

New Brachiopods
from the Southern Hemisphere
and *Cryptopora*
from Oregon (Recent)

G. ARTHUR COOPER

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ABSTRACT

Cooper, G. Arthur. New Brachiopods from the Southern Hemisphere and *Cryptopora* from Oregon (Recent). *Smithsonian Contributions to Paleobiology*, number 41, 43 pages, 4 figures, 7 plates, 1982.—The Recent brachiopods described herein were collected during dredging operations of several research vessels: the United States R/V *Eltanin* (alias *Islas Orcadas* while on loan to Argentina) in Antarctica, in the subantarctic waters of the Atlantic around South Georgia and the South Sandwich Islands, and in the Scotia Sea; R/V *Hero* dredging in Antarctic waters; R/V *Anton Bruun* operating along the west coast of South America; the initial cruises of R/V *Rafale* and *Thierry* operating in the Gulf of Guinea off the coast of West Africa.

Seventeen genera are described, including 19 species and 10 lots not identified as to species; *Pelagodiscus atlanticus* (King), *Discinisca laevis* (Sowerby), *Discinisca* species, *Cryptopora hesperis*, new species, the first report of this genus in the northern Pacific, *Terebratulina kiiensis* Dall and Pilsbry, *Terebratulina* species, *Abyssothyris wyvillei* (Davidson), *A.* cf. *elongata* Cooper, *Abyssothyris?* species, *Liothyrella delsolari*, new species, *L. expansa*, new species, *L. fosteri*, new species, *L. georgiana* Foster, *L. hendleri*, new species, *L. notorcadensis* (Jackson), *L.?* *vema* Cooper, *Platidia* species, *Argyrotheca* species, *Megathiris* species, *Pantel-laria monstrosa* (Scacchi), *Macandrevia americana* Dall, *Macandrevia* species, *Noto-rygmia* species, *Terebratella?* species, *Syntomaria curiosa*, new genus and species, *Dyscritosia secreta*, new genus and species, *Neothyris parva*, new species. The loop development of the new genera is described and illustrated in detail.

Most of the localities from which the specimens were taken add geographic and bathymetric information new for these genera.

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New Brachiopods from the Southern Hemisphere and *Cryptopora* from Oregon (Recent)

G. Arthur Cooper

Introduction

The study of modern brachiopods received great impetus from the extensive interest in the oceans generated by the International Geophysical Year, 1957–1958. Just after this burst of interest in the oceans, an intensified campaign of ocean studies included biological sampling as well as study of the oceans' physical and chemical properties. In the last decade, and up to the present time, descriptive and other studies have led to a considerable increase in our knowledge of living brachiopods. Although outnumbered by the mollusca, they are now a formidable group of extant animals.

Not only have American scientists been active in these studies, but Russian workers and others have contributed. O.N. Zezina (1970a,b, 1975, 1976, 1981) accumulated information collected by Russian research vessels *Vityaz*, *Lomosov*, *Ob*, *Akademik Kovelevskiy*, and *Akademik Kurchatov* and other expeditions. Her writings have made known new species and genera that have added information on brachiopod distributions in the various oceans.

American contributions to our knowledge of these animals have resulted from extensive work

in the Antarctic. Numerous cruises of the R/V *Eltanin*, especially cruises 27 and 32, through the efforts of Dr. M.W. Foster, yielded large quantities of brachiopods. In his work describing these brachiopods, Foster (1974:1–3) records other Antarctic expeditions with lists of the species collected.

The far-ranging R/V *Vema* of the Lamont-Doherty Geological Observatory of Columbia University sampled all the oceans and accumulated specimens exceeding in numbers of species those of the famous *Challenger* expedition of 1873–1876 (Cooper, 1973a).

The United States R/V *Anton Bruun* collected many interesting species while surveying in the northern Indian Ocean (Cooper, 1973b). Numerous brachiopods from the southern Indian Ocean from the waters around Kerguelen, Crozet, Marion, and Prince Edward islands were collected by the French R/V *Marion Dufresne* to add to the list of brachiopods from this hitherto poorly known ocean (Cooper, 1981a).

The explorations of R/V *Gerda* and R/V *Pillsbury* from Miami University of Florida collected many brachiopods from the Caribbean Sea, making the brachiopods from the West Indies rival, in numbers of kinds, the better known faunas of Japan and New Zealand (Cooper, 1977). Knowledge of the brachiopods of the Gulf of Mexico was notably increased by collections made by

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R/V *Oregon* and R/V *Silver Bay* (Cooper, 1977).

In the northern Pacific, Bernard (1972) recorded the brachiopods of the west coast of Canada, and Zezina (1973) listed those from the Gulf of Alaska and the Kurile-Kamchatka Trench (Zezina, 1970b).

Dr. J-L. d'Hondt (1976) described new species from the Bay of Gascogne, France, and from the west coast of Africa. Cooper (1975) described some species from West African waters, extending the ranges of *Kraussina* and *Macandrevia*.

Since 1900 the number of Recent brachiopod genera has been doubled and is now 98, while the species number about 400. Recent brachiopods are an outnumbered race but not a dying one.

The present paper describes specimens of new and old species collected by expeditions of R/V *Eltanin* and *Islas Orcadas* (the name given *Eltanin* while on loan to Argentina) while surveying subantarctic waters of the Atlantic around South Georgia, the South Sandwich Islands, and in Scotia Sea; by R/V *Hero* operating in the Antarctic; by R/V *Anton Bruun* surveying along the west coast of South America; and by R/V *Rafale* and *Thierry* operating in the Gulf of Guinea off the coast of West Africa. (Some specimens referred to in this paper were not collected by these expeditions, but are included for comparison.)

