularly strong on the rostrum. *P. ethekwini* is also superficially similar to *P. hexagonalis* (Reeve, 1845), which differs somewhat in shape, in having both a fairly strong labral nodule and an opposing parietal one, in lacking any trace of angulation to the whorls, and evidently in having a subcylindrical protoconch (although this is rather worn in the holotype of *hexagonalis*, the only example seen). *P. agna* (Melvill & Standen, 1896) resembles *ethekwini* in shape, but lacks colour, has 7 instead of 6 ribs on later whorls, and has a paucispiral, subcylindrical protoconch.

Etymology: Zulu *eThekwini* = Durban Bay.

**Pseudorhaphitoma obturata** sp. n.

Figs 42–48

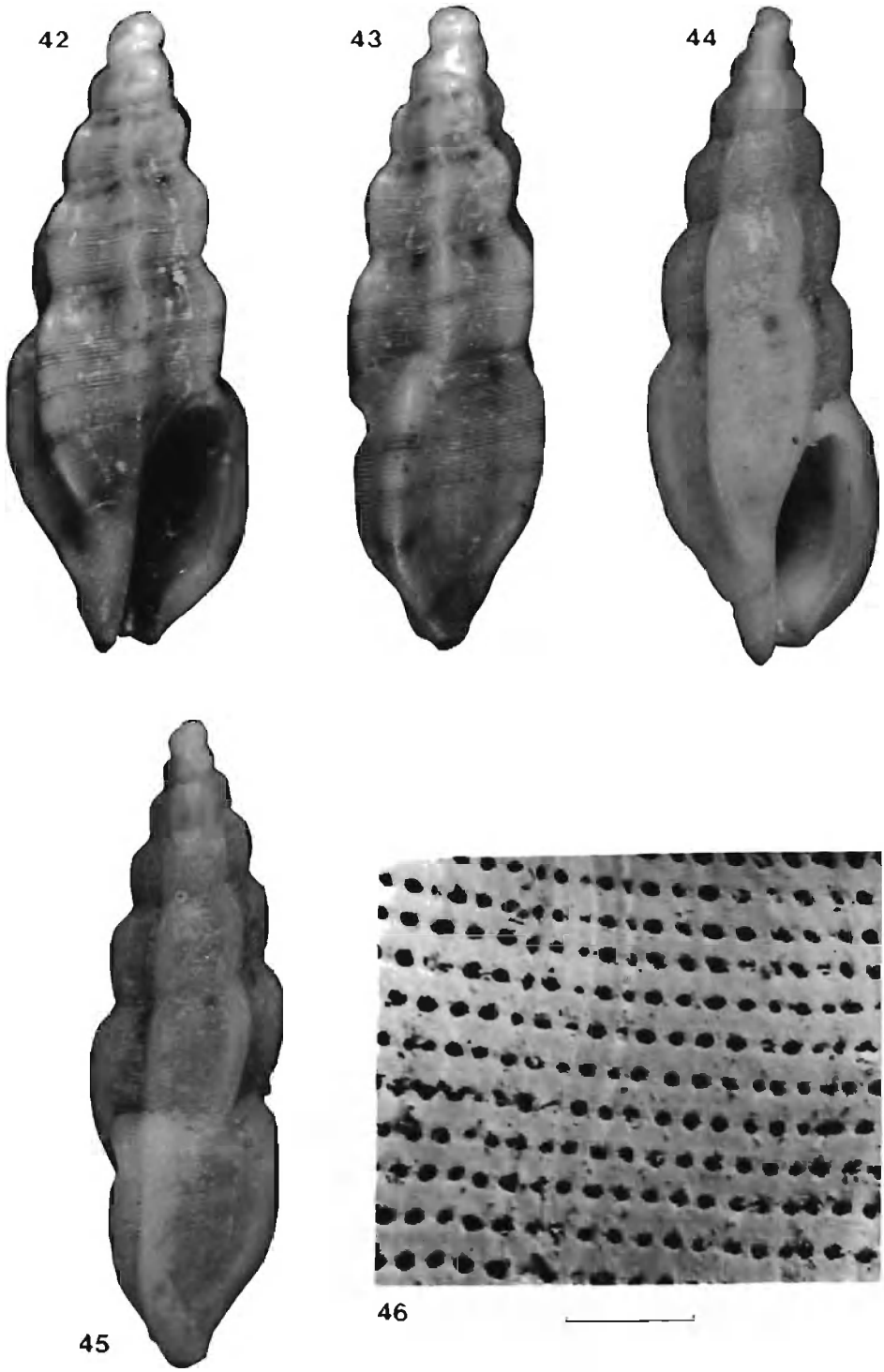
Diagnosis: Shell claviform, b/l 0,39–0,46, a/l 0,39–0,46, base slightly produced, siphonal canal wide, its termination obliquely truncate and rather deeply indented; whorls convex, with a slight, sloping shoulder; aperture narrowly oblong, outer lip sometimes with a feeble nodule within or just anterior to anal sinus; anal sinus moderately deep; axial ribs strong, with angular crests, almost straight, terminating on base of rostrum, 5–6 per whorl; spiral threads about 30 on penultimate whorl, equally fine on rostrum, tabulate, superficially smooth (but microscopically rugose under SEM), interstices foveolate. Pale buff, usually with a faint brown subsutural spot in each rib interval, and several faint brown spiral bars on crests of ribs; protoconch white. Protoconch subcylindrical, blunt, about 1,6 whorls, microscopically pustulose under SEM; breadth 0,45–0,63 mm. Maximum length 6,2 mm.

Description: Shell claviform (b/l 0,39–0,46, a/l 0,39–0,46) with a slightly produced base and blunt, more or less cyrtoconoid spire; teleoconch whorls slightly over 4 in number; suture shallow, inconspicuously undulating, rib profile convex, periphery situated at about one-third length of each whorl below suture, forming a slight, sloping shoulder; shoulder slope barely concave, no subsutural ridge; siphonal canal moderately short, rather straight and wide, its termination obliquely truncate, rather deeply indented, left side of base shallowly concave (not notched by rib intervals), fasciole weak. Aperture narrowly oblong, curved strongly to right at level of anal sinus, columella almost straight, only slightly convex medially, with a slight notch at columella/parietal junction; labial callus fairly thin, flat and smooth, its outer margin slightly free; parietal callus filling posterior angle of aperture, but not forming a tubercle; outer lip preceded by a wide varicoid rib, edge of lip sharp, rather sinuous in side-view, internally smooth, except sometimes for a feeble nodule just inside anal sinus or anterior to it; anal sinus moderately deep and fairly narrow, asymmetrically U-shaped; stromboid notch slight.

Sculptured by strong axial ribs, continuous from whorl to whorl, crossed by very fine, dense spiral lirae, whose summits lack distinct granules, intervals minutely foveolated. Axial ribs much narrower than their intervals (which are gently concave to flattened), their crests angular, their sides steep; orientation slightly opisthocline, almost straight, extending strongly from suture-to-suture, on body whorl terminating at base of rostrum; 5–6 ribs on all teleoconch whorls. Entire surface covered by thin, close, flat-topped spiral lirae, microrugulose under SEM, narrower than or subequal in width to their interstices, which are filled with intritacalx leaving only a series of rounded pits; penultimate whorl with about 30 lirae, base of body whorl with approximately 40, lirae somewhat round-topped with deeper intervals on rostrum.

