

THE SOUTH AFRICAN MUSEUM'S *MEIRING NAUDE* CRUISES

PART 16

BRACHIOPODA FROM THE 1975-1979 CRUISES

By

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(With 19 figures and 1 table)

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ABSTRACT

Sixteen species of articulate brachiopods and a single inarticulate brachiopod are recorded from off the east coast of South Africa. Of the seventeen species, *Grammetaria africana*, *Notozyga gracilis* and *Megerlia acrura* are new, and five others are recorded for the first time from South African waters.

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INTRODUCTION

The present paper deals with a number of brachiopod species that were collected during the *Meiring Naude* cruises in the years from 1975 to 1979 inclusive. The positions of the various sampling stations from which brachiopods were recovered are shown in Figure 1; further data on these stations may be obtained from Louw (1977, 1980). A few specimens that have been separated from coral material of various origins have also been included. Station data for these specimens have been given separately along with the descriptions of the species concerned.

PREVIOUS RESEARCH

Very little research work has been done on the South African brachiopod fauna; the earliest records date from the late eighteenth and early nineteenth centuries and deal with the commonly occurring members of the Kraussinidae. From 1850 onwards a handful of species belonging to other families have been added to the list and described in a number of publications, including the reports

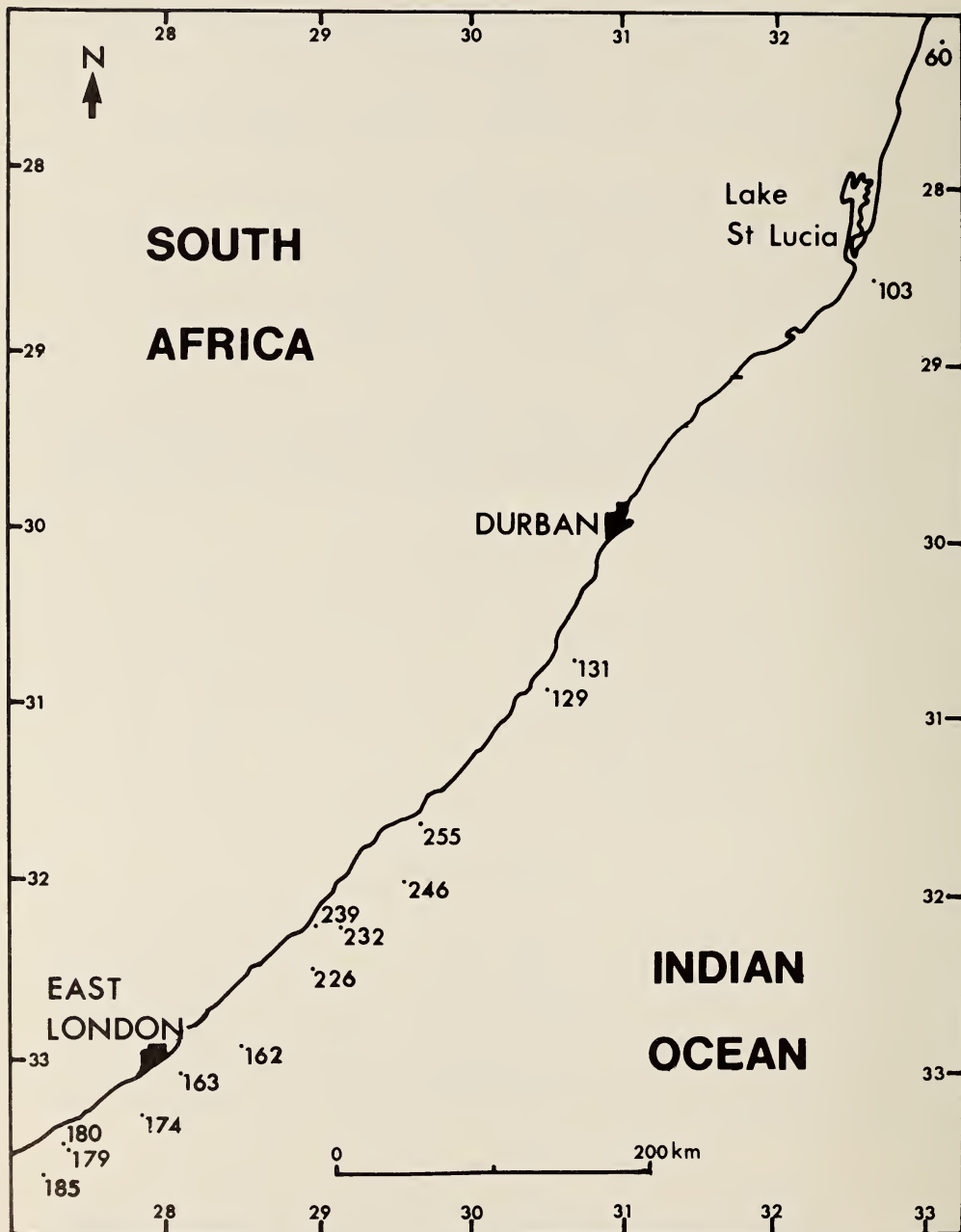


Fig. 1. Map showing locations of SM stations from which brachiopods were recovered during the *Meiring Naude* cruises 1975-1979.

of two major expeditions—the 'Challenger' Expedition (Davidson 1880) and the 'Valdivia' Expedition (Blochmann 1906).

The most comprehensive paper, and the only one dealing specifically with South African brachiopods, was that of Jackson (1952), which includes an account of all the earlier work. Jackson recorded fifteen species belonging to nine genera from a number of stations extending from Saldanha Bay on the west coast round to Delagoa Bay (now Maputo Bay, Mozambique) on the east. Of the forms recorded by Jackson, five—*Crania*, *Agulhasia*, *Terebratulina*, *Kraussina* and *Megerlina*—are recorded again in this paper; two of the species he described from western Cape waters have not, as yet, been found east of Cape Agulhas, viz. *Megathiris capensis* and *Kraussina crassicostata*.

Since the publication of Jackson's work only three papers by Cooper (1973*b*, 1973*c*, 1981) have added to our knowledge of the brachiopods from South African waters. The papers have mostly confirmed previous records but to the list of species they have added *Platidia anomioides* and *Xenobrochus africanus*. Species such as *Chlidonophora chuni* and *Eucalathis fasciculata*, described by Cooper from off Madagascar, can now be added to the South African list.

LIST OF SPECIES

	Station No.	Complete specimens**	Pedicle valves	Brachial valves
Family Craniidae				
<i>Crania</i> sp.	SM 239	1 (1)	—	—
Family Frieleidae				
* <i>Grammetaria africana</i> sp. nov.	SM 232	1 (1)	—	—
Family Dyscoliidae				
* <i>Dyscolia</i> cf. <i>johannisdavisi</i> (Alcock)	SM 174	4 (1)	2	1
<i>Xenobrochus africanus</i> (Cooper)	SM 103	13 (13)	1	—
	SM 129	1 (1)	—	—
	SM 131	—	3	1
	SM 162	—	1	—
<i>Xenobrochus agulhasensis</i> (Helmcke)	SM 232	1	—	—
<i>Xenobrochus</i> ? sp. 1	SM 131	1	—	—
<i>Xenobrochus</i> ? sp. 2	SM 226	—	1	1
	SM 232	—	6	3
Family Cancellothyrididae				
<i>Terebratulina</i> sp.	SM 131	8	1	3
	SM 180	1	—	—
Family Chlidonophoridae				
* <i>Chlidonophora chuni</i> Blochmann	SM 103	2	—	—
	SM 246	3 (2)	—	—
* <i>Notozyga gracilis</i> sp. nov.	SM 131	1	—	—
* <i>Notozyga</i> sp.	SM 131	1	—	—
* <i>Eucalathis fasciculata</i> Cooper	SM 60	4 (4)	—	—
	SM 103	1	—	—
	SM 246	7 (7)	2	2
<i>Agulhasia davidsoni</i> King	SM 131	9	—	—

* New records for South African waters

** Number of live specimens shown in brackets

	Station No.	Complete specimens**	Pedicle valves	Brachial valves
Family Kraussinidae				
<i>Kraussina rubra</i> (Pallas)	SM 129	—	1	—
	SM 131	1	1	—
	SM 185	1 (1)	—	—
* <i>Megerlia acyura</i> sp. nov.	SM 255	1 (1)	—	—
	SM 239	2 (2)	—	—
<i>Megerlina pisum</i> (Lamarck)	SM 163	1	—	—
	SM 179	1 (1)	—	—
	SM 180	1	—	—
	SM 185	7 (7)	2	2

Family Phaneroporidae

* <i>Leptothyrella</i> cf. <i>ignota</i> (Muir-Wood)	SM 129	1	—	—
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* New records for South African waters

** Number of live specimens shown in brackets

BRACHIOPOD DISTRIBUTION

As reported by Cooper (1973*b*, 1973*c*), Recent brachiopods are commonly thought of as rare animals and while it is true they are greatly outnumbered by molluscs in the world's oceans, they are more widely distributed and in greater variety than previously suspected. In the last 20 years research cruises by a number of vessels from different countries have added considerably to our understanding of modern-day brachiopod distribution. They are known from all parts of the world and in some places form the major elements in the invertebrate macrofauna (Cooper 1973*c*: 1).

On a local scale, the cruises of the *Meiring Naude* have added substantially to the knowledge of the brachiopod fauna off the South African coast. In the cruises from 1975 to 1979 the vessel has collected 17 species belonging to 13 genera, 8 of the species recorded for the first time from South African waters.

GEOGRAPHIC DISTRIBUTION

The brachiopod fauna from off the Natal and eastern Cape coast, as is to be expected, shows greatest affinity with other Indian Ocean faunas. Some species are known only from South African waters: *Agulhasia davidsoni*, *Kraussina rubra*, *Xenobrochus africanus* and *X. agulhasensis*, while others extend their range from other parts of the Indian Ocean: *Dyscolia johannisdavisi* from around the Maldive Islands, *Chlidonophora chuni* from the Maldive Islands and south of Madagascar, *Eucalathis fasciculata* from south of Madagascar, and *Leptothyrella ignota* from off Zanzibar and the Gulf of Aden—assuming the specimens of *Dyscolia* and *Leptothyrella* described herein are indeed conspecific with the forms mentioned. Two new species represent totally unexpected additions to the fauna: *Grammetaria africana* is the first record of the genus outside the Philippines and *Notozyga gracilis* is a new form of a genus previously only recorded from the Caribbean.

BATHYMETRIC DISTRIBUTION

It is generally believed that the greatest diversity of brachiopod species is to be found on the continental shelf areas, generally taken by geologists to extend down to the 200 m line. Zezina (1970) states that the overwhelming majority of brachiopods live at depths down to 500 m. If the figures of 200 m and 500 m are taken to divide the ocean into shallow, intermediate and deep zones, then it can be seen from Table 1 that by far the greatest number of specimens collected by the *Meiring Naude* came from waters more than 500 m deep, with only *Crania* sp. and the members of the Kraussinidae being essentially shallow-water forms. According to previous descriptions, this is to be expected for species such as *Dyscolia* cf. *johannisdavisi*, *Chlidonophora chuni*, *Eucalathis fasciculata* and *Leptothyrella* cf. *ignota*, again assuming that the South African specimens of *Dyscolia* and *Leptothyrella* are conspecific with the previously described forms. However, previous records of *Agulhasia davidsoni*, *Xenobrochus africanus* and *X. agulhasensis* suggest they are forms that live at shallow to intermediate depths. In the case of *A. davidsoni* the state of the shells suggests they have been moved from their living site and they may well have been carried by currents from shallower water. *Xenobrochus africanus* has previously been recorded only from Durban Bay at a depth of 366 m and since some of the specimens described herein were found live, these new records simply extend the range of the species into deeper water.

The single specimen of *X. agulhasensis* was recovered dead so it may well have been transported from shallower water, but it must be remembered that the

TABLE 1

Depth ranges of the brachiopod species collected during the *Meiring Naude* cruises 1975-1979.

Species	Shallow 0-200 m (8 stations)	Intermediate 200-500 m (4 stations)	Deep >500 m (35 stations)
<i>Crania</i> sp.	x		
<i>Grammetaria africana</i>			x
<i>Dyscolia</i> cf. <i>johannisdavisi</i>			x
<i>Xenobrochus africanus</i>			x
<i>Xenobrochus agulhasensis</i>			x
<i>Xenobrochus</i> sp. 1.			x
<i>Xenobrochus</i> sp. 2.			x
<i>Terebratulina</i> sp.	x		x
<i>Chlidonophora chuni</i>			x
<i>Notozyga gracilis</i>			x
<i>Notozyga</i> sp.			x
<i>Eucalathis fasciculata</i>			x
<i>Agulhasia davidsoni</i>			x
<i>Kraussina rubra</i>	x		x
<i>Megerlia acrura</i>	x		
<i>Megerlina pisum</i>	x		
<i>Leptothyrella</i> cf. <i>ignota</i>			x

continental shelf off the east coast of South Africa is very narrow with a steep continental slope and this may well have a bearing on the bathymetric distribution of the brachiopods. Certainly the previous records of *X. agulhasensis* are from shallow and intermediate waters off the Cape of Good Hope, and on the Agulhas Bank where the continental shelf is much broader.

SYSTEMATIC ACCOUNT

Most of the genera recorded here belong to the superfamilies Terebratulacea and Cancellothyridacea of the suborder Terebratulidina. The classification schemes employed herein for these two superfamilies are those proposed by Cooper (1973a) for the Cancellothyridacea and Cooper (1983) for the Terebratulacea. Otherwise the classification is that used by Williams *et al.* (1965) in the *Treatise on invertebrate paleontology*.

Class INARTICULATA Huxley, 1869

Order ACROTRETIDA Kuhn, 1949

Suborder CRANIIDINA Waagen, 1885

Superfamily CRANIACEA Menke, 1828

Family **Craniidae** Menke, 1828

Genus *Crania* Retzius, 1781

Crania sp.

Fig. 2

Material

A single live specimen (SAM-A25445) found attached to *Megerlia acrua* sp. nov. from SM 239 at a depth of 90 m.