In addition to these recently acquired collections, some undescribed specimens in the collections of the National Museum of Natural History are made known. All of these add information on geographic distribution and depth ranges and make new species known. The two new genera are of special interest because they are terebratulids, one, *Dyscritosia*, suggesting relationship to *Waltonia* of New Zealand; the other, *Syntomaria*, having an abbreviated loop development similar to that of *Pirothyris*, an Australian genus. These new terebratulid genera lie geographically between those of the Indian Ocean and those of southern South America.

Specimens with USNM numbers (for the former United States National Museum) are deposited in the National Museum of Natural History, Smithsonian Institution.

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Systematic Hierarchy

(from class through species)

- Class INARTICULATA Huxley, 1869
 - Order ACROTRETIDA Kuhn, 1949
 - Suborder ACROTRETIDINA Kuhn, 1949
 - Superfamily DISCINACEA Gray, 1840
 - Family DISCINIDAE Gray, 1840
 - Subfamily DISCINISCINAE Schuchert, 1929
 - Genus *Pelagodiscus* Dall, 1908
 - Pelagodiscus atlanticus* (King)
 - Genus *Discinisca* Dall, 1871
 - Discinisca laevis* (Sowerby)
 - Discinisca* species
 - Subfamily DISCININAE Gray, 1840
 - Genus *Discina* Lamarck, 1819
 - Discina striata* (Schumacher)
- Class ARTICULATA Huxley, 1869
 - Order RHYNCHONELLIDA Kuhn, 1949
 - Superfamily RHYNCHONELLACEA Gray, 1848
 - Family CRYPTOPORIDAE Muir-Wood, 1955
 - Genus *Cryptopora* Jeffries, 1869
 - Cryptopora hesperis*, new species
 - Order TEREBRATULIDA Waagen, 1883
 - Suborder TEREBRATULIDINA Waagen, 1883
 - Superfamily CANCELLOTHYRIDACEA Thomson, 1926
 - Family CANCELLOTHYRIDIDAE Thomson, 1926
 - Subfamily CANCELLOTHYRIDINAE Thomson, 1926
 - Genus *Terebratulina* d'Orbigny, 1847
 - Terebratulina kiiensis* Dall and Pilsbry
 - Terebratulina* species
 - Superfamily TEREBRATULACEA Gray, 1840
 - Family TEREBRATULIDAE Gray, 1840
 - Genus *Abyssothyris* Thomson, 1927
 - Abyssothyris wyvillei* (Davidson)
 - Abyssothyris* cf. *elongata* Cooper
 - Abyssothyris*? species
 - Genus *Liothyrella* Thomson, 1916

Liothyrella delsolari, new species
Liothyrella expansa, new species
Liothyrella fosteri, new species
Liothyrella georgiana Foster
Liothyrella hendleri, new species
Liothyrella notorcadensis (Jackson), new status
Liothyrella uva (Broderip)
Liothyrella? *vema* Cooper

Suborder TEREBRATELLIDINA Muir-Wood, 1955

Superfamily TEREBRATELLACEA King, 1850

Family PLATIDIIDAE Thomson, 1927

Genus *Platidia* Costa, 1852

Platidia species

Family MEGATHIRIDIDAE Dall, 1870

Genus *Argyrotheca* Dall, 1900

Argyrotheca species

Genus *Megathiris* d'Orbigny, 1847

Megathiris species

Family KRAUSINIDAE Dall, 1870

Genus *Pantellaria* Dall, 1919

Pantellaria monstrosa (Scacchi)

Family MACANDREVIIDAE Cooper, 1973

Genus *Macandrevia* King, 1859

Macandrevia americana Dall

Macandrevia americana diegensis Dall

Macandrevia species

Genus *Notorygmia* Cooper, 1972

Notorygmia species

Family TEREBRATELLIDAE King, 1850

Subfamily TEREBRATELLINAE King, 1850

Genus *Terebratella* d'Orbigny, 1847

Terebratella dorsata (Gmelin)

Terebratella? species

Syntomaria, new genus

Syntomaria curiosa, new species

Dyscritosia, new genus

Dyscritosia secreta, new species

Subfamily NEOTHYRIDINAE Allan, 1940

Genus *Neothyris* Douvillé, 1879

Neothyris parva, new species

Genus *Waltonia* Davidson, 1850

Waltonia inconspicua (Sowerby)

Genus *Pelagodiscus* Dall, 1908

Pelagodiscus atlanticus (King)

Discina atlantica King, 1868:170-173.

Pelagodiscus atlanticus (King).—Dall, 1908:261.—Helmcke, 1940:230 [extensive synonymy].—Hertlein and Grant, 1944:21.—Zezina, 1965:345-358.

A single dorsal valve of this abyssal brachiopod was dredged at 1437 m by *Eltanin* cruise 4, sta

138, 62°00'S-62°05'S, 61°09'W-61°08'W, off the South Shetland Islands. This species has the widest geographical distribution of any modern brachiopod, but it is limited to deep or abyssal waters. Its global distribution has been plotted by Zezina (1976:69).

TYPE.—USNM 551178.

Genus *Discinisca* Dall, 1871

Discinisca laevis (Sowerby)

PLATE 1: FIGURE 2

Orbicula laevis Sowerby, 1822:468, pl. 26: fig. 1a-d.—Reeve, 1862:132.—Davidson, 1886-1888:195, pl. 26: figs. 1, 9, 10.

Discinisca laevis (Sowerby).—Dall, 1871a:42; 1871b:76; 1920:276.—Hertlein and Grant, 1944:30 [extensive synonymy].

Six specimens, one adult and five young, are referred to this species. The specimens were dredged by *Anton Bruun* cruise 188, sta 758, 06°44'S, 080°18'W, off northernmost Peru at 30 m.

TYPE.—Hypotype: USNM 551179.

Discinisca species

FIGURES 1, 2

Three lots of small *Discinisca* were taken by *Anton Bruun* off the west coast of South America as follows: cruise 16, sta 654A, 09°29'S, 078°54'W off Chimbote, southern Peru, at 140 m; cruise 16, sta 6670, 02°11'S, 080°56'31"W off Libertad, Ecuador, at 8-9 m; cruise 18A, sta 696, 35°43'S, 072°44'W off Constitucion, Chile, at 45 m.