Pale buff to yellowish-white, crests of ribs usually with several rows of faint brown spots or bars, faint in intervals, one row below suture, one at midwhorl and 1–2 on base of body whorl; also a subsutural brown spot in each rib interval; protoconch pure white.

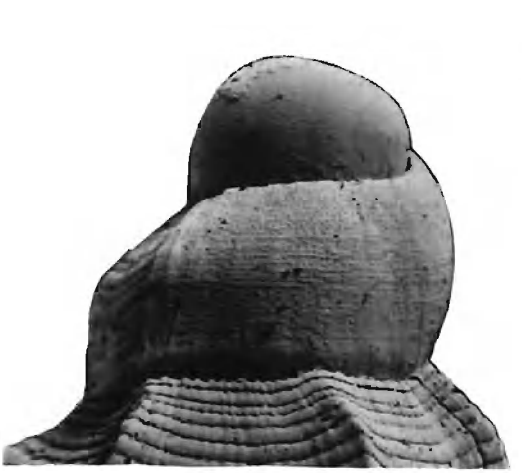
Protoconch cylindrical with flattened top, of just under 2 whorls, 1st whorl strongly tilted, with nucleus immersed; superficially smooth, except for 4–5 thin, feeble, orthocline axial riblets at termination, but under SEM shows minute rounded




Figs 42–46. *Pseudorhaphitoma obturata* sp. n. **42–43**, Holotype, NMSA E5746/T88, 4,8 x 1,9 mm; **44–45**, Large littoral form, example from off Whale Rock, Transkei, 20–26 m, 8,5 x 3,1 mm; **46**, SEM of sculpture of teleoconch, paratype 1, NMSA E5364/T89, scale bar = 100 µm.

pustules, weaker and more irregular on 1st whorl, on 2nd more or less spirally arranged, frequently fusing; breadth 0,45–0,63 mm, height 0,48–0,60 mm (b/h 0,94–1,15).

Dimensions: 4,8 x 1,9 mm (holotype); 6,2 x 2,6 mm (largest paratype).



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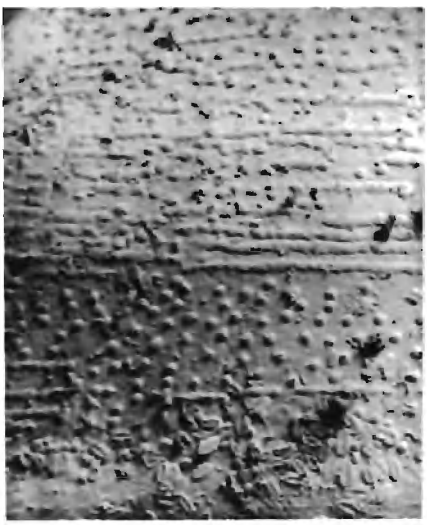

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Figs 47–48. *Pseudorhaphitoma obturata* sp. n. SEM of protoconch, paratype 1, NMSA E5364/T89: **47**, protoconch; **48**, microsculpture of protoconch. Scale bar = 100 µm.

Range: Northern Zululand to western Transkei, in 40–210 m (rarely littoral).

Type material (all NMSA: NMDP, unless otherwise stated): Holotype E5746/T88, off Kosi Bay (26°54,6'S: 32°56,6'E), 75 m, coral rubble, sandstone, marine growths. ZULULAND: Same data as holotype (E5364/T89, 3); do, 45–47 m, red algae, sponges (E5747/T105, 2); off Boteler Point, 70 m, coral rubble (E1578/T102, 9); off Island Rock, 62 m, sandstone, coral, marine growths (E5558/T104, 4); off Sodwana Bay, 100 m (B7181/T103: CSIR bottom-sample, one); off Durnford Point, 114 m, sandstone rubble (E1612/T101, 2). NATAL: off Durban Bluff, 210 m (A2992/T100, CSIR bottom sample, 2); off Park Rynie, 130 m (D229/T99, 2). TRANSKEI: off Mtamvuna River, 106 m, some stones (C7848/T90, one); do, 120–140 m, sponge rubble (C7519/T91, 3); off Port Grosvenor, 80 m, worn calcareous nodules (C7324/T97, one); do, 95–100 m, coarse sand (C7762/T98, one); off Ubombo, 40–45 m, coarse sand, soft corals (C7173/T93, one, large form); do, 80 m, mixed sand and mud (C7354/T92, 5); off Whale Rock, 70–73 m, marine growths, calcareous debris; large form (C7654/T94, 3); do, 90 m, sponge rubble, coarse sand, some rocks (C9971/T95, 2); off Sandy Point, 90 m, calcareous debris, coarse sand (C7747/T96, one).

Additional material (large littoral morph (see below), all NMSA): TRANSKEI: off Whale Rock, 20-26 m, sand and gorgonians, dead (C7410, C7239: NMDP);

Mzamba, worn (B4690, D2566: R. K., D. Herbert); Mbotyi, worn (C8417: R. K.); Mgazi, worn (A1221: R. K.); Xora, worn (A1537: R. K.).

Notes: *Pseudorhaphitoma obturata* has a most distinctive appearance, and there appears to be only one species with which it could be confused, namely the previously unfigured *Pleurotoma (Mangilia) mamillata* E. A. Smith, 1888 (see Appendix). In *P. obturata* spiral sculpture is uniformly fine, whereas in *P. mamillata* three lirae per whorl are stronger than the others, and form feeble nodules on the rib profile (on later whorls these ridges weaken intercostally, but the nodules remain); the whorls in *obturata* also differ in being slightly shouldered and the tip of the siphonal canal is more deeply notched. Nothing approaching *mamillata* occurs in the large series of *P. obturata* that is available, and the species remains unlocalised.

Notwithstanding the above, *P. obturata* varies in other respects. Even in typical individuals, size of protoconch varies in diameter from 0,45 to 0,63 mm. Another variable parameter is adult size: whereas most specimens measure 5 mm or less in total length, in Transkei I have dredged (together with typical examples) a large form, in which adults may attain 6 mm. Perplexingly, there also occurs in Transkei a littoral form (beach-drift to 20–26 m) which differs in a number of minor characters (Figs 44–45); it is larger than the typical deep-water form (up to 8,5 mm length), generally more slender (b/l 0,35–0,41 against 0,39–0,46), the spire is higher (a/l 0,35–0,39, against 0,39–0,46), the protoconch slightly larger (breadth 0,63–0,68, against 0,45–0,63), spiral lirae slightly more numerous (about 40 on penultimate whorl, instead of about 30), axial ribs number 6–7 (instead of 5–6) and ground colour is often violaceous-pink. Although these differences appear minor, it is advisable to exclude this material from the type material of *P. obturata.*

*P. obturata* is one of the commonest members of the genus on the Natal shelf, and some 20 lots additional to the type series have so far been sorted from NMDP bottom samples. It appears to prefer less muddy substrata than *P. ichthys.*