Description

Small elongately oval shell with conical profile; apex low, about one-third of valve length from posterior margin. Posterior slope gently convex; anterior slope

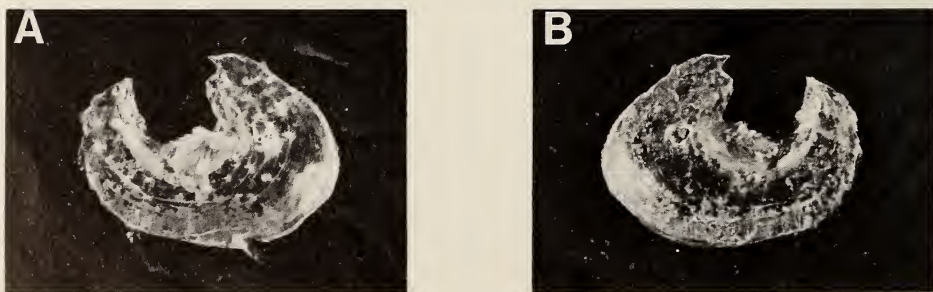


Fig. 2. *Crania* sp., SAM-A25445, SM 239. A. Ventral valve exterior, ventral view. B. Dorsal valve exterior, dorsal view. Both $\times 8$. The specimen is damaged.

gently convex near apex, becoming concave towards margin. Shell substance very thin; ornamented by concentric growth lines.

Ventral valve concave from attachment to convex surface and pitted where it covered tubercles on surface of pedicle valve of *Megerlia acrura*.

Details of interiors of both valves obscure except for pustules on inside of ventral valve corresponding to pits on outer surface.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25445	c. 4	c. 3

Discussion

Previous descriptions of *Crania*, such as that by Thomson (1927: 135), show it to be a genus that displays considerable variation among its assigned species, many of which are inadequately defined, a point made by Cooper (1973c: 19) in his description of *C. patagonica* Dall. The nearest species of *Crania* to that described here is *C. roseoradiata* Jackson, which is recorded from off the Cape west coast, although Turton (1932: 260) records a shell that may doubtfully be assigned to *Crania* from Port Alfred on the east coast. The present specimen was damaged during recovery and the shell substance is so thin (although calcified) that it offers no details of the internal structures that may be used in comparisons with other species. Certainly, the specimen lacks the radiating rose-coloured streaks that are said to distinguish Jackson's species, although colour is not a good criterion on which to define species. More and better-preserved specimens are required before this one can be named.

Class ARTICULATA Huxley, 1869
 Order RHYNCHONELLIDA Kuhn, 1949
 Superfamily RHYNCHONELLACEA Gray, 1848
 Family **Frieleidae** Cooper, 1959
 Genus *Grammetaria* Cooper, 1959
Grammetaria africana sp. nov.

Fig. 3

Diagnosis

Triangular *Grammetaria* with straight anterior margin parallel to hinge line; ventral umbo sharply pointed, nearly straight; radial ornament only faintly developed.

Material

Holotype. SAM-A25446 in the South African Museum, Cape Town. From SM 232 (32°14,9'S 20°10,4'E) at a depth of 560–620 m, 25 June 1979. The sole

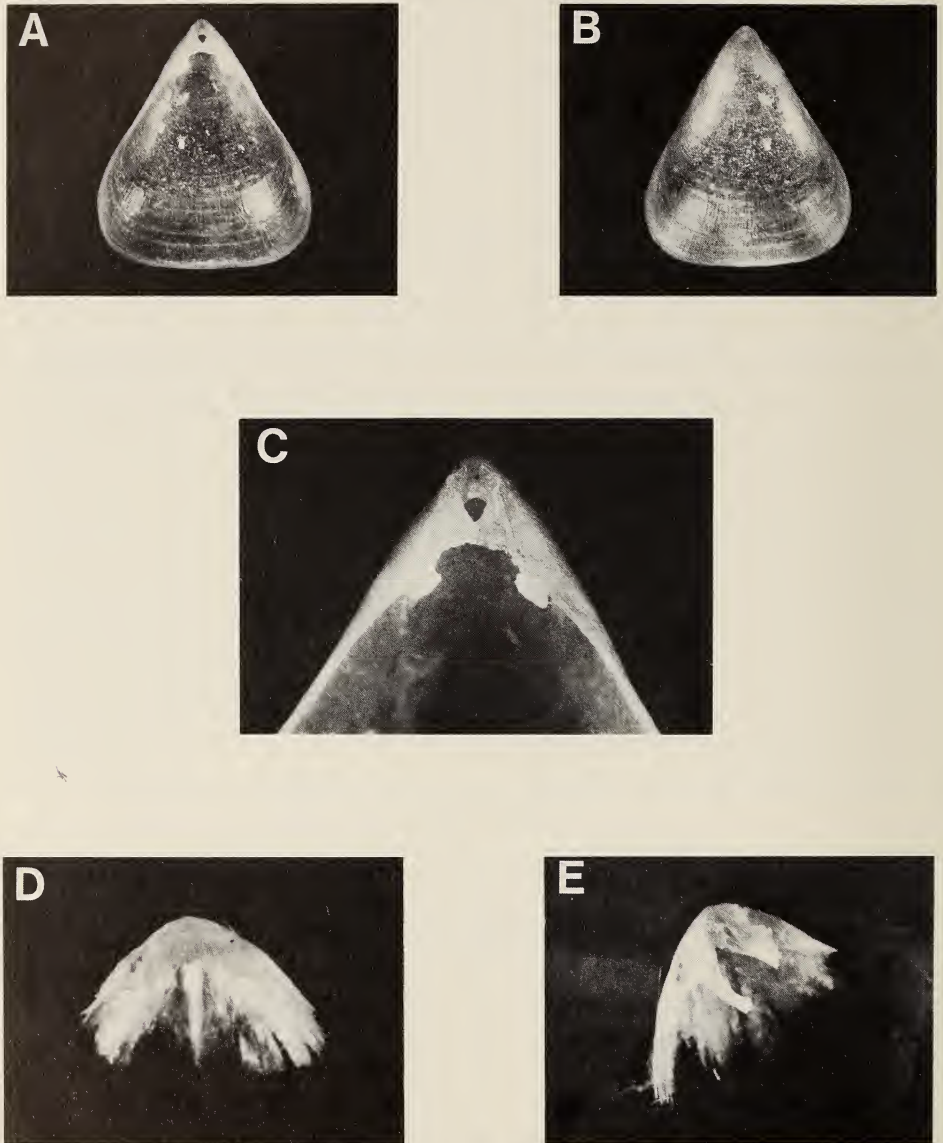


Fig. 3. *Grammetaria africana* sp. nov., SAM-A25446, holotype, SM 232. A-B. Internal and external views of pedicle valve. C. Close-up of ventral beak, dorsal view, showing auriculate deltidial plates. D-E. Ventral and lateral views of cardinalia. A-B $\times 3$. C-E $\times 8$. The brachial valve is damaged.

specimen was live when collected, being attached by a short slender pedicle to a small pebble.

Description

Elongate triangular outline with maximum width close to anterior margin. Valves convex with pedicle valve slightly deeper than brachial. Anterior commissure rectimarginate. Pedicle valve with evenly convex lateral profile; anterior profile gently convex in central portion between almost flat, steeply sloping flanks. Beak small, pointed, nearly straight. Foramen small, elongately oval, hypothrydid; deltidial plates auriculate, conjunct. Ornament of faintly developed capillae and concentric growth rings.

Pedicle valve interior with small corrugated teeth, supported by strong vertical dental plates. Pedicle collar well developed, free anteriorly.

Brachial valve interior with corrugated sockets bounded by strong socket ridges. Crura short, curved, of spinulifer type, triangular in cross-section but becoming flattened, blade-like distally. Outer hinge plates very narrow; inner hinge plates fused medianly to plug of shell material that occupies space bounded by median septum and crural bases. Median ridge thick, supporting proximal ends of crural bases.

Dimensions (mm)

		<i>Length</i>	<i>Width</i>
SAM-A25446	Holotype	10,9	9,3

Discussion

Grammetaria is characterized by its rectimarginate anterior commissure and its auriculate and conjunct deltidial plates. Possession of these features allows the present specimen to be referred immediately to that rare genus.

The only other species thus far assigned to the genus is *G. bartschi* (Dall), which is represented by only two specimens recovered from Philippine waters (Cooper 1959: 58) and a fragmentary specimen from off Bali (Zezina 1981: 12). They show some differences with that described here and are therefore taken to belong to a separate species. The anterior margin of the South African shell is not curved like that of *G. bartschi* but is remarkably straight and parallel to the hinge axis. The beak is much more pointed and nearly straight rather than suberect, and the radial ornament is much less strongly developed.

The exact relationships between these two species cannot be properly assessed on so few specimens. When more material becomes available it might be possible to take into account the full range of variation but until that time it is felt that sufficient differences exist between the South African and Philippine specimens for them to be regarded as separate species.

Etymology

The specific name alludes to the fact that this is the first record of the genus from African waters.

Order TEREBRATULIDA Waagen, 1883
Suborder TEREBRATULIDINA Waagen, 1883
Superfamily TEREBRATULACEA Gray, 1840
Family **Dyscoliidae** Fischer & Oehlert, 1891
Subfamily Dyscoliinae Fischer & Oehlert, 1891
Genus *Dyscolia* Fischer & Oehlert, 1890
Dyscolia cf. *johannisdavisi* (Alcock, 1894)

Figs 4-5

Terebratula johannisdavisi Alcock, 1894: 139. Blochmann, 1908: 638.

Terebratula wyvillei Davidson: Thomson, 1927: 201 (in part).

Dyscolia johannisdavisi (Alcock): Helmcke, 1940: 261, figs 22, 25b. Muir-Wood, 1959: 300, pl. 1 (figs 1, 3, 4).

Material

Four pairs of conjoined valves, one live at time of collection, plus a brachial and two pedicle valves (SAM-A25447 to A25453) all from SM 174 at a depth of 760 m.

Description

Large, roundedly triangular to elongately oval shells; biconvex with maximum width at midvalve or anterior to midvalve. Lateral and anterior margins of largest specimens strongly incurved (flanged); anterior commissure rectimarginate. Beak short, truncated, suberect to erect; foramen large, subcircular, permesothyridid to epithyridid, labiate. Symphytium concave, almost completely hidden by dorsal beak. Shell substance thick in large specimens; surface marked by concentric growth lines and very faint radial capillae.

Pedicle valve fairly evenly convex in lateral profile; anterior profile variably convex, often strongly domed with steep flanks. Brachial valve moderately to strongly convex in lateral profile; gently domed in anterior profile. Greatest convexity in umbonal region with posterolateral corners slightly flattened.

Ventral interior with stout teeth not supported by dental plates and short elevated pedicle collar. Muscle scar subrectangular; adductor scar occupies about one-third of total width of scar. Dorsal interior with strong high socket ridges bounding wide shallow sockets. Fulcral plates thick and extended laterally into broad shelves. Cardinal process transversely elliptical, about one-tenth as wide as valve, often roughened and pitted posteriorly; extends over posterior ends of socket ridges. Outer hinge plates narrow, concave, indistinct. Loop preserved only in two specimens. In the large specimen the crura are short rounded extensions of the socket ridges and merge, at about midloop, with descending lamellae without development of crural processes. In the smaller specimen the crura are curved and flattened and united with descending lamellae anterior of midloop with development of short, blunt crural processes. In both specimens,

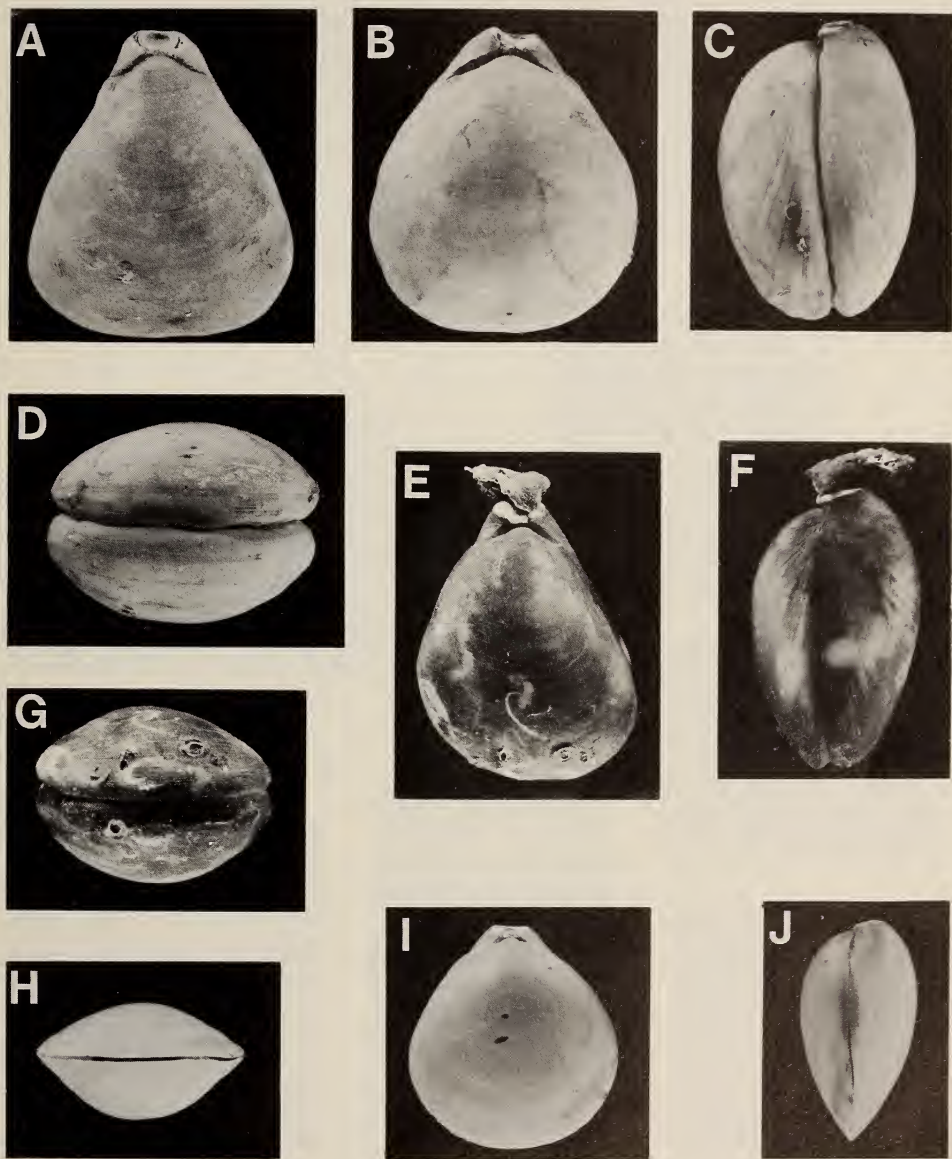


Fig. 4. *Dyscolia* cf. *johannisdavisi* (Alcock, 1894), SM 174. A. SAM-A25447: dorsal view of conjoined valves. B-D. SAM-A25448: dorsal, lateral and anterior views of conjoined valves. E-G. SAM-A25449: dorsal, lateral and anterior views of conjoined valves with pedicle and serpulid worm tubes. H-J. SAM-A25453: anterior, dorsal and lateral views of conjoined valves. All $\times 1$.