Genus *Discina* Lamarck, 1819

Discina striata (Schumacher)

FIGURE 3; PLATE 1: FIGURE 1

Crania (B) *striata* Schumacher, 1817:102, pl. 20: fig. 1a-f; *Discina striata* (Schumacher).—Dall, 1920:274 [synonymy].

Five specimens, all immature, of this completely costellate discinoid were taken by *La Rafale*

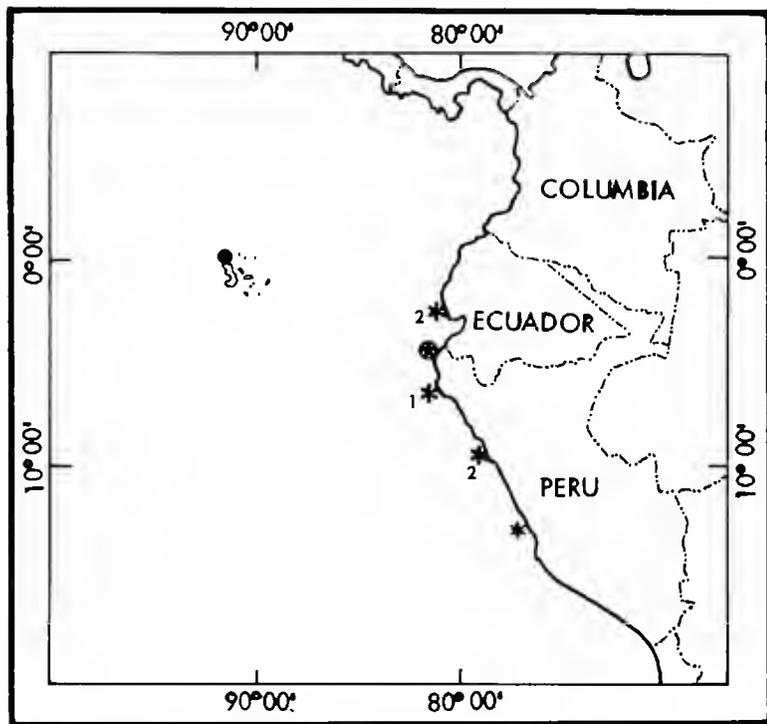


FIGURE 1.—Map of part of the west coast of South America showing position of species (asterisk = (1) *Discinisca laevis* (Sowerby), (2) *Discinisca* species; star in circle = *Liothyrella delsolari*, new species; six-rayed star = *Terebratulina kiiensis* Dall and Pilsbry; solid circle = *Argyrotheca* species).

cruise 1, sta 20/2. This occurrence is near Cape Palmas, listed by Dall (1920) as “type Locality” for this rare species, 04°31'N, 007°10'W, off the Ivory Coast, West Africa.

TYPE.—Hypotype: USNM 551188.

Genus *Cryptopora* Jeffreys, 1869

Cryptopora hesperis, new species

PLATE 2: FIGURES 25–35

DIAGNOSIS.—*Cryptopora* with unmodified marginal deltidial plates, gently sulcate anterior commissure, and rounded outline.

DESCRIPTION.—About medium size for this genus of small shells, longer than wide, sides rounded, anterior margin broadly rounded; apical angle 90°. Valves nearly equal in depth. Lateral commissure faintly sigmoidal; anterior commissure gently sulcate. Beak moderately long, about 1/6 valve length, suberect; foramen wide, deltoid; deltidial plates marginal, narrow, obliquely elevated. Shell translucent, surface marked by faint radial lines.

Ventral valve gently convex, most convex in umbonal region; anterior profile moderately convex with median region swollen, sides flattened, sloping moderately. Median swollen region forming low fold. Teeth small; dental plates short, receding, not extending anterior to teeth. Muscle marks not discernible.

Dorsal valve gently convex in lateral profile, flatly convex anteriorly in anterior profile. Posterior half moderately convex; anterior half gently depressed medially to form shallow sulcus. Cardinal process small, bilobed. Socket ridges short, anteriorly elevated to project beyond posterior margin. Maniculifer crura long, extending anteriorly for about 1/3 valve length, distal end moderately expanded. Median septum thin, reaching to midvalve where it is strongly elevated, narrowing ventrally with distal end narrowly rounded, its posterior slope steeply descending toward notothyrial cavity but not reaching it. Anterior slope concave. Muscle marks not seen.

MEASUREMENTS (mm).—

USNM specimen no.	Length	Dorsal valve length	Width	Thickness	Apical angle
331098a	3.1	2.7	2.5	1.0	90°
331098b	4.1	3.5	3.6	?	90°
331098c	3.6	3.3	3.2	?	90°

LOCALITY.—U.S. Bureau of Fisheries sta 3080, 43°58'N, 124°36'W, off southern Oregon at 170 m.

TYPES.—Holotype: USNM 331098a; paratypes: USNM 331098b,c.

DISCUSSION.—The specimens on which this species is based had been identified as the young of *Frieleia halli* Dall. *Cryptopora hesperis* is unusual for inhabiting relatively shallow water. Of described species, it differs from *C. rectimarginata* Cooper from shallow water off eastern Florida and *C. curiosa* Cooper from the Indian Ocean in not having the elaborate winged deltidial plates characteristic of those species. *Cryptopora hesperis* differs from *C. boettgeri* Helmcke from waters off South Africa, which is similar in size, in its more rounded outline, wider beak, and gently sulcate anterior commissure. From the Indian Ocean species *C. maldivensis* Muir-Wood, *C. hesperis* dif-