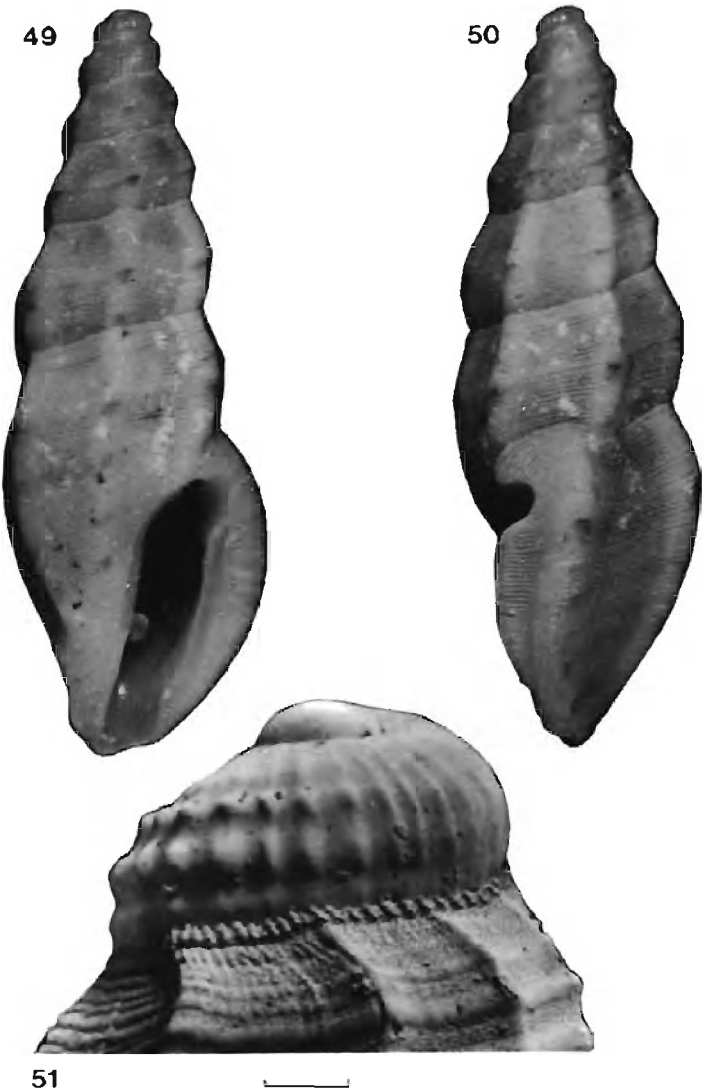
Etymology: L. *obturatus* = with a plug or bung, alluding to the stopper-shaped protoconch.

### **Pseudorhaphitoma stipendiarii** sp. n.

Figs 49–53

*?Mangelia (Paraclathurella) maria* Thiele, 1925 [*partim*]: 248 (214), pl. 27 (39), fig. 10a only.

Diagnosis: Shell narrowly claviform, b/l 0,35–0,38, a/l 0,36–0,39, base rather strongly produced, its termination obliquely truncate and shallowly indented; whorls weakly to fairly strongly convex, with slightly angular periphery; aperture narrow, outer lip with 14–16 weak denticles internally, the posteriormost forming a rounded tubercle which opposes a similar one on the paries; inner lip sometimes with a row of tiny denticles; anal sinus moderately deep; axial ribs rather low, with angular crests, weakly sinuous, continuing onto base of rostrum, 6 per whorl; spiral threads with flat granules that crenulate their edges, 27–33 on penultimate whorl, equally fine on rostrum. Pale flesh-colour, crests of ribs usually with several rows of inconspicuous orange flecks. Protoconch bluntly domed, last whorl bearing weakly arcuate axial riblets, cut into nodules by 5-6 spiral ridges; diameter 0,60–0,70 mm. Maximum length 7,2 mm.




Figs 49–51. *Pseudorhaphitoma stipendiarii* sp. n. **49–50**, Holotype, NMSA E5620/T118, 6,1 x 2,3 mm; **51**, SEM of protoconch, paratype NMSA E5023/T119, scale bar = 100 µm.

Description: Shell narrowly claviform (b/l 0,35–0,38, a/l 0,36–0,39) with a strongly produced base and blunt, more or less orthoconoid to cyrtoconoid spire; teleoconch whorls about 4,5 in number; suture shallow, inconspicuously undulating, whorl profile weakly to fairly strongly convex with a slightly angular periphery situated at or just below midwhorl, not forming a distinct shoulder; shoulder slope shallowly concave, no subsutural ridge; siphonal canal moderately short, somewhat oblique and wide, its termination obliquely truncate, shallowly indented, left side of base

shallowly concave (not notched by rib intervals), fasciole rather weak. Aperture narrow and somewhat sinuously parallel-sided, posterior end pinched into an embayment by opposing parietal and labral nodules, outer lip slightly arched, columella long and straight; labial callus fairly thin, flat and smooth or with a row of small denticles, its outer margin slightly free on columella; parietal callus forming a distinct tubercle a short distance from end; outer lip preceded by a thick, varicoid rib; edge of lip sharp and somewhat incurved, bordered internally by a weak, parallel ridge, which bears 14–16 weak denticles, the posterior one enlarged into a rounded tubercle; lip gently convex in side-view, anal sinus moderately deep and fairly symmetrically U-shaped; stromboid notch slight.

Sculptured by strong but fairly low axial ribs, continuous from whorl to whorl, crossed by very fine, dense spiral lirae, whose summits bear microscopic plicules. Axial ribs narrower than their intervals (which are gently concave, occasionally flattened), their crests angular in T/S, their sides steeply sloping; orientation slightly opisthocline, weakly sinuous, extending strongly from suture-to-suture, on body whorl continuing some distance onto rostrum; 6 axial ribs on all teleoconch whorls. Entire surface covered by thin, close, tabulate spiral lirae, which bear minute, oblique, transverse plicules that serrulate their edges (and render the sutural margin very finely prickly), lirae equal in width to their interstices or wider; 8–12 lirae on 1st teleoconch whorl, penultimate whorl with 27–33, base of body whorl with approximately 40–50 lirae, not becoming coarser on rostrum; under SEM both crests of spirals and their intervals are rugose.

Pale flesh-colour, ribs and apex paler, crests of ribs with several rows of very faint orange flecks, one row at midwhorl being the most conspicuous.

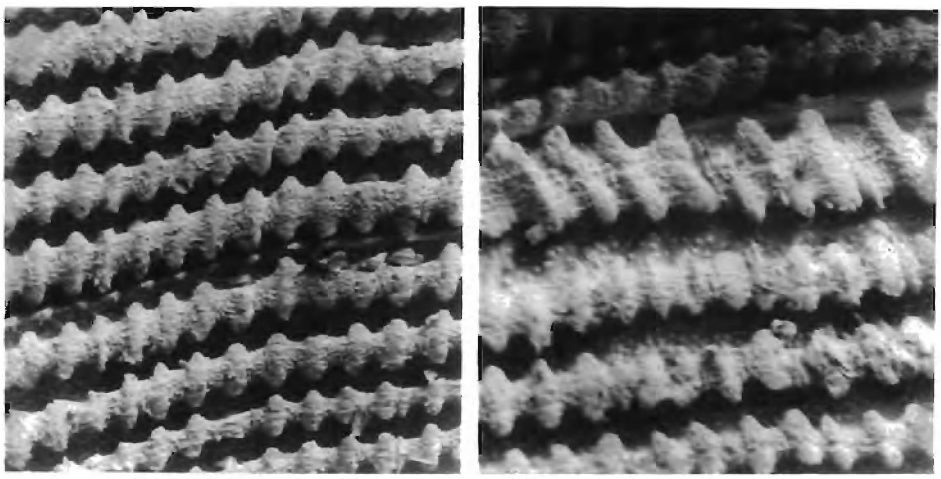
Protoconch bluntly domed of about 1,6 whorls, nucleus somewhat depressed; initially smooth, then developing axials, on last whorl 16-20 thin, slightly arcuate, orthocline axial riblets, becoming strongly tuberculate on last half whorl, with 5-6 rows of tubercles, of which the median three are the stronger; breadth 0,60–0,70 mm, height 0,42–0,60 mm (b/h 1,17–1,43).