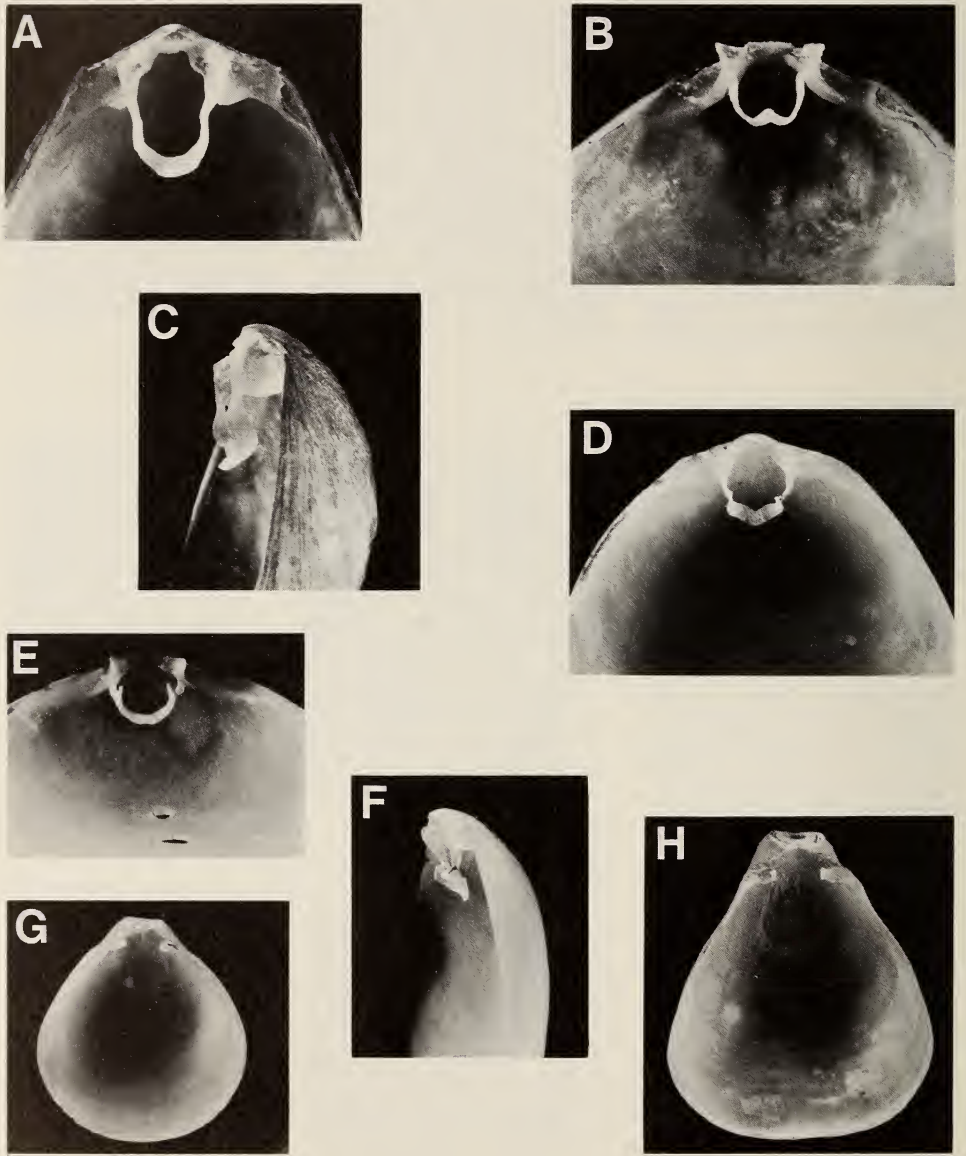


Fig. 5. *Dyscolia* cf. *johannisdavisi* (Alcock, 1894), SM 174. A-C. SAM-A25449: ventral, anterior and lateral views of loop. D-F. SAM-A25453: ventral, anterior and lateral views of loop. G. SAM-A25453: interior view of pedicle valve. H. SAM-A25447: interior view of pedicle valve showing muscle scars. A-F $\times 2$. G-H $\times 1$.

descending lamellae and transverse bands are broad with the latter bearing low median folds that are extended anteriorly as blunt points. Muscle field subquadrate.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>	<i>Thickness</i>	Brachial valve	
				<i>Length</i>	<i>Apical angle</i>
SAM-A25447	41,8	35,7	26,6	39,6	50°
A25448	41,3	37,5	27,8	38,8	84°
A25449	41,1	32,8	24,9	37,3	59°
A25450	34,9	28,2	—	—	62°
A25451	35,8	28,2	—	—	—
A25452	—	32,7	—	33,4	—
A25453	29,9	28,1	11,0	28,6	79°

Muscle field dimensions (mm)

	Pedicle valve		Brachial valve	
	<i>Length</i>	<i>Width</i>	<i>Length</i>	<i>Width</i>
SAM-A25447	16,7	9,0	9,8	9,5
A25448	20,7	11,6	11,1	11,9
A25450	15,4	8,1	—	—
A25452	—	—	11,2	11,7
A25453	10,6	7,3	—	—

Loop dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25449	10,5	4,9
A25453	6,4	3,9

Discussion

The small sample of *Dyscolia* described here from a single locality shows considerable morphological variation, which makes its assignment to one of the known species of *Dyscolia* difficult. The specimens show differences and similarities with most of the described species, e.g. the large size and triangular outline are reminiscent of *D. wyvillei* (Davidson) and *D. johannisdavisii* (Alcock), while the subcircular outline of the smallest specimen is more like those of *D. ? radiata* Cooper and *D. ewingi* Cooper. However, *D. ewingi* has now been removed from *Dyscolia* to become the type-species of the new genus *Goniobrochus* (Cooper 1983: 261). The broad transverse band of the present specimens differs from those of *D. wyvillei* and *D. johannisdavisii*, which are said to be thin

and delicate (Cooper 1973c: 19; 1983: 254), but it is like that of the fossil *D. guiscardiana* (Seguenza) from the Pliocene of Sicily. *Dyscolia johannisdavisi* and *D. ? radiata* are both recorded from the Indian Ocean, but the latter differs in the form of its loop.

The author has examined the holotype of *D. wyvillei* and a brachial valve of *D. johannisdavisi* in the British Museum (Natural History). These two forms are closely similar and Muir-Wood (1959: 301) reports that although some authors would wish to synonymize them (e.g. Thomson 1927: 201), there are differences that are probably sufficient to separate the species. As pointed out by Muir-Wood (1959), *D. wyvillei* has a longer, more narrowly tapering ventral umbo, a longer, better-exposed symphytium and more strongly developed radial ornament. *Dyscolia johannisdavisi* has a more marked marginal flange, a short concave symphytium that is usually hidden by the dorsal umbo and only faintly developed radial ornament. Indeed, in Alcock's original description (1894: 139) no mention is made of any radial ornament. Helmcke (1940: 267) regards the hinge plates of the two forms to be different; those of *D. wyvillei* are large, wide, almost square, while those of *D. johannisdavisi* are small, narrow and barely developed. The holotype of *D. wyvillei* has a row of denticles around the interior margin of both valves. No such feature has been described from *D. johannisdavisi* nor are any denticles visible on any of the South African specimens.

Of the two species, the South African shells described here are undoubtedly closer to *D. johannisdavisi*, the main difference being in the form of the loop. Cooper (1983) attaches considerable taxonomic importance to the form of the loop, using it to distinguish between species and genera of terebratulaceans. However, in view of the amount of variation in other characters of the shell displayed by the *Meiring Naude* sample, it is felt that similar variation may be seen in the form of the loop, and erection of a new taxon is unwarranted at this stage.

Subfamily Aenigmathyridinae Cooper, 1983

Genus *Xenobrochus* Cooper, 1981

The classification and identification of terebratulacean brachiopods depends, to a large extent, on the form of the loop and its relative proportions. Cooper (1983) has established a number of new families, subfamilies, genera and species based largely on this character of the shell. However, placing such taxonomic importance on a single feature raises several problems, especially when what appear to be minor differences are used to distinguish between genera. Most species of Recent Terebratulacea, particularly those from fairly deep water, are established on only a few specimens at most. Thus, the limits of loop variation in a single population or species are still virtually unknown, although for some species such as *Liothyrella neozelanica* and, as has been shown, *Dyscolia* cf. *johannisdavisi* it is obvious that considerable variation may be present.

Further problems are encountered with the identification of juveniles of short-looped genera when only the adult loop has been described, and specimens

in which the loop has not been completely preserved are especially difficult to classify. Two such forms are present in the *Meiring Naude* material. However, other features of the shells, such as their small to medium size, lack of radial ornament, rectimarginate anterior commissures, narrow crura and poorly defined outer hinge plates, suggest they belong to the subfamily Aenigmathyridinae Cooper, 1983. Recent members of this subfamily include *Abyssothyris*, *Acrobelesia* and *Xenobrochus*, and of these *Xenobrochus* probably best accommodates the specimens described below and it is to this genus that they are tentatively assigned.

Xenobrochus africanus (Cooper, 1973)

Fig. 6

Gryphus africanus Cooper 1973b: 8, pl. 4 (figs 31–38).

Xenobrochus africanus (Cooper) Cooper, 1981: 20, pl. 4 (figs 30–35).

Material

Thirteen complete specimens and a single pedicle valve (SAM–A25454) from SM 103 at a depth of 680 m; one complete specimen (SAM–A25455) from SM 129 at a depth of 850 m; a single brachial and three pedicle valves (SAM–A25456) from SM 131 at a depth of 780 m; a damaged pedicle valve (SAM–A25457) from SM 162 at a depth of 630 m. Most of the complete specimens were live at the time of collection, some attached to small pebbles by short slender pedicles.

Description

Small biconvex shells with elongately oval outline. Anterior commissure rectimarginate; beak small, suberect; foramen mesothyridid; deltidial plates conjunct forming completely visible symphytium. Shell surface smooth except for concentric growth lines.

Pedicle valve quite strongly and evenly convex in lateral profile; anterior profile strongly convex with evenly convex middle portion flanked by short steep sides. Brachial valve subcircular with evenly and gently convex lateral profile; anterior profile strongly convex with narrow median portion bounded by flatter sides.

Ventral interior with strong teeth not supported by dental plates or thickened valve wall; pedicle collar short, excavate anteriorly. Details of muscle scars not visible. Dorsal interior with high socket ridges bounding deep sockets; outer hinge plates narrow, concave and tapering anteriorly to join thin crural bases. Crura narrow, bearing scoop-like anterior part of loop without development of descending lamellae. Crural processes low and blunt and attached directly to narrow transverse band, which is convex dorsally and anteriorly.

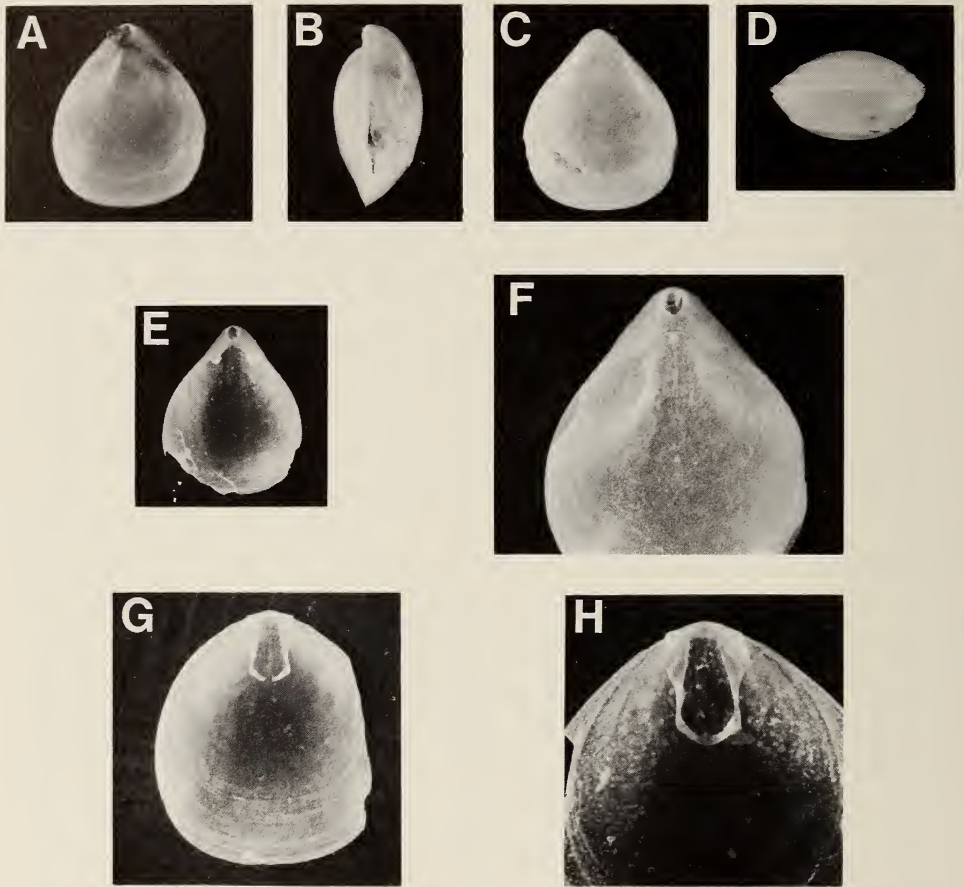


Fig. 6. *Xenobrochus africanus* (Cooper, 1973). A-D. SAM-A25454, SM 103: dorsal, lateral, ventral and anterior views of conjoined valves with pedicle. E. SAM-A25454, SM 103: interior view of pedicle valve. F. SAM-A25455, SM 129: dorsal view of conjoined valves. G. SAM-A25454, SM 103: interior view of brachial valve. H. SAM-A25454, SM 103: ventral view of loop. A-E $\times 3$. F-G $\times 6$. H $\times 8$.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
SAM-A25454	3,8	3,5	1,8
	6,6	5,1	3,4
A25455	6,1	5,2	3,0
A25456	6,6	5,9	—
A25457	—	5,2	—

Loop dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25454	1,5	0,7

Discussion

This genus is characterized by its small size, rectimarginate anterior commissure and a loop that has a transverse band convex toward the anterior (Cooper 1983: 275). Of the species assigned to the genus, *X. indianensis* (Cooper), *X. australis* Cooper, *X. anomalus* Cooper and *X. africanus* (Cooper) bear the closest resemblance to the present specimens. Of these, *X. africanus* is recorded from the same area as these specimens but from shallower depths (Cooper 1973b: 3) and is so similar in morphology that the two forms must be regarded as being conspecific. The other species can be distinguished principally by their larger size but *X. indianensis* has a more incurved beak with partly concealed symphytium, fairly large cardinal process and narrow median fold on the transverse band of the loop. *Xenobrochus australis* is narrower and has an angular transverse band; *X. anomalus* is distinguished by its tubular pedicle collar.