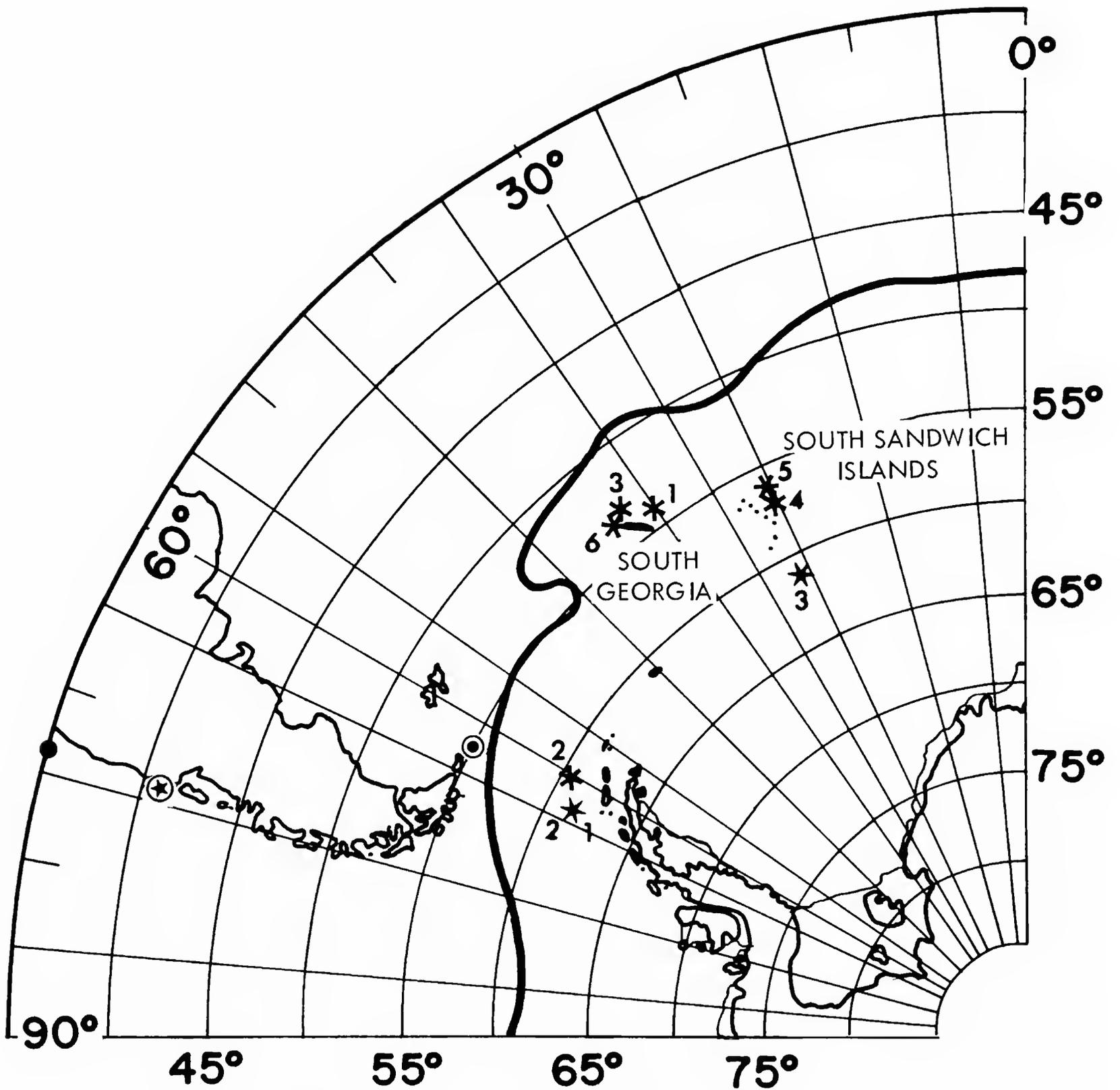


FIGURE 2.—Map of the northwest quadrant of Antarctica showing position of species (solid circle = *Terebratulina kiiensis* Dall and Pilsbry; asterisk = (1) *Liothyrella expansa*, new species, (2) *L. fosteri*, new species, (3) *L. georgiana* Foster, (4) *L. hendleri*, new species, (5) *L. notorcadensis* (Jackson), (6) *L. vema* Cooper; dot in circle = *Platidia* species; star in circle = one *Discinisca* species; six-rayed star = (1) *Abyssothyris wyvillei* (Davidson) and *Notorygmia* species, (2) *A. cf. elongata* Cooper, (3) *A. species*).

fers in being smaller with less-tapered posterior margins, more incurved beak, and larger apical angle. *Cryptopora hesperis* differs from *C. brazieri* Crane in being larger with less-rounded margins,

sulcate anterior commissure, and slightly bowed hinge.

Cryptopora hesperis is a smaller shell than the common Atlantic *C. gnomon* (Jeffreys), which at-

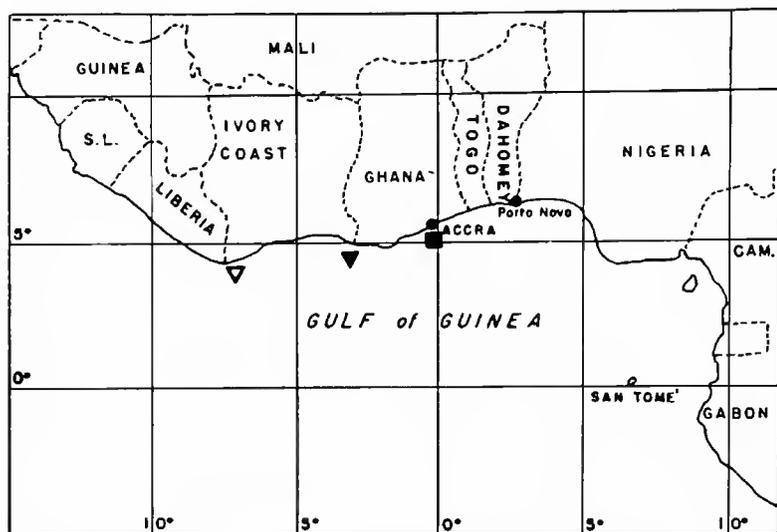


FIGURE 3.—Map of Gulf of Guinea showing location of specimens (open triangle = *Discina striata* (Schumacher), taken by R/V *Rafale*; solid square = *Pantellaria monstruosa* (Scacchi); solid triangle = *Megathiris* species, dredged by R/V *Thierry*).

tains a length of 5 mm or slightly more, is less strongly sulcate, and has a flatter dorsal valve and less expanded anterior. This is the first report of *Cryptopora* in northern Pacific waters.