Dimensions: 6,1 x 2,3 mm (holotype); 7,2 x 2,5 mm, 5,6 x 2,1 mm (largest and smallest adult paratypes respectively).

Range: Inner continental shelf of northern Zululand, 45–60 m, probably north to the Zanzibar/Pemba area.

Type material (all NMSA: NMDP): Holotype E5620/T118, S.E. of Kosi Bay, Zululand (26°56,7'S: 32°54,7'E), 50 m, coarse sand, shells. Paratypes 1–12, E5923/T119, same data. Paratypes 13–19, E5356/T120, same data, fine sand. Paratypes 20–25, E5444/T121, off Kosi Bay, 45 m, red algae, sponges. Paratype 26, D6712/T122, off Hully Point, 60 m, shell-rubble. Paratype 27, E5760/T123, off Gipsy Hill, 52 m, fine sand.

Notes: The crests of the spiral lirae are similarly pliculate in *P. pyramis* (Hinds, 1843) from the tropical western Pacific, but the two differ widely in size and relative breadth of shell, and strength of spiral sculpture. Whereas the lectotype of *Mangelia maria* Thiele, 1925, is identical to *Pseudorhaphitoma ichthys* (Melvill, 1910) (*q.v.*), the protoconch of the juvenile paralectotype appears to agree with that of *P. stipendiarii*, as does its teleoconch sculpture. Confirmation of the occurrence of *stipendiarii* in East Africa is required from adult shells.




Figs 52–53. *Pseudorhaphitoma stipendiarii* sp. n. SEM of teleoconch sculpture, paratype NMSA E5023/T119. Scale bar = 100 µm.

In its narrow form and denticulate labrum, *P. stipendiarii* resembles various western Atlantic mangeliines generally referred to the genus *Ithycythara* Woodring, 1928, and even its protoconch appears similar to that of *Mangilia psila* Bush, 1885, type species of the latter genus. However, true *Ithycythara* appears to lack strong spiral sculpture, other than a peripheral keel and a few indistinct basal threads.

Etymology: L. *stipendiarius* = the [South African] taxpayer, who unwittingly funded the discovery of this and so many other new turrid species.

## APPENDIX

I reproduce here some of my notes and photographs of extralimital Indo-West Pacific species, assembled during the background research for this study, as an aid to workers in other regions.

### *Pseudorhaphitoma heptagona* (Dunker, 1871)

Figs 54–55

*Clathurella heptagona* Dunker, 1871: 161. Type locality: Upolu [Western Samoa].
Not: *Mangelia heptagona* (Dunker, 1871); Melvill, 1917: 171, pl. 9, figs 14, 14a [= *Pseudorhaphitoma drivasi* sp. n.]

Type material: Not only is this species unidentifiable from the brief original description, but the type material was housed in the Godeffroy Museum, which was destroyed during World War II. However, Dr R. Kilias has sent me a specimen presented to ZMHB by the Godeffroy Museum, which, although of unconfirmed syntypic status, can be regarded as authentic. This specimen, described below, is here designated as neotype.

Notes: Shell narrow-claviform (b/l and a/l 0,37), base relatively short and rapidly tapering, spire acute and orthoconoid, teleoconch whorls nearly 5; termination of siphonal canal damaged; parietal nodule small, outer lip with a single nodule just anterior to anal sinus, which is U-shaped. Axial ribs strong, continuous, equal to their intervals, which are concave, in t/s ribs are angularly rounded, with sloping sides, slightly prosocline, rather straight, suture to suture, terminating on rostrum, 7 ribs per whorl. Main spiral lirae 3 per whorl (the median one projecting angularly), occupying anterior 0,75 whorl, a 4th lira showing above suture on penultimate whorl, 8 main lirae on base of body whorl; intervals and shoulder slope covered with very fine, microscopically granular spiral threads. Colour pale buff. Protoconch eroded, conical, evidently of about 2,5 whorls, axial ribs visible on last whorl, breadth 0,43 mm, height 0,38 mm (b/h 1,13). Dimensions: 4,4 x 1,6 mm.

*Pseudorhaphitoma perlonga* (Melvill, 1899)

Fig. 56

*Mangilia perlonga* Melvill, 1899: 87, pl. 1, fig. 5; *idem*, 1917: 174; Trew, 1987: 57. Type locality: Karachi [Pakistan].

Type material: Holotype BMNH 99.12.18.7, F. W. Townsend. Possibly deformed.

Notes: Axial ribs 7 on penultimate whorl, rounded in t/s, with rather flat intervals; 4th whorl with 5 main spiral lirae and 6–7 fine, microgranular intermediary threads, plus approximately 14 below suture, on penultimate whorl becoming dense and more uniform. Third whorl of protoconch nodose-cancellate. Dimensions 7,2 x 2,2 mm.

*Pseudorhaphitoma phaea* (Melvill & Standen, 1901)

Fig. 57

*Mangilia phaea* Melvill & Standen, 1901: 442, pl. 24, fig. 7; Melvill, 1917: 175; Trew, 1987: 57. Type locality: Linjah, Persian Gulf, 3½ fathoms.

Type material: Holotype BMNH 1901.12.9.139, F. W. Townsend, a juvenile with 4 teleoconch whorls and undeveloped apertural characters.

Notes: Shape biconical, with sharp apex and very shallow suture. Axial ribs strong, continuous, almost straight, extending from suture (where they are slightly lower and a little procurved) to base, slightly opisthocline, in t/s asymmetrically rounded, with gradually sloping sides, equal in width to the gently concave intervals; 8 ribs on 1st whorl, 7 on last. Main spiral lirae rather weak in intervals, expanded slightly on rib crests, 1 lira on 1st whorl, 2 on others (2nd lira initiated above suture on 2nd whorl), upper lira the stronger, rendering whorls medially somewhat angular, base with 6 main lirae, plus about 6 thin, rather indistinct threads on rostrum; intervals and subsutural region with extremely fine, microscopically rugose spiral threads. Uniform orange-brown. Protoconch conical, of about 2,5 whorls, evidently smooth, apart from opisthocline axial ribs on last half whorl; breadth 0,48 mm. Dimensions: 4,9 x 1,8 mm.

The original figure of this species is indifferently drawn, being more suggestive of a member of the genus *Macteola* Hedley, 1918.


Figs 54–58. *Pseudorhaphitoma heptagona* (Dunker, 1871), *P. perlonga* (Melvill, 1899), *P. phaea* (Melvill & Standen, 1901) and *P. bipyramidata* Hedley, 1922. **54–55**, *P. heptagona*, lectotype of *Clathurella heptagona* Dunker, 1871, ZMHB, 4,4 x 1,6 mm; **56**, *P. perlonga*, holotype of *Mangilia perlonga* Melvill, 1899, BMNH 99.12.18.7, 7,2 x 2,2 mm; **57**, *P. phaea*, holotype of *Mangilia phaea* Melvill & Standen, 1901, BMNH 1901.12.9.139, 4,9 x 1,8 mm; **58**, *P. bipyramidata*, holotype, AMSA C.42345, 5,5 x 2,2 mm.