Xenobrochus agulhasensis (Helmcke, 1938)

Fig. 7

Terebratula vitrea var. *minor* Philippi: Davidson, 1880: 29, pl. 2 (figs 5–6).

Liothyryna (*Gryphus*) sp. Blochmann, 1908: 613, pl. 39 (fig. 31).

Liothyryna agulhasensis Helmcke, 1938: 243; 1940: 258, fig. 21.

Material

A single complete dead specimen (SAM-A25458) from SM 232, at a depth of 560–620 m.

Description

Elongately oval, biconvex shells with rectimarginate anterior commissure; beak small, suberect with submesothyridid subcircular foramen. Deltidial plates conjunct forming short symphytium. Shell surface smooth except for concentric growth lines.

Pedicle valve quite strongly convex in both profiles. Brachial valve subcircular, over nine-tenths as long as pedicle valve, with gently convex profiles.

Ventral interior with small teeth not supported by dental plates; pedicle collar very short, excavate. Details of muscle scars not visible. Dorsal interior with quite low straight socket ridges bounding fairly wide sockets. Cardinal process transversely elliptical, covering posterior ends of socket ridges. Outer hinge plates narrow, triangular and tapering anteriorly to merge with crural bases. Crura strong, rounded in section, bearing anterior part of loop, which is convex anterodorsally. Crural processes small blunt points in midloop position and attached directly to broad transverse band, which bears faint ventrally directed median fold.

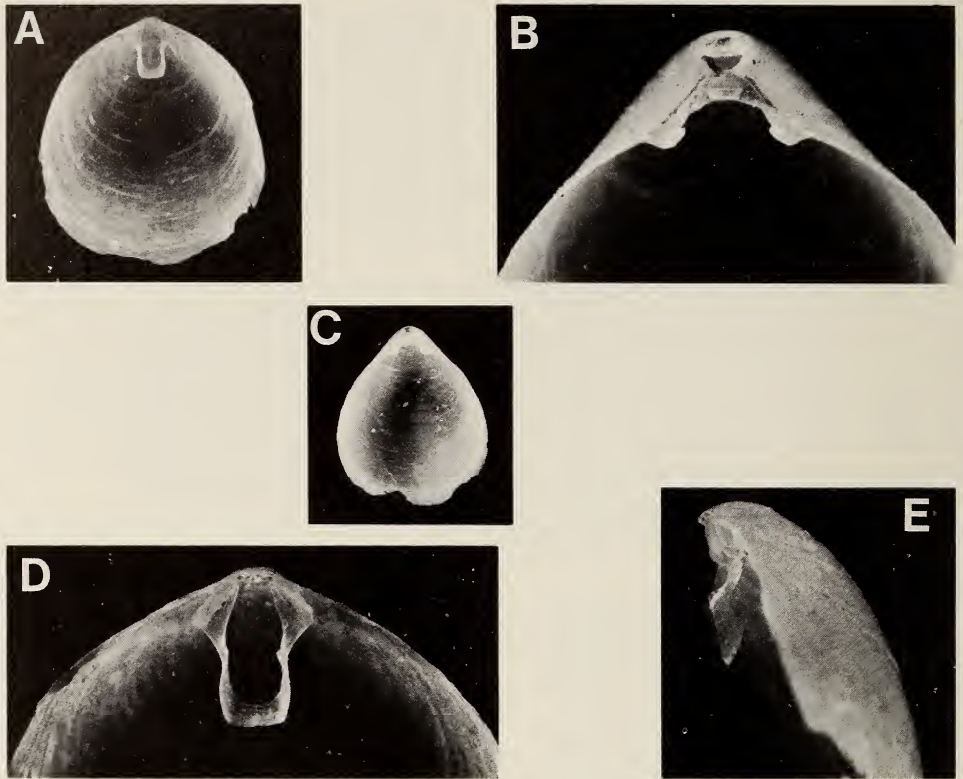


Fig. 7. *Xenobrochus agulhasensis* (Helmcke, 1938), SAM-A25458, SM 232. A. Interior view of brachial valve. B. Close-up of ventral beak, dorsal view. C. Interior view of pedicle valve. D-E. Ventral and lateral views of loop. A $\times 3$. B, D-E $\times 8$. C $\times 2$.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
SAM-A25458	11,7	9,9	6,7

Loop dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25458	2,1	1,2

Discussion

This specimen bears a close resemblance to *Liothyryna agulhasensis* Helmcke from the Agulhas Bank. The species was first described by Davidson (1880) after two specimens were dredged off the Cape of Good Hope during the *Challenger* Expedition. Davidson identified the specimens as *Terebratula vitrea* var. *minor*

Philippi, which is synonymous with *Liothyrella affinis* Calcara. The author has examined one of Davidson's specimens in the British Museum (Natural History) and found it to be very similar to that described here, particular in the form of the loop.

Further specimens from the Agulhas Bank were recovered by the *Valdivia* Expedition in 1898. Blochmann (1906, 1908) compared these to Davidson's specimens and concluded that both were separable from *L. affinis* on the grounds that their loops were different. He assigned the specimens to *Liothyrina* (*Gryphus*) but left the species unnamed. The loop figured by Blochmann (1908, pl. 39 (fig. 31)) is very similar to that of the specimen described here.

Helmcke (1940: 258) revised Blochmann's descriptions and again emphasized the differences between the loops of *L. agulhasensis* and *L. affinis*, that of the former being more rounded while the latter had an angular transition between the transverse band and the sides of the loop. Helmcke described the transverse band of *L. agulhasensis* as being like a weakly fallen arch (? i.e. concave ventrally).

The present author follows Cooper (1981: 20, 1983: 275) in assigning the species to *Xenobrochus* because the transverse band of the loop is convex dorsally and anteriorly, a distinguishing characteristic of the genus.

Jackson (1952: 17) mentions the possibility that the 'Challenger' and 'Valdivia' specimens might belong to his *Gryphus capensis* but in his description of the loop of this species he states that the transverse band is narrow and arched ventrally. This would immediately separate *G. capensis* from any of the specimens mentioned here and indeed exclude it from *Xenobrochus*. Also the thread-like median septum separating adductor scars in the brachial valve of *G. capensis* is a feature not seen in any species of *Xenobrochus*.

It is interesting to note that Cooper (1983: 275) has now questionably assigned *Liothyrella affinis* to *Xenobrochus*.

Xenobrochus? sp. 1

Fig. 8

Material

One complete dead specimen (SAM-A25459) from SM 131 at a depth of 780 m.

Description

Small, elongately oval biconvex shell with maximum width about midvalve; anterior commissure rectimarginate. Beak moderately long, narrowly rounded, suberect to erect; foramen large, mesothyridid. Deltidial plates disjunct or conjunct; symphytium short, visible. Shell surface smooth but for concentric growth lines.

Pedicle valve deeper and more convex than brachial valve, evenly convex in lateral profile, strongly convex in anterior profile, especially in median portion.

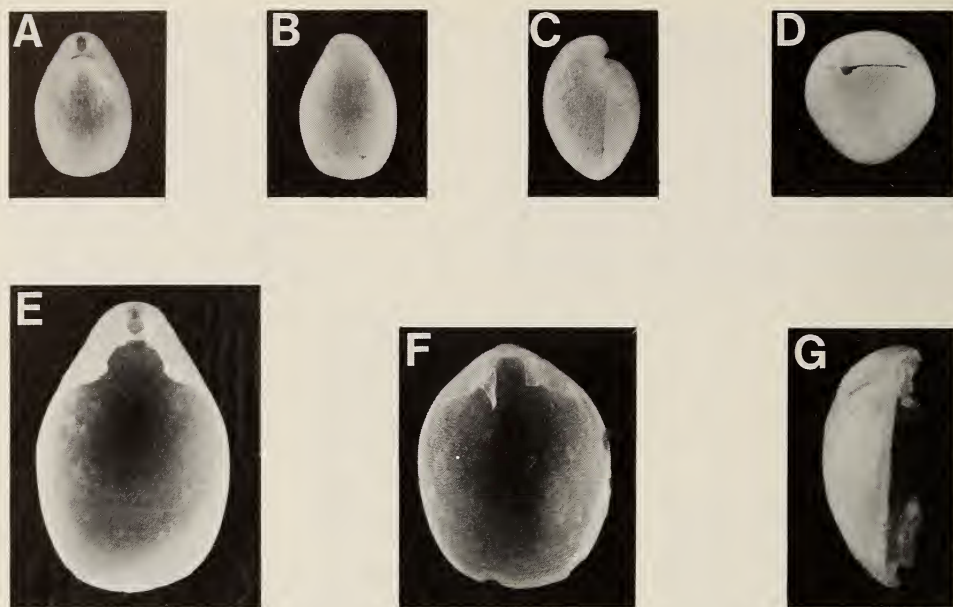


Fig. 8. *Xenobrochus?* sp. 1, SAM-A25459, SM 131. A-D. Dorsal, ventral, lateral and anterior views of conjoined valves. E. Interior view of pedicle valve. F. Interior view of brachial valve. G. Lateral view of brachial valve showing crus. A-D $\times 3$. E-G $\times 6$.

Brachial valve moderately convex in lateral profile, more strongly convex in anterior profile.

Ventral interior with strong teeth; pedicle collar excavate anteriorly. Details of muscle scars not discernible. Dorsal interior with broad, transversely elliptical cardinal process extending across posterior ends of socket ridges; socket ridges high posteriorly but lower at their anterior ends, bounding narrow sockets. Outer hinge plates flattish, tapering anteriorly and merging with crural bases. Crura thin, subparallel; crural processes very small. Remainder of loop not preserved.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
SAM-A25459	6,3	4,3	4,4

Discussion

This specimen bears a strong resemblance to *Xenobrochus anomalus* Cooper from the waters around Marion Island. However, that species is characterized by its extravagantly developed tubular pedicle collar and its crural processes are situated at the anterior limit of the outer hinge plates (Cooper 1981: 20). While the present specimen has a well-defined pedicle collar, it could hardly be

described as extravagant and the crural processes are located anterior of the outer hinge plates.

Xenobrochus? sp. 2

Fig. 9

Material

Six pedicle and three brachial valves (SAM-A25460) from SM 232 at a depth of 560–620 m and a pedicle and brachial valve (SAM-A25461) from SM 226 at a depth of 710–775 m.

Description

Small to medium elongately oval shells with maximum width at or slightly anterior of midvalve; anterior commissure rectimarginate. Beak moderately long, quite narrowly rounded, suberect to erect; foramen quite large, mesothyridid; symphytium short, visible. Shell surface smooth except for concentric growth lines.

Pedicle valve deeper and more convex than brachial valve; moderately convex in lateral profile with maximum convexity in umbonal region; strongly convex in anterior profile. Brachial valve gently and evenly convex in both profiles.

Ventral interior with small elongate teeth; pedicle collar short, excavate anteriorly. Muscle scars not visible. Dorsal interior with transversely elliptical cardinal process; high socket ridges bounding fairly wide sockets; outer hinge plates small, merging with crural bases. Crura thin; crural processes small, blunt. Remainder of loop not preserved. Lightly impressed elongate rectangular muscle scars, extending for about one-third of the valve length, barely discernible beneath loop.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25460	14,7	11,1
	13,7	10,5
	13,3	9,9
	11,8	9,2
SAM-A25461	11,7	8,4

Discussion

These specimens resemble *Xenobrochus indianensis* (Cooper) from the north-western part of the Indian Ocean, although without a complete loop further comparison is impossible.