Genus *Terebratulina* d'Orbigny, 1847

Terebratulina kiiensis Dall and Pilsbry

FIGURES 1, 2; PLATE 1: FIGURES 8–18

Terebratulina kiiensis Dall and Pilsbry, 1891:18, pl. 1: figs. 4, 5.—Hatai, 1940:235, pl. 7: figs. 18–21.—Hertlein and Grant [part], 1944:71, fig. 18a–c, pl. 6: figs. 10, 13.—Zezina, 1970b:443, pl. 1: fig. 3.

T. crossei Fischer and Oehlert, 1892:5, pl. 8: figs. 1–8 [not Davidson, 1848].

T. magalhaenica Helmcke, 1939:22, figs. 19–24.

T. austroamericana Zezina, 1981:155, fig. 1a,b, pls. 1–4.

DESCRIPTION.—Large, maximum observed length 50.4 mm (USNM 342219), thin-shelled, nearly circular, biconvex, ventral valve deeper than dorsal one; lateral and anterior margins rounded; apical angle 108° – 116° . Lateral commissure straight; anterior commissure rectimarginate, occasionally wavy. Beak short, rounded; foramen large; deltidial plates rudimentary. Interareas narrow. Pedicle usually short, distal end frayed. Surface multicostellate, costellae increasing by bifurcation in several generations and

numerous intercalations of finer costellae.

Ventral valve evenly and broadly convex in lateral view; anterior view moderately convex with slight median elevation. Umbonal and median regions swollen, swelling continuing to anterior to form poorly defined fold, which meets corresponding low fold of opposite valve.

Dorsal valve gently convex in lateral profile, broadly convex in anterior view. Umbonal region slightly flattened; median region with maximum swelling anterior to midvalve forming poorly perceptible fold.

Ventral valve interior with small hooklike teeth, short anteriorly excavate pedicle collar. Muscle marks lightly impressed because of thin shell.

Dorsal valve with stout socket ridges extended posteriorly and terminating in a point. Crura long, thin, supporting a stout incomplete ring. Crural processes curved, projecting medially but not meeting, their distal ends narrow and pointed.

MEASUREMENTS (mm).—

USNM specimen no.	Length	Dorsal valve length	Width	Thickness	Apical angle
551236a	42.0	38.2	40.6	19.0	112°
551236b	39.0	36.5	35.5	18.0	108°
550849c	35.5	31.5	31.8	15.6	96°
128463	42.9	39.0	39.0	21.0	101°

LOCALITIES.—*Anton Bruun* cruise 18A, sta 698, $34^{\circ}54'S$, $072^{\circ}44'W$, southwest of Valparaiso and northwest of Constitucion, Chile, at 780–925 m; *Anton Bruun* cruise 17, sta 660-G, $12^{\circ}58'S$, $077^{\circ}16'W$, north-northwest off Punta Huacas, Pisco, Peru, at 1000 m.

TYPES.—Holotype: USNM 128643; hypotypes: USNM 550849a–c, 550850, 551236a–c.

DISCUSSION.—The specimens from waters off Chile are attached to black volcanic pebbles and gastropod shells.

Several localities along the coasts of North and South America have yielded specimens of a large *Terebratulina*. Fischer and Oehlert (1892:5) described a large *Terebratulina* as the Japanese species *T. crossei* Davidson from the Strait of Magellan. Helmcke (1939:22, 23) mentioned another

occurrence of the same brachiopod at Chierchia in the same area. To the specimens described by Fischer and Oehlert and the one from Chierchia, Helmcke (1939:22) gave the name *T. magalhaenica* in accordance with the views of Blochmann (1908) and Eichler (1911:15) and his own analysis (1939:17–22), that the Magellanian specimens are not the same species as the Japanese *T. crossei*. According to Helmcke, the Magellanian specimens are smaller, shorter, wider, and less thick than the Japanese species.

Dall (1920:303, 307) recognized two Japanese species of *Terebratulina* off the west coast of the United States: *T. crossei* Davidson from fairly shallow water and *T. kiiensis* Dall and Pilsbry from deeper water. Dall's *T. crossei* (USNM 219900) from Redondo Beach, California, is a small, somewhat narrowly triangular specimen rather doubtfully conspecific with the Japanese species. Two other lots of large *Terebratulina* (USNM 208868 and 549889) are larger than the preceding (*T. crossei*) but smaller and narrower than *T. kiiensis* from off Santa Barbara, California (Plate 1: figures 5–7). They are yellowish brown and come from deep water. They probably represent another species, but the lots are insufficient in specimens for adequate description.

Terebratulina kiiensis is identified from waters off Alaska, Washington, and California from deep water (439–1023 m). This is a species with large shells, mostly with a ventral valve deeper than the dorsal one and with length varying from slightly longer than to almost equal to the width. Comparison of American specimens with Japanese examples shows the latter to have a slightly deeper dorsal valve and somewhat finer costellation, although these features are variable.

The type specimen of *T. kiiensis* (USNM 128643, Plate 1: figures 10–13) has nearly equally deep valves, whereas most American specimens (South and North American), as well as some Japanese specimens, have a flattish, shallow dorsal valve. Conversely, some American forms are aberrant in having a swollen dorsal valve (see below).