*Pseudorhaphitoma fuscescens* (Thiele, 1925)

Figs 59–60

*Mangelia (Pseudorhaphitoma) fuscescens* Thiele, 1925: 306 (340), pl. 27 (39), fig. 19. Type locality: Padang, Sumatra.

Type material: Although Thiele mentioned only 'Ein Paar ..... Schalen', there are now 6 specimens marked as types in the ZMHB colln, leg. Schöde. The largest example appears to be that illustrated by Thiele and is here designated as lectotype; it measures 5,1 x 1,9 mm with about 4,6 teleoconch whorls, and a protoconch breadth of 0,58 mm.

*Pseudorhaphitoma severa* (Thiele, 1925)

Figs 61–62

*Mangelia (Pseudorhaphitoma) severa* Thiele, 1925: 305(339), pl. 27 (39), fig. 17. Type locality: Padang, Sumatra.

Type material: Twenty-two syntypes in ZMHB. One syntype has been isolated, presumably to indicate the figured specimen; this specimen (here designated as lectotype), measures 6,1 x 2,2 mm.

*Pseudorhaphitoma albula* (Thiele, 1925)

Fig. 63

*Mangelia (Pseudorhaphitoma) albula* Thiele, 1925: 305 (339), pl. 27 (39), fig. 18. Type locality Padang, Sumatra.

Type material: 5 syntypes in ZMHB. The smallest syntype differs from the others in its more spout-like anal sinus, finer and closer main spiral lirae and broader protoconch; direct comparison of this specimen with *P. epistomifer* is required. Lectotype (Fig. 63) here designated, 5,4 x 2,1 mm.

Notes: Axial ribs 11 on penultimate whorl, 9 on 1st teleoconch whorl, in t/s angular and subequal to intervals. Spiral lirae 3 on penultimate whorl (uppermost the strongest, lowermost in suture), plus 2–3 weaker ones above periphery; slightly nodular where cross axials, with quadrate intervals; microsculpture very fine. Inner lip with a low parietal nodule, outer lip with a weak to strong opposing nodule anterior to anal sinus, and an internal ridge parallel to the lip margin. White, outer lip edged with orange-brown. Protoconch conical, with about 3 convex whorls; last 0,7 whorl with about 17 opisthocline riblets; near termination these may be crossed by a few spiral threads.

*Pseudorhaphitoma bipyramidata* Hedley, 1922

Fig. 58

*Pseudorhaphitoma bipyramidata* Hedley, 1922: 308, pl. 51, fig. 132. Type locality: Murray Island, Queensland, 5–8 fathoms [9–15 m].

Type material: Holotype and 6 paratypes AMSA C.42345.

Notes: The interstitial rows of granules are extremely fine and number up to 10 per spiral interval (rather than 'two to six rows' as given by Hedley). The main spiral lirae number 3 on the penultimate whorl, plus (as a rule) 1–2 weaker ones posteriorly; they


Figs 59–63. *Pseudorhaphitoma fuscescens* (Thiele, 1925), *P. severa* (Thiele, 1925) and *P. albula* (Thiele, 1925). **59–60**, *P. fuscescens* (Thiele, 1925), lectotype of *Mangelia (Pseudorhaphitoma) fuscescens* Thiele, 1925, ZMHB, 5,1 x 1,9 mm. **61–62**, *P. severa* (Thiele, 1925), lectotype of *Mangelia (Pseudorhaphitoma) severa* Thiele, 1925, ZMHB, 6,1 x 2,2 mm. **63**, *P. albula* (Thiele, 1925), lectotype of *Mangelia albula* Thiele, 1925, ZMHB, 5,4 x 2,1 mm.

are rather evenly spaced, and even on the rostrum are only slightly closer. Apart from the parietal tubercle mentioned by Hedley, in most of the paratypes the upper part of the columella bears two weak nodules, and the outer lip, in addition to a conspicuous posterior denticle, may show traces of vestigial denticles anteriorly.

### *Pseudorhaphitoma mamillata* (E. A. Smith, 1888)

Figs 69–70

*Pleurotoma (Mangilia) mamillata* E. A. Smith, 1888: 313. Type locality unknown.

Type material: Holotype BMNH 74.5.26.67.

Notes: Shell very similar to *P. obturata* (see above); b/l 0,42, a/l 0,40, approximately 3,6 teleoconch whorls; termination of siphonal canal obliquely truncate and only moderately indented; whorls convex, without trace of a shoulder; outer lip with a moderately strong nodule at anterior end of anal sinus. Axial ribs strong, with angular crests, almost straight, terminating on base of rostrum, 7 per whorl. Spiral sculpture of fine, close threads overall, plus several stronger ridges that form weak nodules on rib crests; 1st whorl somewhat worn, anterior two-thirds of this and subsequent whorl bearing three moderately strong ridges, which by end of 2nd whorl have become as weak as the secondary threads, except on the rib crests where they continue to expand to form weak nodules, base of body whorl with two additional rows of feeble nodules; spiral threads total 25 on penultimate whorl, approximately 38 on base of body whorl, equally fine on rostrum, tabulate, with traces of intritacalx in interstices. Uniform buff. Protoconch subcylindrical and blunt, about 1,6 whorls; breadth 0,60 mm, height 0,55 mm (b/l 1,09). Dimensions 5,0 x 2,1 mm.

### *Pseudorhaphitoma granilirata* (E. A. Smith, 1888)

Fig. 36

*Pleurotoma (Mangilia?) granilirata* E. A. Smith, 1888: 314. Type locality unknown.

Type material: Three specimens (?syntypes) of *Pleurotoma granilirata*, BMNH 74.5.26.60, H. Cuming collection, one (Fig. 36) labelled as 'the type' here designated as lectotype.

Notes: Axial ribs 8 per whorl, rather straight (not procurved below suture), rather orthocline, in t/s slightly angularly rounded, broader than their intervals; spiral lirae coarse, 16 on penultimate whorl, of which 3 or 4 are dominant, bearing rather prickly, axially transverse granules. Inner lip smooth, other than a small parietal denticle; outer lip with 6 denticles, becoming progressively stronger posteriorly. Protoconch of 3 whorls, smooth, except for about 19 axial plicules on last whorl. Dimensions: 5,8 x 2,1 mm.

As observed above, *Pseudorhaphitoma granilirata* will probably prove to be a senior synonym of *P. crudelis* Hedley, 1922 (*q.v.*).

### *Pseudorhaphitoma alma* (Thiele, 1925)

Fig. 65

*Mangelia (Pseudorhaphitoma) alma* Thiele, 1925: 213 (247), pl. 27 (39), fig. 39. Type locality: off Zanzibar/Pemba area, 5°55,8'S: 39°1,2'E, 50 m.

Type material: Two syntypes in ZMHB, the larger worn and broken; the smaller (length 5 mm, outer lip damaged) here designated lectotype.

Notes: Axial ribs 7 per whorl, in t/s angularly rounded, somewhat compressed, narrower than their intervals; 1st whorl with 3 spiral lirae, penultimate whorl with 4 thin main lirae, base of body whorl with 11; interstices with microscopic, faintly granular spiral threads. Protoconch conical, of about 2,3 pinkish whorls, last whorl with axial riblets.