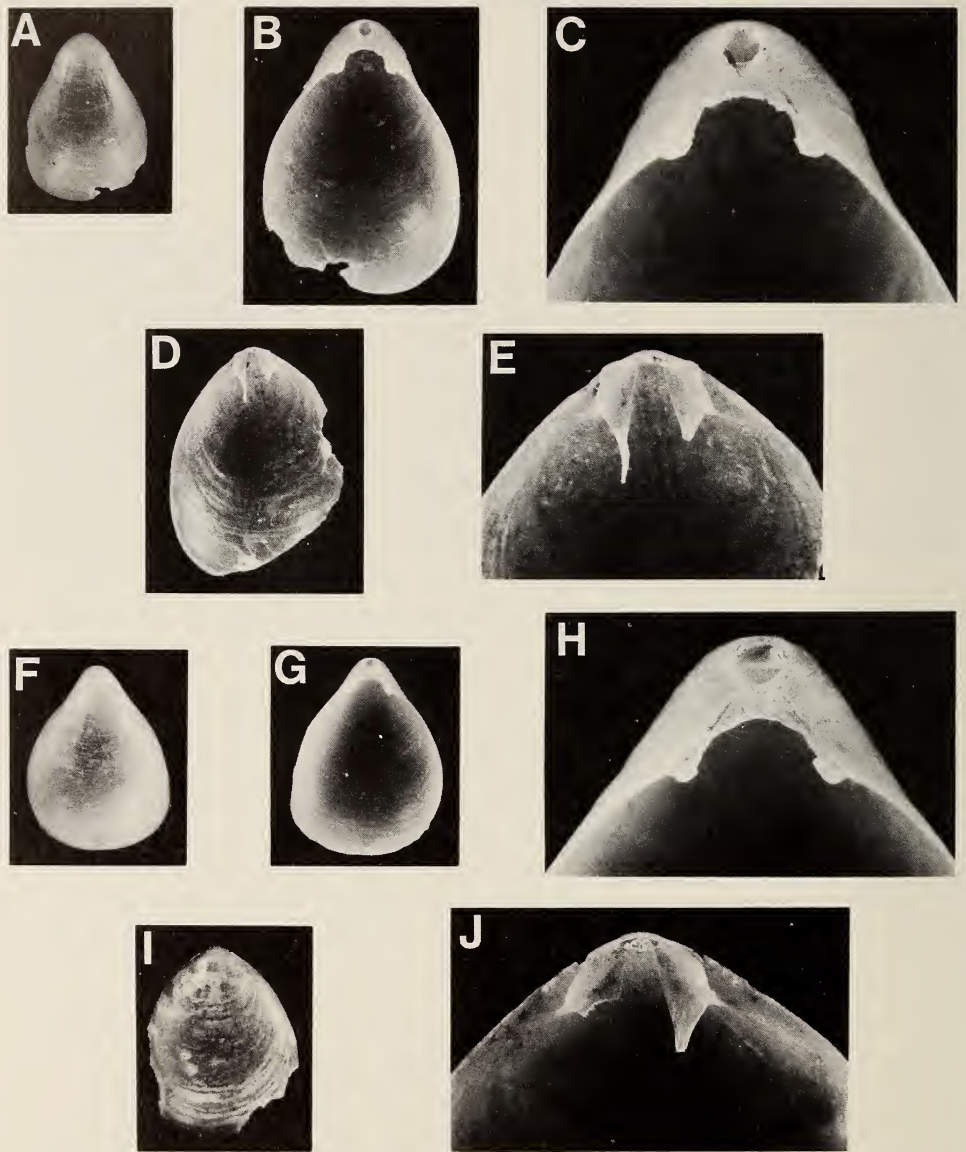


Fig. 9. *Xenobrochus?* sp. 2. A-E. SAM-A25461, SM 226. A. Ventral view of pedicle valve. B. Interior view of pedicle valve. C. Close-up of ventral beak. D. Interior view of brachial valve. E. Close-up of cardinalia. F-J. SAM-A25460, SM 232. F. Ventral view of pedicle valve. G. Interior view of pedicle valve. H. Close-up of ventral beak. I. Dorsal view of brachial valve. J. Close-up of cardinalia. A, F, G, I $\times 2$. B, D $\times 3$. C, E, H, J $\times 8$.

Superfamily CANCELLOTHYRIDACEA Thomson, 1926
 Family **Cancellothyrididae** Thomson, 1926
 Subfamily Cancellothyridinae Thomson, 1926
 Genus *Terebratulina* d'Orbigny, 1847

Terebratulina sp.

Fig. 10

Material

A total of 13 immature specimens: 8 complete specimens, 3 brachial valves and a pedicle valve (SAM-A25462) from SM 131 at a depth of 780 m, and a single complete specimen (SAM-A25463) from SM 180 at a depth of 80 m. All were dead at time of recovery.

Description

Very small biconvex shells with elongately oval to roundedly triangular outline; maximum width in anterior third of shell. Beak nearly straight with large submesothyridid foramen; deltidial plates very small. Anterior commissure rectimarginate. Ornament consisting of rounded costae and costellae and strong concentric growth lines. Many of the specimens have strongly beaded appearance caused by interference of radial and concentric ornaments. Posterolateral extremities with concentric ornament only.

Pedicle valve moderately convex in lateral profile; gently convex in anterior profile but with steep posterolateral slopes. Brachial valve gently convex in both profiles, but more arched umbonally. Posterolateral corners flattened.

Ventral interior with small hook-like teeth; pedicle collar short, excavate. Other details obscure. Dorsal interior with high, strong, widely divergent socket ridges fused posteriorly to weakly developed cardinal process; sockets short and deep. Crura short, stout, rounded in cross-section. Remainder of loop not preserved in any of these specimens.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
SAM-A25462	3,5	2,5	1,8
	3,2	2,3	1,5
	2,6	2,1	1,2
	2,3	1,9	1,1
SAM-A25463	4,2	3,5	2,0

Discussion

Terebratulina is very widespread in the world's oceans and is represented in South African waters by *T. abyssicola* (Adams & Reeve) and *T. meridionalis*

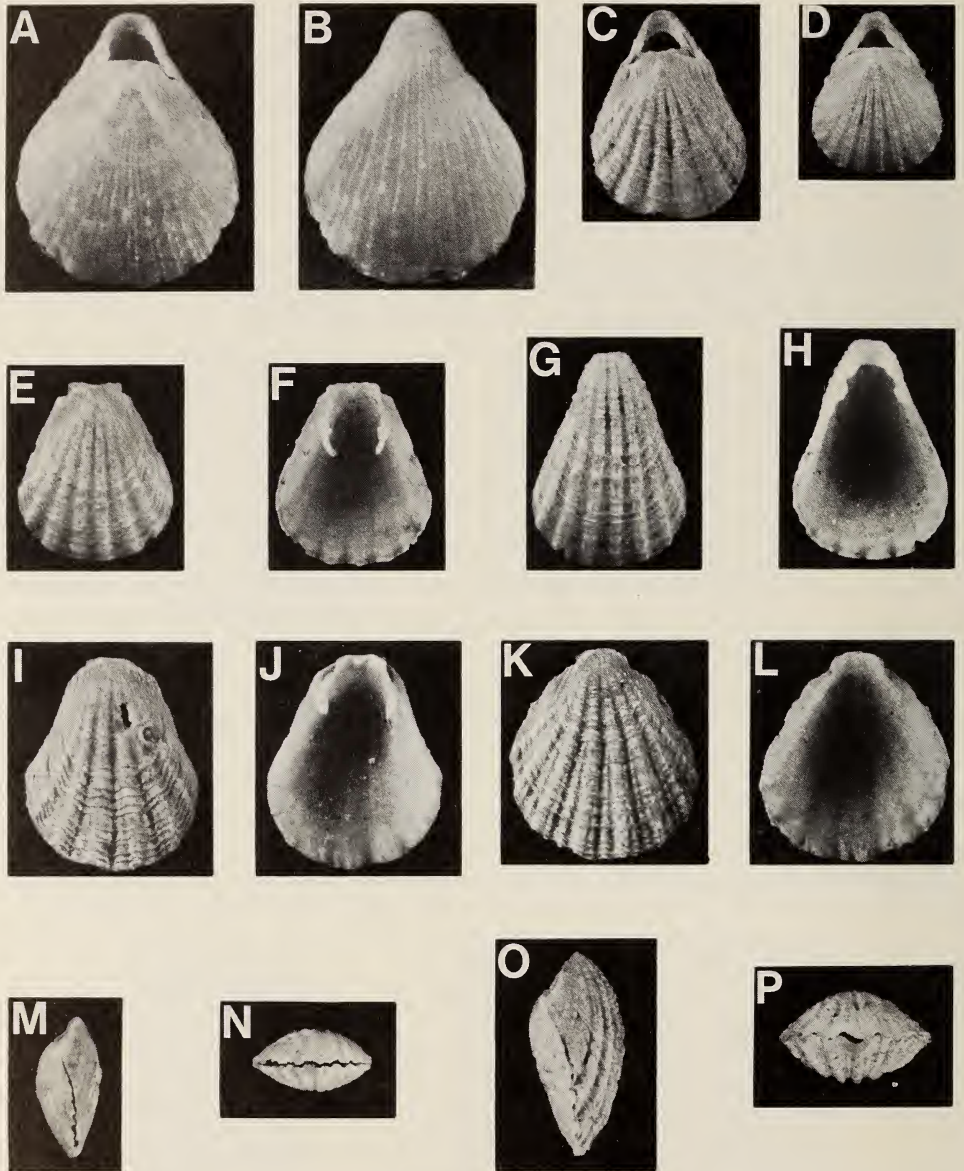


Fig. 10. *Terebratulina* sp. A-B. SAM-A25463, SM 180: dorsal and ventral views of conjoined valves. C-P. SAM-A25462, SM 131. C. Dorsal view of conjoined valves. D. Dorsal view of conjoined valves. E-F. Dorsal and interior views of brachial valve. G-H. Ventral and interior views of pedicle valve. I-J. Dorsal and interior views of brachial valve. K-L. Dorsal and interior views of brachial valve. M-N. Lateral and anterior views of conjoined valves. O-P. Lateral and anterior views of conjoined valves. All $\times 8$.

Jackson, as well as unnamed species recorded by Jackson (1952) and Cooper (1973*b*). The present specimens cannot be assigned to either of the above-named species because of their much stronger radial ornament. The beaded appearance of the ribs displayed by most of the present specimens is typical of many immature *Terebratulina* (Cooper 1978: 7) so until associated adult shells become available a more precise identification cannot be attempted. More than one species may be present in this sample.

Family **Chlidonophoridae** Muir-Wood, 1959
Subfamily Chlidonophorinae Muir-Wood, 1959
Genus *Chlidonophora* Dall, 1903
Chlidonophora chuni Blochmann, 1903

Fig. 11

Terebratula sp.: Alcock, 1894: 139.

Terebratulina sp.: Chun, 1900: 404, 405, 2 figs.

Chlidonophora chuni Blochmann in Chun, 1903: 435, 436, 2 figs. Blochmann, 1906: 695.

Thomson, 1927: 182. Helmcke, 1940: 239, fig. 6. Muir-Wood, 1959: 296, pl. 4 (figs 5-7).

Cooper, 1973*b*: 13, pl. 8 (figs 17-26).

Material

Two complete specimens (SAM-A25464), dead at time of recovery, from SM 103 at a depth of 680 m; three complete specimens (SAM-A25465), one dead and two live at time of recovery, from SM 246 at a depth of 1 640-1 660 m.

Description

Small subcircular biconvex shells with maximum width at about midvalve. Hinge line nearly straight, less than one-half as wide as valve. Anterior commissure broadly and very gently uniplicate. Beak short; interarea small; foramen hypothyrigid; deltidial plates disjunct but one specimen with pedicle shows delthyrium closed anterior to pedicle by ?symphytium. Pedicle quite short, slender and frayed at end. Ornamentation of rounded costae and costellae crossed by strongly developed concentric growth lamellae to produce a reticulate pattern.

Pedicle valve gently convex in lateral profile; maximum convexity in umbonal region becoming flatter anteriorly. Anterior profile quite strongly arched with median flattening due to development of broad shallow sulcus originating near umbo. Brachial valve evenly convex in lateral profile; anterior profile arched by incipiently developed fold.

Pedicle valve interior with strong teeth but no dental plates; other details obscure. Brachial valve interior with short socket ridges fused posteriorly to transverse cardinal process; cardinalia project posterior to hinge line. Crura short, stout, converge anteromedianly, crural processes sharply pointed with points directed anteroventrally. Narrow transverse band with ventrally directed median fold.

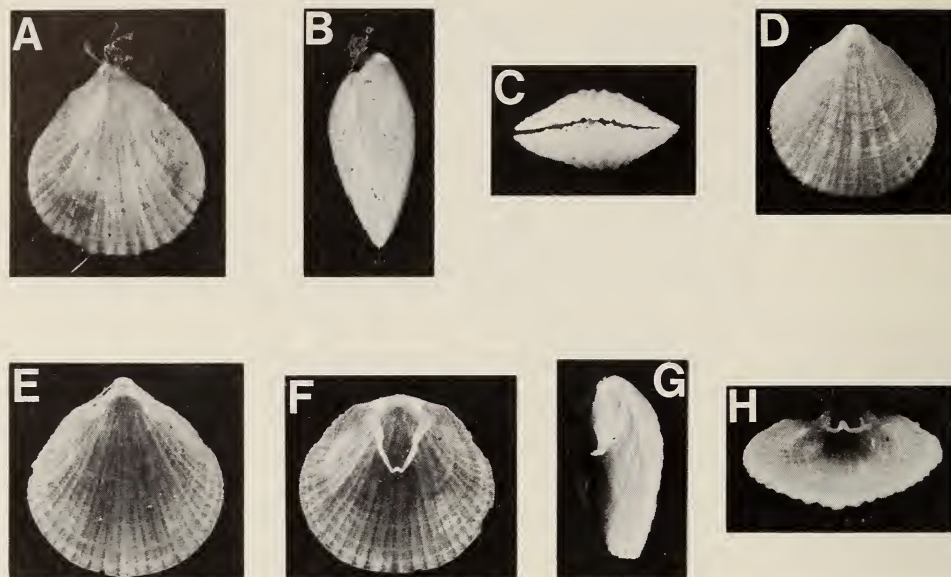


Fig. 11. *Chlidonophora chuni* Blochman, 1903, SAM-A25465, SM 246. A-B. Dorsal and lateral views of conjoined valves with pedicle. C. Anterior view of conjoined valves. D-E. Ventral and interior views of pedicle valve. F-H. Ventral, lateral and anterior views of brachial valve interior showing loop. All $\times 6$.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
SAM-A25464	4,7	4,1	2,2
	4,4	4,1	1,9
SAM-A25465	4,7	4,5	2,1
	4,1	3,9	1,9
	4,5	4,2	2,1

Loop dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25465	1,9	0,9

Discussion

Two species of *Chlidonophora* are known; *C. incerta* (Davidson) from the Atlantic Ocean can be distinguished from *C. chuni* Blochmann from the Indian Ocean by the form of its pedicle, its loop and its wider hinge line. The pedicle of *C. chuni* is long and slender and frays some distance from the umbo whereas that of *C. incerta* frays immediately on emergence from the foramen to give a radiating effect. The loop of *C. chuni* is longer and more pointed than that of *C. incerta*, which is short and rounded. The *Meiring Naude* specimens have the

narrow hinge line and longer pointed loop of *C. chuni* and although the pedicle is not long it does not fray until a short distance from the umbo. They must therefore be placed in that species.