Recently, collections made by *Anton Bruun* cruises 17 and 18A included specimens similar to

those described by Fischer and Oehlert, Helmcke, and Zezina, especially that taken off Valparaiso, Chile, described above. This lot consists of about 40 specimens, which included also *Macandrevia americana* Dall (described below). The specimens are variable in length/width relationship (ca. 1.0–1.20); the thickness is fairly uniform, and the specimens are clearly referable to *T. kiiensis*.

Zezina (1981:155–157) relates her new species *Terebratulina austroamericana*, from waters off Valparaiso, Chile, at 700 m, to the larger *Terebratulina* identified as *T. crossei* Davidson by Fischer and Oehlert (1892). Earlier (1970b:443–446), she had stated that “it is possible to accept the possibility of relationship of the South American specimens described in detail in Fischer and Oehlert's work, to the species *T. kiiensis*.” The specimen of *T. austroamericana* Zezina, from her description and figures, suggests a young individual of *T. kiiensis*.

A large *Terebratulina* identified as *T. crossei* (USNM 551238) from waters off British Columbia (Bernard, 1972:77) is much more convex than *T. crossei* and more convex and narrower than *T. kiiensis* and has a wavy anterior commissure (probably abnormal). Bernard's (1972:79, fig. 10) *Terebratulina* species suggests *T. kiiensis* of the California and South American coasts. The strongly convex forms may be aberrant *T. kiiensis* or, possibly, a new species.

Konjukova (1957:17, figs. 10, 11, pl. 1: figs. 6–11) figured as *T. crossei* a nearly circular, large *Terebratulina*. The two figured specimens conform to the dimensions of *T. kiiensis* rather than to those of *T. crossei*. Zezina (1973) reports *T. kiiensis* from the Gulf of Alaska.

I have placed *T. magalhaenica* Helmcke in the synonymy of *T. kiiensis* because Helmcke's figures show specimens almost identical to *T. kiiensis* from waters off Chile and the California coast and the Chilean form placed by Zezina in *T. austroamericana*. One specimen figured by Fischer and Oehlert (1892, pl. 8: fig. 7) shows a dorsal valve with conjunct crural processes, a feature not seen in any other specimens assigned to *T. kiiensis* or *T. crossei*.

I have been unable to find any persistent characters that will separate both the North and

South American specimens from the Japanese specimens.

The distribution of *T. kiiensis* leads to speculation as to the migration of the species from Japan to the south tip of South America, or the reverse. Konjukova's specimens show that migration could have taken place along the coasts of the three continents, the species occupying somewhat cold shallow water in the more northern and southern parts of its range, moving into deeper, cold water in the more temperate and tropical regions, to occupy water of a temperature congenial to the species.

Terebratulina species

PLATE 1: FIGURES 5-7

This species, identified as *T. kiiensis* Dall and Pilsbry, is intermediate between that species and *T. crossei* Davidson. It seems to be a new species.

Genus *Abyssothyris* Thomson, 1927

Abyssothyris wyvillei (Davidson)

FIGURE 2; PLATE 2: FIGURES 13-17

Terebratula wyvillei Davidson, 1878:436, 437.

Liothyris wyvillei (Davidson).—Davidson, 1886-1888:15, 16, pl. 2: figs. 10-14 [not 8, 9 = *Neorhynchia*].

Abyssothyris wyvillei (Davidson).—Thomson, 1927:190, fig. 56b [not 56a = *Neorhynchia*].—Hertlein and Grant, 1944:101, pl. 7: figs. 20, 22-29 [not 15-19, 21 = *Neorhynchia*].—Zezina, 1975:251.

Three small specimens extend the range of this interesting deep-sea genus. Two specimens are 11 mm long by 9 mm wide; the third has a length and width of 13 mm. The specimens are strongly and deeply sulcate with strong fold and long, narrowly rounded tongue on the dorsal valve. The loop of the dorsal valve is short, about 1/3 valve length. The crural processes are posterior to midloop, sharply pointed, and moderately approximate. The transverse band is moderately broad laterally where it joins the short descending lamellae, thins medially where it is raised into a

narrow fold. The anterolateral extremities of the loop are subangular. The outer hinge plates are moderately broad.

LOCALITY.—*Eltanin* cruise 4, sta 135, 62°40'S-62°37'S, 064°06'W-63°57'W, off the South Shetland Islands, at 3715-3752 m.

TYPES.—Hypotypes: USNM 551224a-c.

DISCUSSION.—*Abyssothyris wyvillei* is found in abyssal waters in a belt between the 30th and 60th parallels south and along the west coast of South America to the Galapagos Islands (doubtful). It is also reported south of New Guinea, north of the 30th parallel, and there are two occurrences in the northern Pacific (Zezina, 1976), one in mid-ocean and the other off Baja California. The latter refers to *A. elongata* Cooper, which Zezina (1976) does not recognize as a valid species. The occurrence reported herein adds a location in waters south of the 60th parallel. Found with this *Abyssothyris* was a fragment of the dorsal valve of a macandreviid (USNM 551234) having a dorsal sulcus and undoubtedly belonging to *Notorygmia* and another species of *Abyssothyris*. These two genera often occur together (Cooper, 1972).

Abyssothyris cf. *elongata* Cooper

FIGURE 2; PLATE 2: FIGURES 4-7

See Cooper, 1972:9, figs. 3c-e, 4, pl. 2: fig. 39, pl. 3: figs. 20-41, pl. 4: figs. 1-52.

A single elongate specimen differs markedly from *Abyssothyris wyvillei*, with which it occurs. The specimen measures in mm: length 14.7, length of dorsal valve 13.0, width 11.2, thickness 8.8; apical angle 79°. Besides its difference in dimensions, this specimen is broadly and gently sulcate, contrasting strongly with the deep and narrow sulcation of *A. wyvillei*. Inside the dorsal valve, the loop has rounded anterolateral extremities like *A. elongata* from the Baja California Abyssal Plain off the west coast of Mexico and the United States.