*Pseudorhaphitoma cognata* (Thiele, 1925)

Fig. 64

*Mangelia (Pseudorhaphitoma) cognata* Thiele, 1925: 305 (337), pl. 27 (39), fig. 16. Type locality: Padang, Sumatra.

Type material: Numerous syntypes in ZMHB, one separated by Thiele is evidently the figured shell [= lectotype], dimensions 6,2 x 2,1 mm.

Notes: Axial ribs high, in t/s well rounded, sides slightly asymmetrical, steep, subequal to intervals, 6 per whorl. Main spiral lirae slightly nodular where they cross axials, 4 main lirae on penultimate whorl, subsutural one weakest, 2nd lira the strongest, 4th one in suture, 6–8 granular microspirals in intervals. Columella with 3 denticles, plus a small parietal nodule; outer lip with a strong posterior tooth and three weak ones anteriorly. Protoconch orthoconoid, last whorl with an angular peripheral keel, crossed by arcuate axial riblets.

*Pseudorhaphitoma tropica* (Thiele, 1925)

Fig. 66

*Mangelia (Pseudorhaphitoma) tropica* Thiele, 1925: 214 (249), pl. 27 (39), fig. 21. Type locality: off Sumatra, 0°30,2'N: 97°59,7'E, 132 m.

Type material: Five syntypes in ZMHB, of which the largest (4,3 x 1,6 mm) is figured here.

Notes: Axial ribs high, in t/s angular and equal to intervals, 7 per whorl. Main spiral lirae 3 per whorl, median lira strongest, somewhat nodose where they cross axials, becoming weaker in intervals, 12 on base of body whorl; interstices with very fine granular threads. Protoconch large and conical, of 3 whorls, the last swollen, with about 19 arcuate, opisthocline axial riblets; breadth about 0,60 mm.

*Pseudorhaphitoma scitula* (E. A. Smith, 1884)

Fig. 67

*Pleurotoma (Mangilia?) scitula* Smith, 1884: 321. Type locality: Persian Gulf.
*Mangilia scitula*; Melvill, 1917: 177, pl. 9, fig. 4 (type).

Type material: Five syntypes BMNH 74.1.19.29, one marked with red dot evidently 'the Type' [here designated as lectotype], dimensions 6,7 x 2,2 mm.

Notes: Axial ribs 8 on 1st whorl, 6 on body whorl, in t/s somewhat angularly rounded, slightly compressed, somewhat narrower than their intervals. Main spiral lirae 3 on first three teleoconch whorls, a 4th developing above suture on 4th whorl, about 8 main spirals on base, rostrum with uniform secondary spirals only; intervals


Figs 64–68. *Pseudorhaphitoma cognata* (Thiele, 1925), *P. alma* (Thiele, 1925), *P. tropica* (Thiele, 1925), *P. scitula* (E. A. Smith, 1884) and *P. thielei* nom. n. **64**, *P. cognata*, lectotype of *Mangelia (Pseudorhaphitoma) cognata* Thiele, 1925, ZMHB, 6,2 x 2,1 mm. **65**, *P. alma*, lectotype of *Mangelia (Pseudorhaphitoma) alma* Thiele, 1925, ZMHB, length 5,0 mm. **66**, *P. tropica*, syntype of *Mangelia (Pseudorhaphitoma) tropica* Thiele, 1925, ZMHB, 4,3 x 1,6 mm. **67**, *P. scitula*, lectotype of *Pleurotoma (Mangilia) scitula* Smith, 1884, BMNH 74.1.19.29, 6,7 x 2,2 mm. **68**, *P. thielei*, syntype of *Mangelia (Pseudorhaphitoma) anna* Thiele, 1925 (*non* Jousseaume, 1883), ZMHB, 4,7 x 1,9 mm.

with microscopically granular spiral threads, 6–9 between main spirals on penultimate whorl. Protoconch conical, of about 2,6 whorls, bearing nodose-cancellate sculpture (last whorl with 3 spiral threads, crossed by fine axials). Dimensions: 6,7 x 2,2 mm.

*Pseudorhaphitoma thielei* **nom. n.**

Fig. 68

*Mangelia (Pseudorhaphitoma) anna* Thiele, 1925 (*non Mangelia anna* Jousseaume, 1883): 213 (247), pl. 27 (39), fig. 9. Type locality: off Zanzibar/Pemba area, 5°55,8'S: 39°1,2'E, 50 m.

Type material: Two damaged syntypes in ZMHB.

Notes: Axial ribs 6 per whorl, angular with fairly steep sides in t/s, rendered somewhat nodular where crossed by the main spiral lirae; latter number 4 on penultimate whorl, 2nd lira from suture the strongest; intervals between main spirals each with 4–7 granular spiral threads. Inner lip with a parietal denticle, outer lip with an opposing denticle anteriorly. Protoconch conical, with arcuate axial riblets on last whorl.

*Pseudorhaphitoma tetragona* (Gould, 1860), **comb. n.**

Figs 72–73

*Mangelia tetragona* Gould, 1860: 382; *idem*, 1862: 137; Yen, 1944: 576, pl. 51, figs 8, 9 (holotype); Johnson, 1964: 158, pl. 21, fig. 9 (holotype). Type locality: China Seas.

Type material: Lectotype (designated Johnson 1964) USNM 24197.

Notes on lectotype: Later whorls flattened, with shallowly impressed suture, early whorls somewhat convex; left side of base strongly concave, rostrum distinct; inner lip smooth, outer lip with only a small denticle at anterior side of anal sinus. Sculpture of 5 strong axial ribs per whorl, in t/s angular with flatly sloping sides and shallowly concave intervals; spiral lirae somewhat worn, but consisting of fine threads, subequal to their intervals, pliculated by axial striae, about 26 lirae on penultimate whorl. Evidently white. Protoconch consisting of last whorl only, breadth about 0,53 mm, but evidently subcylindrical and paucispiral. Dimensions: 5,2 x 1,8 mm.

*Pseudorhaphitoma castellata* (E. A. Smith, 1888)

Fig. 71

*Pleurotoma (Mangilia) castellata* E. A. Smith, 1888: 312. Type locality unknown.

Type material: Two syntypes BMNH 1854.6.30.136–7; one marked with a red dot is here designated lectotype, 6,5 x 2,6 mm (Fig. 71).

Notes: Characterised by the axial ribs forming a prominent, rounded shoulder below the suture; no columella pleats, outer lip with a single nodule posteriorly. Somewhat doubtfully referred to *Pseudorhaphitoma*.

*Pseudorhaphitoma agna* (Melvill & Standen, 1896)

Fig. 74

*Mangilia agna* Melvill & Standen, 1896: 279, pl. 9, fig. 2; Trew, 1987: 23. Type locality: Loyalty Islands [New Caledonia].

*Mangilia hexagonalis* (*non* Reeve, 1846); Bouge & Dautzenberg, 1914: 150.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Type material: See Trew (1987); three syntypes examined, BMNH 1897.1.22.140–143.

Notes: Although synonymised with *P. hexagonalis* by Bouge & Dautzenberg (1914) and Powell (1966: 108), *P. agna* is distinguished from that, as well as from *P. pyramidalis* (Reeve, 1846) and *P. pyramis* (Hinds, 1843) in possessing 7 axial ribs per whorl, instead of 6, and in its slight but distinct shoulder angle. Shape and lack of colour and columella denticles further distinguish *agna* from *hexagonalis*.