Genus *Notozyga* Cooper, 1977

Notozyga gracilis sp. nov.

Fig. 12

Diagnosis

Notozyga with subdued radial ornament and delicate, slender loop.

Material

Holotype. SAM-A25466 in the South African Museum, Cape Town. From SM 131 (30°43,2'S 30°40,8'E) at a depth of 780 m, 11 May 1977. One complete, dead specimen.

Description

Small biconvex shell with rounded subpentagonal outline; posterolateral angles obtuse. Hinge line straight, about two-thirds as wide as valve; maximum width slightly anterior of midvalve. Anterior commissure rectimarginate. Interarea quite high, about one-third as long as valve; foramen quite large, triangular, flanked by narrow deltidial plates. Well-defined triangular palintropes between deltidial plates and beak ridges. Ornament of very subdued rounded costae and costellae and very faint concentric growth lines.

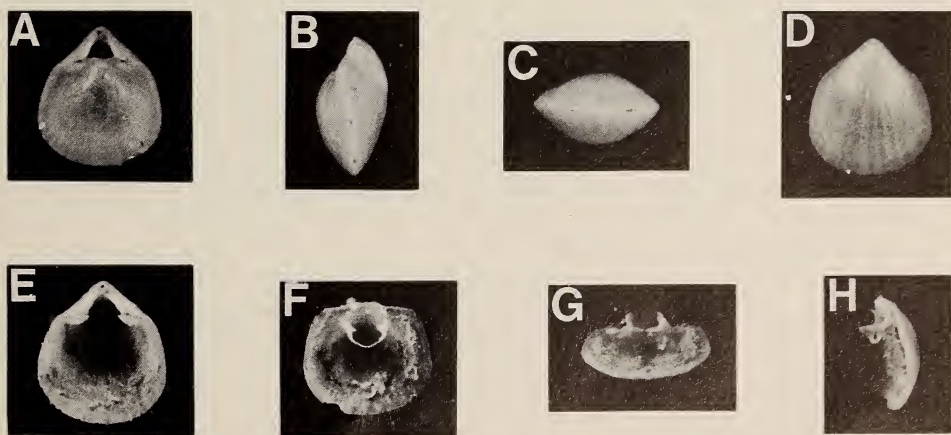


Fig. 12. *Notozyga gracilis* sp. nov., SAM-A25466, holotype, SM 131. A-D. Dorsal, lateral, anterior and ventral views of conjoined valves. E. Interior view of pedicle valve. F-H. Ventral, anterior and lateral views of brachial valve interior showing loop. All $\times 8$.

Pedicle valve lateral profile strongly convex near umbo, becoming less so anteriorly; anterior profile strongly convex. Brachial valve quite strongly convex in both profiles; posterolateral corners flattened.

Ventral interior with short, excavate pedicle collar; teeth strong, semicircular in shape, without dental plates. Dorsal interior with fairly high, widely divergent socket ridges, fused posteriorly and bounding narrow, deep sockets. Crura short, strong, projecting anteromedianly from below anterior ends of socket ridges. Crural processes moderately high, bluntly pointed. Descending lamellae very thin, curved, uniting medianly without development of true transverse band. Both valves with flattened rim around anterior and lateral margins with well-developed eminences and embayments inside this.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
SAM-A25466 Holotype	2,2	2,1	1,2

Loop dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25466 Holotype	0,8	0,7

Discussion

The genus *Notozyga* is much like *Eucalathis* in appearance but can be distinguished principally by its well-defined ventral interarea and the rounded, as opposed to pointed, form of its loop, which extends only slightly beyond the crural processes (Cooper 1977: 105). The specimen described here possesses these distinctive features and is thus placed in that genus but it differs from the only previously described species, *N. lowenstami* Cooper, in its subdued ornament and finer, more delicate loop.

Eucalathis macrorhynchus Foster from the Pacific-Antarctic ridge is a form with a subdued radial ornament and well-defined interarea and in these respects resembles *N. gracilis*. The loops of these two species are also similar but in his description Foster (1974: 81) points out that *E. macrorhynchus* shows considerable variation in the form of its loop from rounded *Notozyga*-type to a more pointed shape typical of *Eucalathis*.

Another species worthy of investigation is *Eucalathis trigona* (Jeffreys), which Cooper (1973b: 13) reports as having a loop more rounded anteriorly than is usual for the genus, and he states that Dall (1920: 324) questions the generic affinities of *E. trigona*. This might also prove to belong to *Notozyga*.

Etymology

From the Latin *gracilis* meaning slender, referring to the form of the loop.

Notozyga sp.

Fig. 13

Material

A single complete, dead specimen (SAM-A25467) from SM 131 at a depth of 780 m.

Description

Small biconvex shell, subpentagonal to elongately oval in outline; maximum width at about two-thirds valve length. Anterior commissure rectimarginate. Hinge line nearly straight, about seven-tenths as wide as valve. Interarea quite high, over one-third as long as valve; foramen large, triangular, flanked by narrow deltidial plates. Fairly broad, triangular palintropes between deltidial plates and beak ridges. Ornament consists of strong rounded costae, which become broader anteriorly and increase by branching. Posterolateral corners of brachial valve devoid of radial ornament. Concentric ornament of faint growth lines.

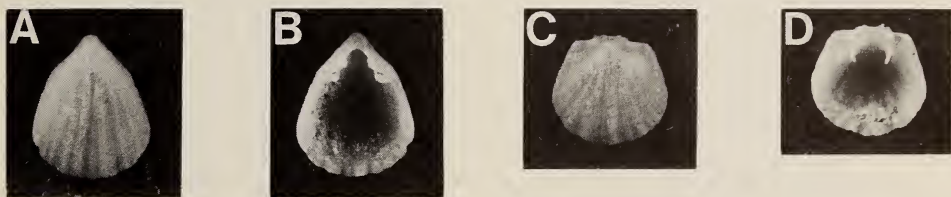


Fig. 13. *Notozyga* sp., SAM-A25467, SM 131. A-B. Ventral and interior views of pedicle valve. C-D. Dorsal and interior views of brachial valve. All $\times 8$.

Pedicle valve gently convex in lateral profile; quite strongly convex in anterior profile. Brachial valve evenly convex in both profiles.

Ventral interior with short, elevated pedicle collar and small teeth. Other details not seen. Dorsal interior with short, almost colinear socket ridges bounding small sockets. Stout crura, slightly flattened, projecting anteromedianly from valve wall in front of socket ridges. Remainder of loop not preserved.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25467	2,4	1,9

Discussion

This little specimen is placed in *Notozyga* on the basis of its well-defined ventral interarea, but it differs from *N. gracilis* sp. nov. in its more elongate outline and much stronger ribbing. However, more material with complete brachidia is required before another new species can be erected.

Subfamily Eucalathinae Muir-Wood, 1965

Genus *Eucalathis* Fischer & Oehlert, 1890*Eucalathis fasciculata* Cooper, 1973

Fig. 14

Eucalathis fasciculata Cooper, 1973b: 12, pl. 1 (figs 26–28).*Material*

Four complete specimens (SAM–A25468), live, from SM 60 at a depth of 800–810 m; one complete specimen (SAM–A25469), dead, from SM 103 at a depth of 680 m; seven complete, live specimens plus two brachial and two pedicle valves (SAM–A25470) from SM 246 at a depth of 1 640–1 660 m.

Description

Small, broadly triangular biconvex shells with narrow hinge and rounded anterior margin; posterolateral angles obtuse; maximum width, about twice hinge width, situated at around two-thirds valve length. Anterior commissure faintly uniplicate. Interarea very narrow; foramen wide, triangular; deltidial plates not always present but several specimens show development of symphytium. Pedicle relatively long, slender and frayed at end. Ornament consists of faint concentric growth lines and about 10 subangular primary costae, each of which gives rise to one or two costella to produce coarse fascicostellate ornament. Posterior portions of shell nearly smooth although faint traces of ribs may be seen.

Pedicle valve gently convex in lateral profile; anterior profile quite strongly convex in umbonal region but anterior of midvalve a weakly developed sulcus flattens profile. Brachial valve gently convex in lateral profile; inconspicuous fold originates near midvalve.

Pedicle valve interior with small teeth; pedicle collar developed; other details obscure. Brachial valve interior with stout socket ridges united posteriorly with wide, weakly developed cardinal process. Crura strong with blunt crural processes; loop short, triangular, with broad descending lamellae, which converge anteromedianly, and joined by narrow transverse band with small ventrally directed median fold.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
SAM–A25468	3,5	3,0	—
	3,1	2,8	1,5
A25469	2,8	2,3	1,2
A25470	2,7	2,4	1,4
	2,4	2,1	1,3

Loop dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM–A25468	1,5	0,7

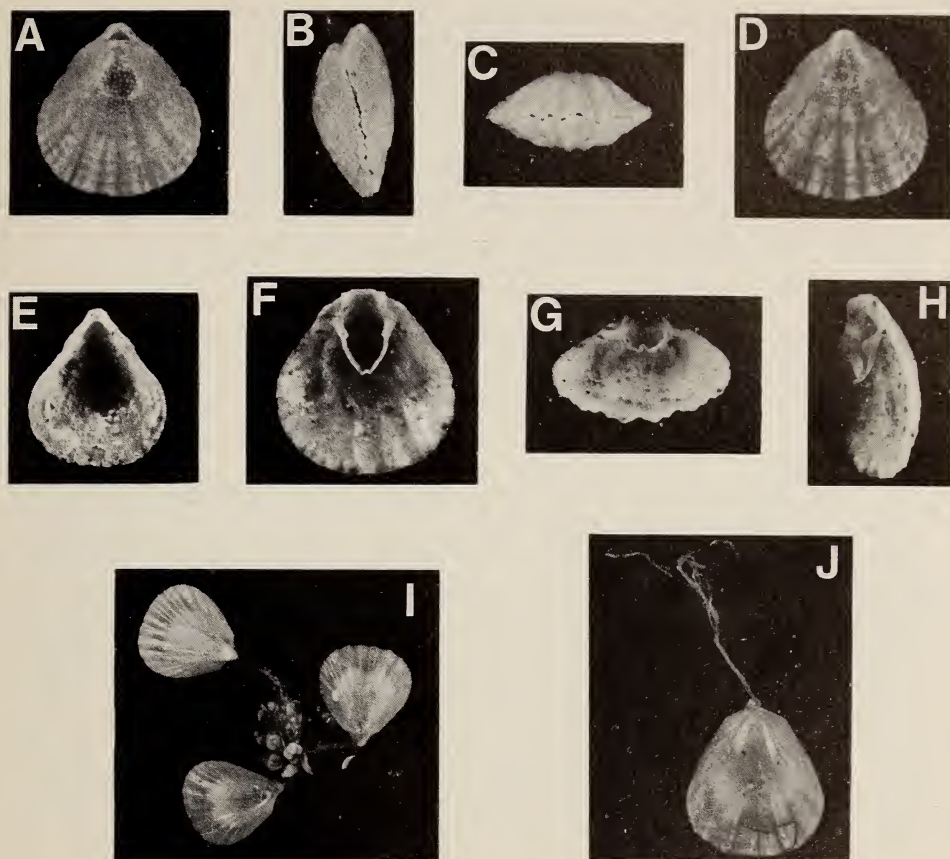


Fig. 14. *Eucalathis fasciculata* Cooper, 1973. A-D. SAM-A25470, SM 246: dorsal, lateral, anterior and ventral views of conjoined valves. E. SAM-A25469, SM 103: interior view of pedicle valve. F-H. SAM-A25470, SM 246: ventral, anterior and lateral views of brachial valve interior showing loop. I-J. SAM-A25468, SM 60. I. Group of three specimens with pedicles attached to foraminifera. J. Complete specimen showing long frayed pedicle. A-H, J $\times 8$. I $\times 6$.

Discussions

These specimens can immediately be referred to *Eucalathis fasciculata* Cooper from south of Madagascar. It is distinguished from the other known species of the genus by its small size and distinctive ornament. This is the only species in which the posterior part of the shell is more or less smooth. The other Indian Ocean species, all from south of Madagascar, are *E. costellata* Cooper, *E. rotundata* Cooper, and an unnamed species recorded by Cooper (1981: 19). All of these forms have a strongly developed radial ornament.

Subfamily Agulhasiinae Muir-Wood, 1965

Genus *Agulhasia* King, 1871*Agulhasia davidsoni* King, 1871

Fig. 15

Agulhasia davidsoni King, 1871: 111, pl. 11 (figs 1-7). Thomson, 1927: 182, fig. 52. Helmcke, 1940: 242, fig. 7. Jackson, 1952: 9. Cooper, 1973b: 14, pl. 4 (figs 1-14); 1973c: 15, pl. 8 (figs 18-24).

Terebratulina (Agulhasia) davidsoni King: Davidson, 1886: 36, pl. 7 (figs 1-5).

Material

Nine complete specimens (SAM-A25471) from SM 131 at a depth of 780 m. All appear to have been dead and sediment-filled at time of collection. Some show signs of abrasion suggesting transportation from living site.

Description

Small biconvex shells with broadly triangular outline; maximum width near anterior margin. Anterior commissure gently uniplicate. Ventral beak greatly elongate, about one-third as long as shell, narrowly pointed; delthyrium bounded by pair of disjunct deltidial plates and almost closed by long, triangular, concave apical plate, which restricts foramen to a small opening at anterior end of beak. Radial ornament consists of rounded costae and costellae; most specimens had 6 (pedicle valve) or 7 (brachial valve) primary costae extending from umbo, secondary ribs arise mostly by intercalation between primaries from about 1 mm growth stage to give total of 11 or 12 ribs by 2 mm growth stage. Largest specimens with 18-22 ribs at anterior margin. Radial ornament absent from lateral margins of both valves. Concentric ornament of closely spaced growth lines.