LOCALITY.—Same as for *Abyssothyris wyvillei*.

TYPE.—Hypotype: USNM 551225.

DISCUSSION.—This occurrence greatly increases the range of this species from California to the Antarctic.

Abyssothyris? species

FIGURE 2; PLATE 2: FIGURES 8–12

A single specimen of very thin and transparent shell was attached to a small fragment of volcanic rock by a slender pedicle. The measurements in mm are: length 13.0, length of dorsal valve 11.8, width 12, thickness 6.5. The beak is short, and its apical angle is 105° . The foramen is small and permesothyridid. The lateral commissure is straight, and the anterior commissure is rectimarginate. The surface is smooth. When the specimen is moistened, the loop may be observed through the shell (Plate 2: figure 12). It is 3 mm long, about 1/4 the length of the dorsal valve. It has rounded anterolateral extremities. The lophophore was short.

LOCALITY.—*Eltanin* cruise 8, sta 616, $61^\circ 59'S$ – $62^\circ 00'S$, $027^\circ 40'W$ – $027^\circ 40'W$, south of the south end of the South Sandwich Islands, at 3349–3038 m.

TYPE.—USNM 551242.

DISCUSSION.—This specimen, which has the appearance of an adult, may represent a stock of uniplicate, abyssal forms related to *Abyssothyris wyvillei*, the strongly sulcate type of the genus. The loop of this specimen has rounded anterolateral angles like the loop of *A. elongata* Cooper from the eastern Pacific off Baja California. Cooper (1973a:18) described a similar small, rectimarginate specimen from the abyss off Argentina. This specimen is rectimarginate and has a loop similar to that of the specimen described above; however, this Argentine specimen is only 5.5 mm long and thus is probably more youthful than that of the specimen from off the South Sandwich Islands, which might explain its rectimarginate anterior commissure.

Three abyssal genera, *Notorygmia*, *Abyssothyris*, and *Neorhynchia*, often associated together (Muir-

Wood, 1960; Cooper, 1972), are strongly sulcate. This suggests the possibility of a relationship between great depth and sulcation. Although the idea is attractive, doubt must be cast on it, because a number of rectimarginate species of *Maccandrevia* inhabit abyssal waters, and most of the genera occurring in shallow water in the southern hemisphere are sulcate: *Waltonia*, *Terebratella*, *Magasella*, *Magellania*, and *Aerothyris*, for example. It is thus possible for a rectimarginate terebratulid stock to occupy abyssal waters, and for sulcate stocks to inhabit shallow waters.

Genus *Liothyrella* Thomson, 1916

Liothyrella Thomson, 1916:44; 1927:197.—Jackson, 1918:73–79.—Allan, 1932:1–10.—Foster, 1974:56.

Liothyrella has numerous species and is abundant in the Southern Hemisphere, especially in the Antarctic, but is rather rare in the Pacific of the Northern Hemisphere. As now identified, *Liothyrella* may consist of more than one genus. The type-species is *Terebratula uva* Broderip, a long narrow brachiopod from the Gulf of Tehuantepec, Mexico. With the type occurred smaller, more triangular forms. The loop of the type specimen was broken off, and its characteristics are thus unknown. Blochmann (1908:615) regarded the type specimen as deformed and identified small, triangular specimens from the Antarctic with the smaller forms that accompanied Broderip's specimen, regarding them as more representative of the species. It is from these smaller Antarctic forms that the generic concept of *Liothyrella* has been derived. The loop of some Antarctic specimens is widely triangular and has a thin transverse band. The crural processes are located opposite the ends of the outer hinge plates. Thus, the present conception of *Liothyrella* is of subtriangular to oval forms, some very large. The loop, however, is variable. A group of *Liothyrellas* that has a loop with nearly parallel sides and a broad transverse band may ultimately be separable from *Liothyrella* when more is known about these shells.

Liothyrella delsolari, new species

FIGURE 1; PLATE 2: FIGURES 18–23

DIAGNOSIS.—Nearly circular *Liothyrella* with fine, regular concentric lines of growth and wide loop.

DESCRIPTION.—*Exterior*: About medium size, nearly circular, maximum width at midvalve, posterolateral extremities forming an angle of 90°. Lateral commissure slightly sinuous; anterior commissure slightly and broadly uniplicate. Beak short, suberect, labiate. Foramen large, permesothyridd. Symphytium short, visible. Surface marked by closely crowded lines of growth.

Ventral valve moderately convex in lateral view, gently and broadly bowed in anterior profile. Umbonal and median regions swollen, anterior convex; lateral slopes steep.

Dorsal valve flatly convex in lateral view, moderately domed but only less so than that of ventral valve. Lateral slopes moderately steep, short.

Interior: Ventral valve interior with short, narrow pedicle collar; teeth small, hook-like. Muscle scars lightly impressed.

Dorsal valve with wide cardinal process. Loop short and wide, occupying 1/3 the length and 1/5 the width of the dorsal valve. Socket ridges narrow, erect. Sockets wide, floored by stout fulcral plates. Outer hinge plates fairly long, deeply concave, tapering along ventral side of crural bases to end posterior of crural processes. Crus short. Crural processes located anterior of mid-loop, low and sharply pointed. Descending lamellae short. Transverse band gently and evenly arched. Anterior margin of transverse band notched; posterolateral margins of transverse band with short angular projections.

MEASUREMENTS (mm).—USNM 551061, length 25.5, dorsal valve length 22.9, width 23.2, thickness 14.0, apical angle 90°.

LOCALITY.—04°00'S, 80°30'W, between Mancora and Chicama, Peru, at 760–1000 m.

TYPE.—Holotype: USNM 551061.

ETYMOLOGY.—Named for the discoverer of the species, Sr. E.M. del Solar, Lima, Peru.

DISCUSSION.—This species can be distinguished from other *Liothyrellas* by its nearly circular form.