*Pseudorhaphitoma pyramidalis* (Reeve, 1846)

Fig. 75

*Mangelia pyramidalis* Reeve, 1846*a*: pl. 5, sp. 13; Tryon, 1884: 261, pl. 23, fig. 93 (after Reeve); Boettger, 1895: 17. Type locality: Island of Mindoro, Philippines.
?*Pseudoraphitoma pyramis* (*non* Hinds, 1843); Fukuda *et al.*, 1990:12, pl. 5, fig. 3.

Type material: Holotype, without accession number, BMNH, H. Cuming colln, dimensions 7,5 x 2,4 mm.

Notes: Although somewhat resembling *P. agna*, the holotype of *P. pyramidalis* has only 6 axial ribs, spiral lirae that are relatively coarser (but not more numerous, numbering about 33 on penultimate whorl), 3 distinct columella denticles (absent in *agna*) and a straighter-sided body whorl. Spiral lirae dense, rather low and close-set, not tabulate, pricked by collabral striae. Although synonymised with *P. pyramis* by Tomlin (1934*b*: 41) it differs from that in its much finer, closer spiral lirae. The figure of a Japanese specimen identified by Fukuda *et al.* (*loc. cit.*) as *Pseudoraphitoma pyramis* appears to show *pyramidalis*.

The limits of variation of *P. pyramidalis* need to be established. Some individuals of *P. ichthys* (*q.v.*) from Durban Bay show superficial similarity, and a specimen (Fig. 76) from 145 m off the Matigulu River, southern Zululand (NMSA E8813), agrees even more closely with the holotype of *P. pyramidalis*, but exhibits somewhat more widely-spaced spiral lirae.

*Pseudorhaphitoma hexagonalis* (Reeve, 1845)

Fig. 77

*Pleurotoma hexagonalis* Reeve, 1845: pl. 32, sp. 293; *idem*, 1846*b*: 118. Type locality: Loay, Island of Bohol, Philippines (found in sandy mud at the depth of seventeen fathoms).
*Mangilia hexagonalis*; Tryon, 1884: 251, pl. 20, fig. 1 (after Reeve); Boettger, 1895: 16; Schepman, 1913: 431; Melvill, 1917: 171.

Type material: Holotype BMNH 1963857.

Notes: Although synonymised with *P. pyramis* by Tomlin (1934*b*) and equated with *obeliscus* by Tryon (1884), *P. hexagonalis* differs in being pale brown (not white),

Figs 69–74. *Pseudorhaphitoma mamillata* (E. A. Smith, 1888), *P. castellata* (E. A. Smith, 1888), *P. tetragona* (Gould, 1849) and *P. agna* (Melvill & Standen, 1896). **69–70**, *P. mamillata*, holotype of *Pleurotoma (Mangilia) mamillata* Smith, 1888, BMNH 74.5.26.67, 5,0 x 2,1 mm. **71**, *P. castellata*, lectotype of *Pleurotoma (Mangilia) castellata* Smith, 1888, BMNH 1854.6.30.136, 6,5 x 2,6 mm. **72–73**, *P. tetragona*, lectotype of *Mangelia tetragona* Gould, 1849, USNM 24197, 5,2 x 1,8 mm. **74**, *P. agna*, syntype of *Mangilia agna* Melvill & Standen, 1896, BMNH 1897.1.22.140–3, 6,3 x 2,2 mm.


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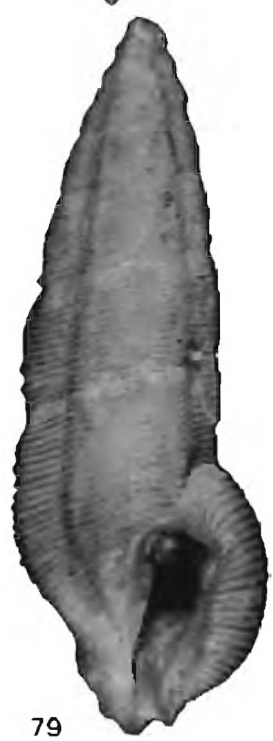
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the axial ribs are more orthocline and the spiral lirae are separated by minutely foveolated interstices; in *pyramis* the edges of the spiral lirae are serrulated, but do not form foveolations with adjacent lirae.

### *Pseudorhaphitoma pyramis* (Hinds, 1843)

Figs 78–80

*Clavatula pyramis* Hinds, 1843 (October): 42; *idem*, 1844: 20, pl. 6, fig. 19. Type locality: Straits of Macassar.
*Pleurotoma pyramis*; Reeve, 1843 (December): pl. 18, sp. 147.
*Mangilia pyramis*; Tryon, 1884: 253, pl. 34, fig. 86 (after Reeve).
*Pseudorhaphitoma pyramis*; Hedley, 1922: 310.
*Pseudoraphitoma pyramis*; Powell, 1966: 198.
*Mangelia obeliscus* Reeve, 1846*b*: pl. 7, sp. 56; *idem*, 1846*c*: 64. Type locality: Island of Corrigidor, Philippines (found among coarse sand at the depth of ten fathoms).
*Clathurella (Pseudorhaphitoma) obeliscus*; Boettger, 1895: 56.

Type material: Two syntypes of *C. pyramis* are BMNH 1844.6.7.62, 1879.2.26.70 *ex* Belcher colln, lectotype (here designated, Fig. 78) 10,5 x 3,4 mm. Three syntypes of *M. obeliscus* BMNH 1963.467 (Figs 79–80).

Notes: One of three syntypes of *M. obeliscus* is a different species, characterised by sharp spiral lirae, which lack distinct transverse plicules and are narrower than their intervals; this specimen appears to be somewhat similar to *P. multigranosa* (Schepman, 1913), but has more evenly developed spiral sculpture.

Hedley (1922) and Powell (1966) correctly regarded *Mangelia obeliscus* as a synonym of *Clavatula pyramis*, as did Tomlin (1934*b*: 41). However, Tomlin erred in rejecting *Mangilia hexagonalis* Reeve, 1845, and *M. pyramidalis* Reeve, 1846 (*q.v.*), as further synonyms. Tryon (1884: 251) incorrectly cited *obeliscus* in the synonymy of *hexagonalis*.

### *Pseudorhaphitoma multigranosa* (Schepman, 1913)

Figs 81–83

*Mangilia multigranosa* Schepman, 1913: 67 (431), pl. 28, fig. 10. Type locality: 'Bay of Bima near South fort. 55 M.' and 'Near north point of Nuhu Jaan, Kei-islands. 90 M.' [Indonesia].
*Pseudoraphitoma multigranosa*; Powell, 1966: 108.

Type material: Two syntypes in ZMAN colln.

Notes: Spiral lirae of very uneven strength; 5–6 on first teleoconch whorl, two strongest ones on anterior half; penultimate whorl with a total of 25–39 spiral lirae, of about 4 grades of strength, including about 8 main lirae. All lirae with close-set, slightly squamiform granules, those on main lirae pliculate. Protoconch conical, of about 3 whorls, worn, but 22 arcuate, opisthocline axial ribs visible on last whorl, breadth about 0,68 mm.