Pedicle valve elongately triangular; lateral profile evenly convex; anterior profile with median flattening and development of broad shallow sulcus in later growth stages. Brachial valve elongately subpentagonal; lateral profile with maximum convexity near umbo; anterior profile arched along midline but true fold not developed.

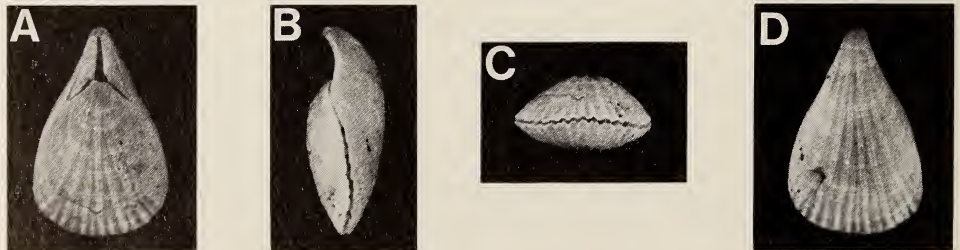


Fig. 15. *Agulhasia davidsoni* King, 1871, SAM-A25471, SM 131. A-D. Dorsal, lateral, anterior and ventral views of conjoined valves. All $\times 8$.

Details of internal characteristics of valves not available from present specimens, but see Cooper (1973b: 14).

Dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25471	4,5	2,9
	4,0	2,6
	3,4	2,3
	2,3	1,5
	2,4	1,7
	1,6	1,0
	2,2	1,4
	2,9	1,9
	1,8	1,1

Discussion

Agulhasia davidsoni King is characterized by its small size, broadly triangular shape and especially by its elongated ventral beak. It is unlikely to be mistaken for any other species. It is known only from South African waters.

Suborder TEREBRATELLIDINA Muir-Wood, 1955

Superfamily TEREBRATELLACEA King, 1850

Family **Kraussinidae** Dall, 1870

Genus *Kraussina* Davidson, 1859

Kraussina rubra (Pallas, 1766)

Fig. 16

Anomia rubra Pallas, 1766: 182, pl. 14 (figs 2-11).

Terebratula capensis Küster (*non* Adams & Reeve), 1848: 32, pl. 3 (figs 15, 17).

Terebratula capensis Krauss (*non* Adams & Reeve), 1848b: 32, pl. 2 (fig. 10).

Terebratula (*Kraussia*) *rubra* (Pallas): Reeve, 1861: 9, fig. 37.

Kraussina rubra (Pallas): Davidson, 1887: 119, pl. 20 (figs 19-23). Jackson, 1952: 22, pl. 3 (figs 1-2). Cooper, 1973c: 23, fig. 5, pl. 9 (figs 10-22).

Material

A broken pedicle valve (SAM-A25472) from SM 129 at a depth of 850 m; a complete specimen and a pedicle valve (SAM-A25473) from SM 131 at a depth of 780 m; and a complete specimen (SAM-A25474) collected live from SM 185 at a depth of 90 m. Also included in this description are two specimens separated from coral material collected during earlier research expeditions: a complete

immature specimen (SAM-A25484) with coral SAM-H1366 dredged 28 December 1898 by S.S. *Pieter Faure* at station PF 796 (33°4'S 27°57'E) at a depth of 59 m; and a complete specimen (SAM-A25483) collected live at Somerset Strand, 23 October 1897, with coral SAM-H1406.

Description

Biconvex shells with width usually slightly less than length; outline variable but usually elongately oval. Hinge line nearly straight, about seven-tenths as wide as valve. Anterior commissure gently sulcate. Beak suberect, irregularly truncated with large incomplete submesothrydid foramen bounded by small triangular deltidial plates. Narrow triangular palintropes between deltidial plates and beak ridges. Ornament consists of concentric growth lines and strong rounded costae, which increase by branching and intercalation; 18-22 ribs on pedicle valve at 5 mm growth stage.

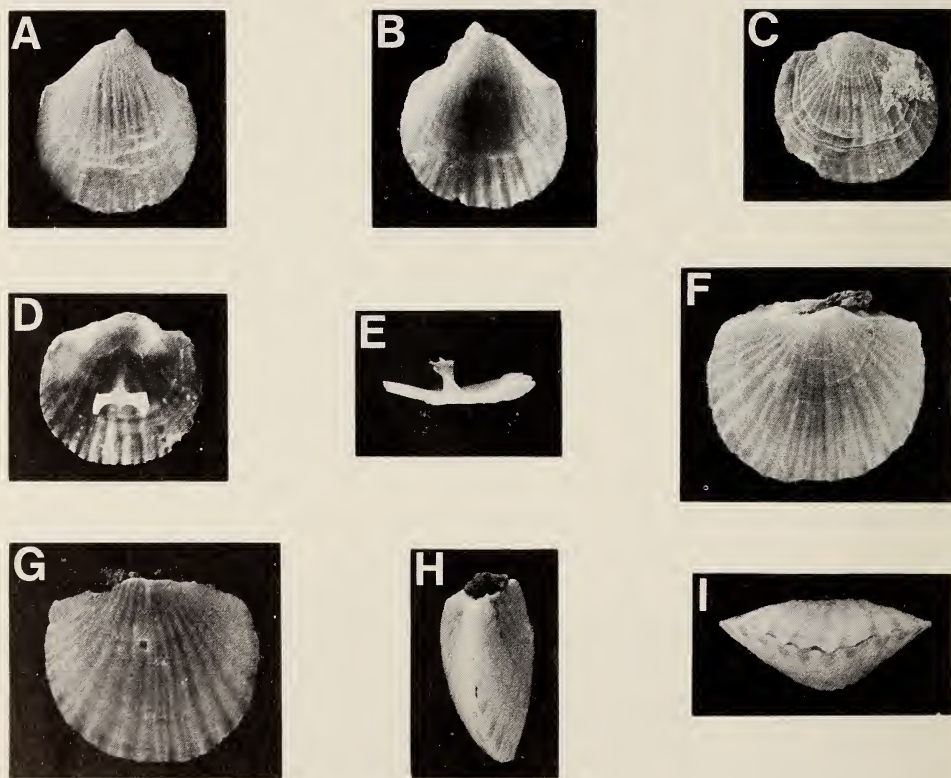


Fig. 16. *Kraussina rubra* (Pallas, 1766). A-E. SAM-A25483, Somerset Strand. A-B. Ventral and interior views of pedicle valve. C-D. Dorsal and interior views of brachial valve. E. Lateral view of brachidium. F-I. SAM-A25474, SM 185: dorsal, ventral, lateral and anterior views of conjoined valves with pedicle. A-E $\times 2$. F-I $\times 4$.

Pedicle valve gently convex in lateral profile but broadly carinate in anterior profile. Brachial valve gently convex in lateral profile, anterior profile with broad shallow sulcus extending from near umbo, separating gently convex flanks.

Pedicle valve interior with small teeth without dental plates; pedicle collar short, sessile but may be slightly excavate anteriorly. Other details obscure. Brachial valve interior with low, widely divergent socket ridges bounding narrow sockets. Cardinal process transversely elliptical, between posterior ends of socket ridges. Notothyrial platform consists of a pair of suboval thickenings between socket ridges and posterior end of median septum; in middle of each, rounded depressed attachment scars of pedicle muscles are situated. Low median septum extends from in front of notothyrial platform and supports at its distal end a pair of diverging lamellae, extending ventrally. Ventral end of each lamella drawn out into short anteriorly directed prong; some specimens also bear posterior prongs and some have short spine on top of each lamella. Valve floors of small specimens show radial rows of coarse tubercles but these are not seen in adult shells. Occasional small submarginal spines present in some specimens.

Dimensions (mm)

	Length	Width
SAM-A25472	7,2	c. 7
A25473	3,6	3,0
	4,1	3,2
A25474	5,7	7,3
A25483	12,2	10,9
A25484	1,7	1,3

Discussion

Kraussina is a fairly common genus in Cape coastal waters and is represented by the species *K. crassicosata* Jackson, *K. cognata* (Sowerby) and *K. rubra* (Pallas), which is perhaps the most common of all brachiopod species in this part of the world. *Kraussina crassicosata* can immediately be separated from the others by its smaller size, more convex valves and stronger, coarser ornament. *Kraussina cognata* is poorly known and more material is required for its relationship to *K. rubra* to be fully assessed. It is recorded from western Cape waters whereas *K. rubra*, while known from the western Cape coast, is more commonly found on the east coast. From previous descriptions, e.g. Jackson (1952: 24), it seems that the principal difference between *K. cognata* and *K. rubra* is one of colour; the former is reported to be pale yellow whereas the latter is noted for its red and white markings although the author has seen pure white shells in a sample of otherwise coloured specimens. Colour alone is a most unsatisfactory criterion on which to separate species.

Of the present specimens, the very small shells are white but one has reddish markings around its anterior margin and the specimen separated from coral SAM-H1406 is yellowish. This last specimen may prove to be *K. cognata* but for the present it is included with the others in *K. rubra*, which has such a variable

shape that growth ratios are virtually useless in separating species. The species are rather poorly defined and in need of revision so that the full range of morphological variation can be taken into account when distinguishing between them.

Genus *Megerlia* King, 1850

Megerlia acura sp. nov.

Fig. 17

Diagnosis

Megerlia similar in most respects to *M. gigantea* (Deshayes) but without the development of crura.

Material

Holotype. SAM-A25475 in the South African Museum, Cape Town. From SM 239 (32°14,8'S 29°00,8'E) at a depth of 90 m, 25 June 1979.

Paratypes. SAM-A25476 in the South African Museum, Cape Town. From SM 239 (32°14,8'S 29°00,8'E) at a depth of 90 m, 25 June 1979. SAM-A25477 in the South African Museum, Cape Town. From SM 255 (31°37,8'S 29°40,8'E) at a depth of 125 m, 28 June 1979.

All the specimens were live at time of collection; that from SM 255 is a juvenile.

Description

Small subcircular to roundedly subrectangular shells with width slightly greater than length. Anterior commissure broadly and very gently sulcate. Beak broadly rounded; foramen hypothyriddid, bounded by small, narrow, raised deltidial plates. Interarea flat to gently curved.

Ornament on pedicle valve consists of concentric growth lines, faintly developed costellae, tubercles and small bristle-like spines; brachial valve ornament of faint ribs and growth lines but no spines or tubercles. Pedicle short and thick.

Pedicle valve strongly and evenly convex in lateral profile; anterior profile more arched medianly with flatter, sloping flanks. Brachial valve varying from almost flat to gently convex especially in umbonal region; anterior profile evenly convex.

Pedicle valve interior with short, slightly excavate pedicle collar and strong teeth. Large subcircular pedicle muscle scars situated on either side of median line about one-third valve length from posterior margin. Brachial valve interior with high thickened socket ridges bounding relatively narrow sockets; no cardinal process. Between socket ridges, thickened triangular platform passes anteriorly into low median ridge, which extends to about midvalve and supports at its anterior end a pair of anteroventrally directed plates, which form an open V-shape when viewed from anterior. At about two-thirds of their height, posterior margins of plates give rise to fine ribbon-like lamellae, which unite postero-medianly to form complete ring. From about one-third of their height, anterior

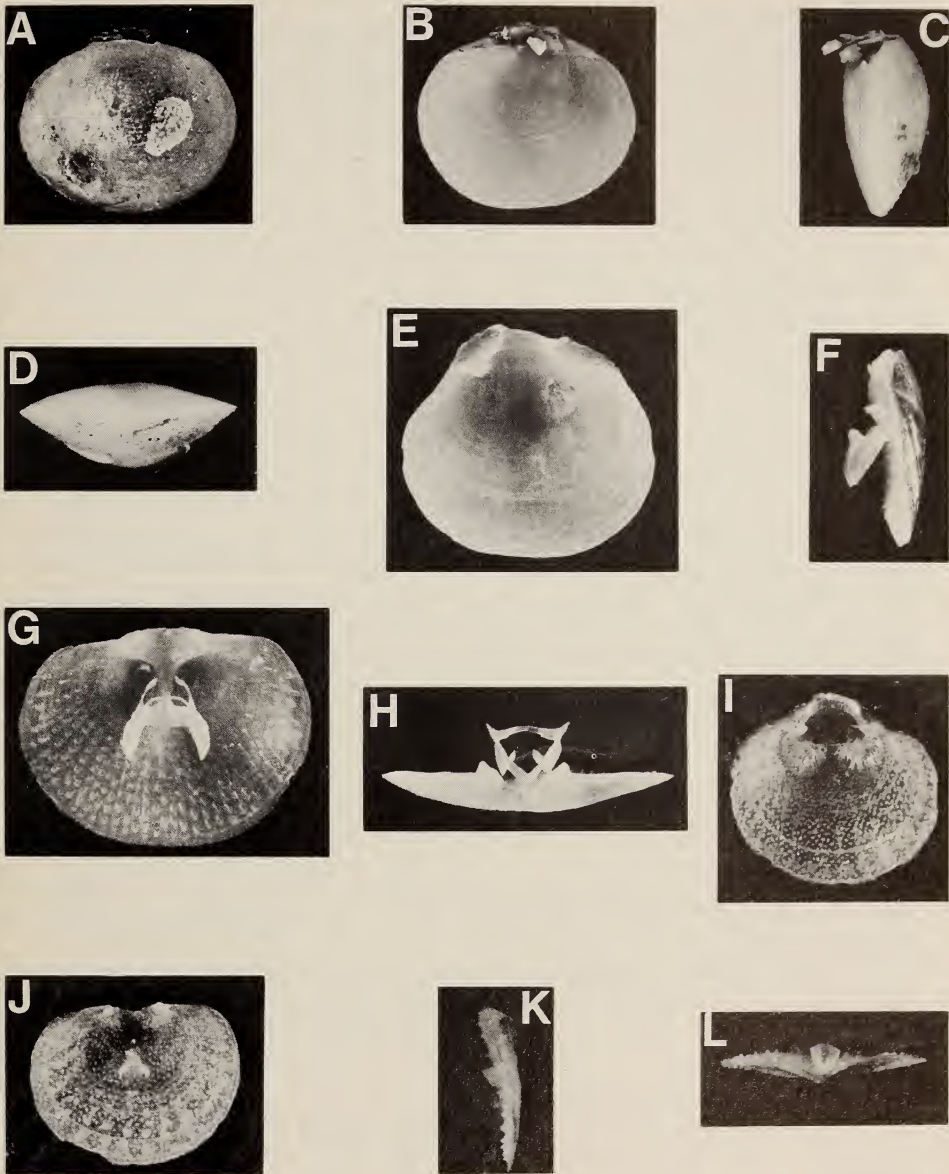


Fig. 17. *Megerlia acrura* sp. nov. A-D. SAM-A25475, holotype, SM 239: ventral, dorsal, lateral and anterior views of conjoined valves with pedicle. E-F. SAM-A25476, paratype, SM 239. E. Interior view of pedicle valve. F. Lateral view of brachidium. G-H. SAM-A25475, holotype, SM 239: ventral and posterior views of brachial valve interior showing brachidium. I-L. SAM-A25477, paratype (juvenile), SM 255. I. Interior view of pedicle valve. J-L. Ventral, lateral and posterior views of brachial valve interior showing precampagiform stage brachidium. A-F $\times 3$. G-H $\times 4$. I-L $\times 8$.

margins of plates give rise to another pair of ribbon-like lamellae, which extend and converge posteriorly but do not meet. In none of the specimens is there any sign of crural development. Diductor muscles attached to thickened notothyrial platform between socket ridges; adductors located on valve floor anterior to this, on either side of median ridge. Outside muscle field, valve floor covered in coarse, radially disposed tubercles, which increase in size towards valve margin.

Dimensions (mm)

		<i>Length</i>	<i>Width</i>	<i>Thickness</i>
SAM-A25475	Holotype	9,9	10,9	—
SAM-A25476	Paratype	8,1	9,8	4,0
SAM-A25477	Paratype	3,2	3,4	1,1

Discussion

In most respects these specimens are very similar to *Megerlia gigantea* (Deshayes), including the strong re-entrant at the dorsal beak suggesting an amphithyridid foramen. The principal difference with this, and indeed other species in the genus, is that none of the specimens described here shows any sign of the development of crura. The juvenile specimen shows an early stage (pre-campagiform) in loop development with a small cone, open anteriorly, supported on a short pillar, similar to the situation described by Cooper (1981: 28) in specimens of similar size. However, this specimen shows no sign of incipient crus development as shown by Cooper's specimens. Cooper (1981, pl. 6 (figs 9, 16, 22)) also figures adult specimens of similar size to the large *Meiring Naude* specimens, in which the crura are fully developed and extend from in front of the socket ridges to join the rest of the brachidium. No such development is seen in the present specimens, which are thus distinguished by their lack of crura.

Etymology

The specific name refers to the lack of crura.

Genus *Megerlina* Deslongchamps, 1884

Megerlina pisum (Lamarck, 1819)

Fig. 18

Terebratula pisum Lamarck, 1819: 245.

Terebratula natalensis Krauss, 1844 (plates), pl. 2b (figs 4-7); 1848a (text): 36.

Material

One dead specimen (SAM-A25478) from SM 163 at a depth of 90 m; one live specimen (SAM-A25479) from SM 179 at a depth of 80 m; one dead specimen (SAM-A25480) from SM 180 at a depth of 80 m; and seven live and four dead specimens plus a few fragments (SAM-A25481) from SM 185 at a depth of 90 m. Also included in this description are two specimens separated from coral material collected during an earlier research expedition: a complete

live specimen (SAM-A25485) with coral SAM-H1365 dredged 29 August 1901 by S.S. *Pieter Faure* at station PF 13601, 8 km W by N of Great Fish Point Lighthouse at a depth of c. 41 m; a complete live specimen (SAM-A25486) with coral SAM-H1383 dredged 25 September 1901 by S.S. *Pieter Faure* at station PF 13959, 4,8 km N by E $\frac{3}{4}$ E of Bird Island Lighthouse at a depth of c. 66 m.

Description

Subpentagonal to subquadrate shells with length and width about equal; maximum width about midvalve. Pedicle valve slightly deeper than brachial valve. Anterior commissure sulcate. Hinge line nearly straight, about three-fifths as wide as valve. Beak suberect with large incomplete submesothyridid foramen bounded by small triangular deltidial plates. Narrow triangular palintropes between deltidial plates and beak ridges. Ornamentation of rounded costellae, which increase by branching and intercalation; 24-33, most commonly 27, ribs at 5 mm growth stage on brachial valve.

Pedicle valve gently convex in lateral profile; anterior profile broadly carinate. Median fold narrow, extending from near umbo becoming broader and more prominent anteriorly; lateral slopes flat to very gently convex. Brachial valve over four-fifths as long as pedicle valve, gently convex in both profiles. Narrow shallow median sulcus extends from close to umbo, becoming broader and deeper anteriorly.

Pedicle valve interior with small teeth; pedicle collar very short, slightly excavate anteriorly. Radially disposed tubercles cover anterior part of valve floor; occasional spine present just inside anterior margin. Brachial valve interior with strong socket ridges and fulcral plates bounding narrow deep sockets. Notothyrial platform defined by buttresses joining anterior ends of socket ridges to medium septum; cardinal process elliptical, weakly developed. Medium septum extends from in front of cardinal process to just anterior of midvalve. At its anterior end it supports a brachidium consisting of a pair of anteroventrally directed diverging lamellae. Each lamella bears, at its distal end, a small prong that projects posteromedianly, and midway down the outer surface of each lamella is an accessory ledge (or process). Valve floor covered by radial rows of coarse tubercles. Muscle scars lightly impressed on notothyrial platform and valve floor immediately anterior to platform.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
SAM-A25478	8,3	8,3	3,5
A25479	6,9	6,4	2,7
A25480	4,7	4,4	1,8
A25481	6,4	6,3	—
	5,2	4,9	1,9
A25485	6,1	6,2	2,5
A25486	4,5	4,3	1,6

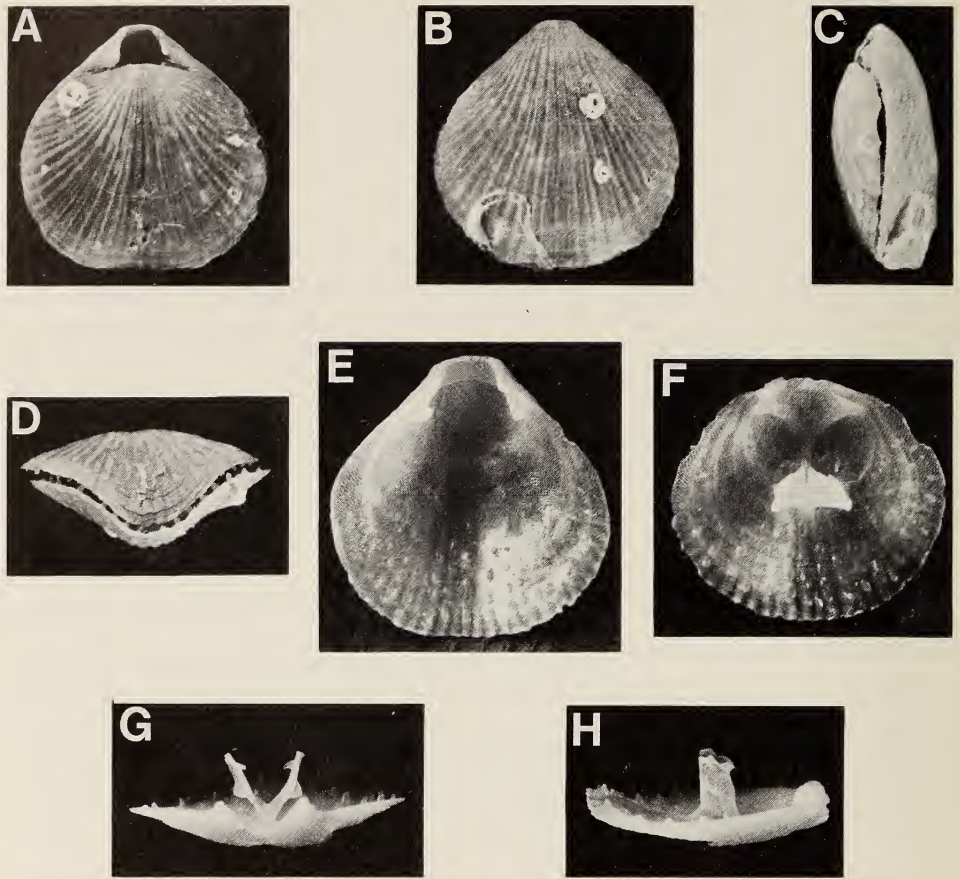


Fig. 18. *Megerlia pisum* (Lamarck, 1819). A-D. SAM-A25478, SM 163: dorsal, ventral, lateral and anterior views of conjoined valves with serpulid worm tubes. E-H. SAM-A25481, SM 185. E. Interior view of pedicle valve. F-H. Ventral, posterior and lateral views of brachial valve interior showing brachidium. A-D $\times 4$. E-H $\times 6$.

Discussion

No less than four species of *Megerlina* have been recorded from the same area off the eastern Cape coast from which the present specimens were recovered. Previous descriptions of these species, *M. pisum* (Lamarck), *M. natalensis* (Krauss), *M. capensis* (Adams & Reeve) and *M. striata* Jackson, have been based on very few specimens and it is unlikely that the full extent of the variation within the genus has been properly assessed, with the result that the relationships between these four species are unknown.

The earlier descriptions distinguish between species on characters such as colour, strength of ribbing, depth of sulcus and size and shape of the punctae. The *Meiring Naude* specimens are all whitish in colour but pink or red around the

margins. In this they are similar to the first three species named above. Their strength of ribbing suggests affinities with both *M. striata* and *M. capensis* but no figures of rib numbers are available for comparison. *Megerlina pisum* and *M. natalensis* have less pronounced ribbing and may be smooth umbonally.

The depth of sulcus depends on the size of the shell, so comparisons should only be made between specimens of approximately equal length; again examples of other species are needed for comparison. In shape and density, the punctae of the *Meiring Naude* specimens show closest similarity with the figures given by Jackson (1952: 31) for *M. pisum* although the range overlaps with the ranges for other species.

Wright (1972: 5) showed the range of variation that was possible within a single species depending on its habitat especially when strength of ribbing and colour were considered. It may be that the species of *Megerlina* recorded from off the eastern Cape are simply variants of one species, *M. pisum*, so until such time as re-assessment of these species is carried out, it is felt that the *Meiring Naude* specimens are best identified as *M. pisum*.

Family **Phaneroporidae** Zezina, 1981

Genus *Leptothyrella* Muir-Wood, 1965

Leptothyrella cf. *ignota* (Muir-Wood, 1959)

Fig. 19

Leptothyris ignota Muir-Wood, 1959: 308, pl. 4 (fig. 9), pl. 5 (figs 12–14).

Material

A single slightly damaged specimen (SAM-A25482) from SM 129 at a depth of 850 m. The specimen was dead at time of collection and shell was partially filled with sediment.

Description

Small shell with elongately oval pedicle valve and almost circular brachial valve; both valves gently and evenly convex, anterior commissure rectimarginate. Ventral beak quite narrow, nearly straight; foramen hypothyriddid; delthyrium open with no, or extremely narrow, deltidial plates. Shell surface smooth except for concentric growth lines. Punctae coarse.

Pedicle valve interior with strong teeth without dental plates; pedicle collar broad, sessile, extending almost full length of delthyrium; broad, low, median ridge extends to about two-thirds valve length. Brachial valve interior with strong high socket ridges bounding fairly deep sockets; no cardinal process. Rounded, narrow crura extend from anterior ends of socket ridges towards median septum, anterior ends becoming flatter. High, pillar-like median septum originates in front of notothyrial cavity and extends to about midvalve. No ring or hood present.

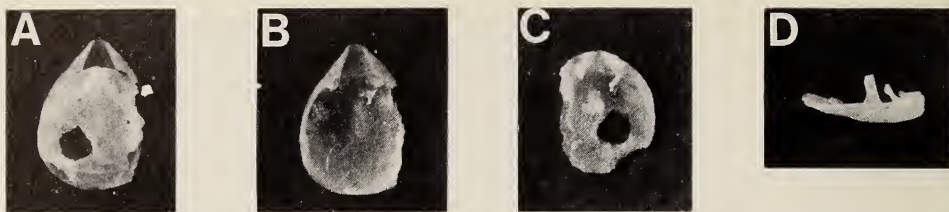


Fig. 19. *Leptothyrella* cf. *ignota* (Muir-Wood, 1959), SAM-A25482, SM 129. A. Dorsal view of conjoined valves. B. Interior view of pedicle valve. C-D. Ventral and lateral views of brachial valve interior showing brachidium. All $\times 8$.

Dimensions (mm)

	<i>Length</i>	<i>Width</i>
SAM-A25482	2,5	1,8

Discussion

The inwardly directed crura, high pillar-like septum, wide foramen with incipiently developed deltidial plates of this little specimen all point to an early growth stage of a terebratulacean. However, the poorly known *Leptothyrella ignota* (Muir-Wood) from off Zanzibar and the Gulf of Aden is remarkably similar, although Muir-Wood's specimens, which the author has examined, are larger at 5 mm length. Both forms are coarsely punctate and have the same overall shell outline with gently convex valves and rectimarginate anterior commissure. Both have an open delthyrium flanked by extremely narrow deltidial plates and floored by a pedicle collar that extends almost the full length of the delthyrium. The brachial valve of *L. ignota* has a high, plate-like median septum, which does not continue posteriorly into the notothyrial cavity; the crura are slender and curved; the cardinal process is minute.

Any differences between *L. ignota* and the shell described here can be accounted for by the larger size and presumably more adult nature of *L. ignota*, by which stage the tiny cardinal process has developed as have the points of attachment of the descending branches to the median septum. Otherwise both forms are so similar that they must be regarded as being very closely related.

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