Figs 75–80. *Pseudorhaphitoma pyramidalis* (Reeve, 1846), *P. hexagonalis* (Reeve, 1845) and *P. pyramis* (Hinds, 1843). **75**, *P. pyramidalis*, holotype of *Mangelia pyramidalis* Reeve, 1846, BMNH, 7,5 x 2,4 mm; **76**, *P. ?pyramidalis*, NMSA E8813, off Matigulu River, Zululand, 145 m, 12,2 x 4,3 mm. **77**, *P. hexagonalis*, holotype of *Pleurotoma hexagonalis* Reeve, 1845, BMNH 1963857, 7,7 x 2,6 mm. **78–80**, *P. pyramis*: **78**, lectotype of *Clavatula pyramis* Hinds, 1843, BMNH 1844.6.7.62, 10,5 x 3,4 mm; **79–80**, syntype of *Mangelia obeliscus* Reeve, 1846, BMNH 1963.467, 10,3 x 3,6 mm.

*Pseudorhaphitoma(?) fortistriata* (E. A. Smith, 1888)

Figs 84–86

*Pleurotoma (Mangilia) fortistriata* E. A. Smith, 1888: 313. Type locality: Bombay.
*Mangilia fortistriata*; Melvill, 1917: 170, pl. 8, fig. 12.
Not: *Anacithara (Anacithara) fortistriata* (Smith, 1888); Shuto, 1965: 178, pl. 34, figs 4, 5, 7.

Type material: Three syntypes, BMNH 1992105, H. Cuming colln. Although there appears to be a certain similarity between these specimens, it is probable that they represent three different species, of which two may possibly prove referable to *Pseudorhaphitoma*. However, as is well known with Cuming material, the given locality is open to confirmation, and the material may not even be Indo-Pacific in origin. The following notes were made on the syntypes:

(1) Largest but most juvenile shell (Fig. 86), marked with a red dot, 6,7 x 2,6 mm; axial ribs continuous, almost orthocline, 7 per whorl; spiral lirae flattened and close, of very irregular strength, about 26 in total on penultimate whorl; outer lip undeveloped; worn base of protoconch appears to retain traces of axial plicules and two or more spiral ridges. Evidently this is the specimen figured by Melvill (1917). Possibly belongs to genus *Pseudorhaphitoma*, but is too immature for certainty.

(2) Smallest shell (Fig. 84), 5,1 x 2,1 mm, axial ribs not continuous, 9 on penultimate whorl, opisthocline; spiral sculpture regular, of main lirae with a weaker thread in each interval, 6 main lirae on penultimate whorl, subsutural region with about 8 finer, more irregular and finely granular lirae; anal sinus rather spout-like, outer lip mature, edentulate other than a very weak posterior nodule; protoconch conical, worn. Probably referable to the [Western Atlantic] genus *Pyrgocythara* Woodring, 1928.

(3) Medium-sized shell (Fig. 85), 5,7 x 2,6 mm; axial ribs continuous, 7 on penultimate whorl, opisthocline; spiral lirae irregular, with three main, flattened lirae on lower part of penultimate whorl, and 1–3 finer lirae of varying strengths in their intervals (the finest are granular), subsutural region with close, uneven lirae; outer lip thick, with 4 denticles (the posterior one strongest), and an anal sinus bent almost at right angles to axis; protoconch worn and damaged. Probably genus *Pseudorhaphitoma*, with some resemblance to *P. averina* (Melvill & Standen, 1901), but spiral sculpture very atypical.

Shuto (1965) recorded this species, as *Anacithara (Anacithara) fortistriata*, from the Pleistocene of Moeshima, Japan. However, he evidently based his identification solely on Melvill's figure (*loc. cit.*) of syntype 1, and in fact Shuto's illustrations of Japanese material do not agree well with any of the syntypes. The lack of an anal sinus in syntype 1 is a consequence of immaturity (aided by wear), and there seems no valid reason for referring it to genus *Anacithara* Hedley, 1922.

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Figs 81–86. *Pseudorhaphitoma multigranosa* (Schepman, 1913) and *P.(?) fortistriata* (E. A. Smith, 1888). **81–83**, *P. multigranosa*, syntypes of *Mangilia multigranosa* Schepman, 1913, ZMAN: **81–82**, *Siboga* Stn 47, 11,6 x 3,8 mm; **83**, *Siboga* Stn 260, 8,3 x 3,1 mm. **84–86**, *P.(?) fortistriata*, syntypes of *Pleurotoma (Mangilia) fortistriata* Smith, 1888, BMNH 1992105: **84**, 6,7 x 2,6 mm; **85**, 5,7 x 2,6 mm; **86**, 5,1 x 2,1 mm.


81
82
83
84
85
86

*Pseudorhaphitoma averina* (Melvill & Standen, 1901)

Figs 87–88

*Mangilia averina* Melvill & Standen, 1901: 441, pl. 24, fig. 5; Melvill, 1917: 168; Trew, 1987: 26. Type locality: Karachi, Pakistan.

Type material: Holotype BMNH 1901.12.9.138.


Figs 87–88. *Pseudorhaphitoma averina* (Melvill & Standen, 1901). Holotype of *Mangilia averina*, BMNH 1901.12.9.138, 6,0 x 2,8 mm.

Notes: Anal sinus spout-like, at right angle to axis, outer lip with a rounded nodule below sinus and 4 feeble denticles anteriorly; inner lip smooth except for a feeble median notch. Axial ribs continuous on later whorls, suture-to-suture (strongly indented at suture), extending onto rostrum; slightly arcuate and almost orthocline, in t/s strongly rounded, slightly compressed, slightly wider than intervals, which are concave; 8 axials on early whorls, 7 on later ones. Spiral lirae: 4 main lirae on teleoconch ones, their interstices on penultimate whorl each with 3 intermediary threads (of which the median is strongest), plus about 6 threads below suture; base of body whorl with 9 main spiral lirae plus weaker intermediaries. Protoconch somewhat conical, of about 2,4 rounded whorls, 2nd whorl with arcuate axial riblets, last additionally sculptured with two spiral lirae, above and below median; breadth about 0,65 mm. Colour white, termination of body whorl tinged intercostally with buff; aperture margin stained with ochre [probably of extraneous origin]. Dimensions 6,0 x 2,8 mm.

ACKNOWLEDGEMENTS

This study was supported by a grant from the Foundation for Research Development (FRD). Most of the South African material studied was collected by me during the Natal Museum dredging programme, using the NRIO research vessel *Meiring Naudé* (1980–1989) and (since 1990) the Sea Fisheries Research Institute ship *R. V. Sardinops*. The use of these facilities is gratefully acknowledged. For the loan of types and other material I am indebted to Ms Kathie Way (BMNH), Dr R. Kilias (ZMHB), Ms Alison Trew (NMWC), Ms Shelley S. Greenhouse (USNM), Ms Michelle van der Merwe (SAMC), Dr R. Moolenbeek (ZMAN), Mr I. Loch (AMSA) and Dr Giuliano Doria (MCSN). Drs J. van Goethem, J. Taylor and R. Kilias kindly gave access to the ISNB, BMNH and ZMHB collections respectively. Mrs Linda Davis helped in the preparation of plates. I thank the Electron Microscopy Unit of the University of Natal, Pietermaritzburg, for the use of their equipment. Dr D. G. Herbert kindly read the manuscript.

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Date received: 20 November 1992