Liothyrella expansa, new species

FIGURE 2; PLATE 3: FIGURES 1–4

DIAGNOSIS.—Large, broadly oval *Liothyrella*, widest at midvalve, anteriorly subnasute with rectimarginate to gently uniplicate anterior commissure.

DESCRIPTION.—*Exterior*: Large, roundly oval, subequally convex, ventral valve slightly more convex; maximum width at midvalve. Anterior margin narrowly rounded. Posterolateral extremities nearly straight, making an angle slightly more than 90°. Lateral commissure straight, anterior commissure rectimarginate to gently uniplicate. Beak narrow, obliquely truncated, slightly labiate, suberect. Foramen large, mesothyridd. Surface marked by concentric growth lines and fine short, interrupted striations.

Ventral valve moderately and evenly convex in lateral profile, broadly and moderately domed in anterior view. Median region gently and narrowly swollen, swelling continued from beak to anterior margin. Sides sloping gently.

Dorsal valve flatly convex in lateral profile, moderately domed in anterior view, more so than same view of ventral valve. Median region moderately and longitudinally swollen producing narrowed anterior.

Interior: Ventral muscle scars lightly impressed. Pedicle collar short, excavated. Dorsal valve with moderately wide loop occupying 1/3 the length and less than 1/4 dorsal valve width. Transverse band narrow with wide anterior reentrant and lateral anterior notches.

MEASUREMENTS (mm).—

USNM specimen no.	Length	Dorsal valve length	Width	Thickness	Apical angle
551153a	36.0	31.8	30.0	16.9	88°
551153b	34.3	30.8	29.4	16.0	95°
551153c	35.5	31.8	30.8	17.9	88°
551153d	26.4	23.6	24.4	12.0	92°
551153e	32.0	29.0	29.0	15.0	87°

LOCALITY.—*Islas Orcadas* cruise 575, sta 89, 54°44.2'S, 037°11.2'W, off the north coast of South Georgia, at 225–265 m.

TYPES.—Holotype: USNM 551153b; para-

types: USNM 551153a,c-e.

DISCUSSION.—This is a large species represented by five specimens that were taken near the locality and at about the same depth as *Liothyrella uva georgiana* Foster. The figure of the holotype of Foster's species (1974, pl. 5: figs. 10–13) is enlarged $\times 1.5$ and at this enlargement resembles *L. expansa*. Specimens accompanying the type of *L. u. georgiana* younger and older than the type specimen indicate that this species is smaller and narrower in the adult form than *L. expansa*. The latter differs from *L. u. georgiana* in size, about 1.5 times the holotype, and in having shells of lesser depth, somewhat rhombic outline, and narrowed anterior.

Liothyrella expansa differs from *L. notorcadensis* (Jackson) in its wider, less-deep shell and lesser folding of the anterior commissure. *Liothyrella expansa* differs from *L. vema* Cooper in its flatter shell, greater width at midvalve, and lesser development of anterior folding. *Liothyrella expansa* differs from *L. fosteri* in its larger size, wider shell, and more narrowly rounded anterior. The loop of *L. expansa* is wider than that of *L. fosteri*.

Liothyrella fosteri, new species

FIGURE 2; PLATE 3: FIGURES 5–9

DIAGNOSIS.—Large, widely oval, subequally convex *Liothyrella* having broad, gently uniplicate anterior commissure.

DESCRIPTION.—*Exterior*: Large, longer than wide, oval, valves subequally convex, ventral valve having greater convexity. Sides and anterior margin rounded; posterolateral extremities forming an angle of 77° . Lateral commissure nearly straight, anterior commissure gently uniplicate. Beak moderately long, suberect. Foramen large, submesothyridid. Smooth. White.

Ventral valve evenly convex in lateral profile, maximum convexity in posterior half. Anterior profile moderately and broadly convex. Umbonal region narrowly swollen, swelling continuing to midvalve, lessening anteriorly to form gently convex anterior slope. Flanks rounded and steep.

Dorsal valve evenly and gently convex in lateral profile, slightly keeled in anterior profile.

Umbonal and median regions moderately swollen. Anterior slope gently convex; lateral slopes flattened and fairly steep.

Interior: Loop with angle of 35° , $1/4$ valve length. Outer hinge plates narrow; crural processes short, anterior to midloop, approximate. Transverse band narrow, widely and gently arched; anterolateral extremities rounded.

MEASUREMENTS (mm).—USNM 551070, length 35.2, dorsal valve length 31.3, width 27.8, thickness 16.7; apical angle 77° .

LOCALITY.—*Eltanin* cruise 6, sta 410, $61^\circ 18'S$, $056^\circ 09'W$ to $61^\circ 20'S$, $056^\circ 10'W$, off Elephant Island, Scotia Sea, Antarctica, at 220–240 m.

TYPE.—Holotype: USNM 551070.

ETYMOLOGY.—Named for Merrill W. Foster in recognition of his excellent work on Antarctic brachiopods.

DISCUSSION.—*Liothyrella fosteri* is not so large as *L. notorcadensis* (Jackson) and is much less swollen. The loop of *L. fosteri* is narrower, the crural processes are more anterior, the hinge plates more tapering, and the transverse band more broadly arched than that of *L. expansa*. *Liothyrella vema* Cooper has a deeper shell with more gently and broadly rounded anterior than those features of *L. fosteri*.

Liothyrella georgiana Foster

FIGURE 2; PLATE 4: FIGURES 7–13

Liothyrella uva georgiana Foster, 1974:73, figs. 3(4), 18B, pl. 5: figs. 10–13, pl. 9: fig. 9, pl. 12.

Four lots totaling nine specimens were taken by *Islas Orcadas* in the same general area on the north side of South Georgia as Foster's type lot of 13 specimens (six live and seven empty shells) and from approximately the same depth. The four lots show considerable variation as do Foster's 13 specimens. Of the latter, the specimen selected as type deviates from the others in being rounder and wider ($L/W = 1.16$), whereas the others of Foster's lot vary in $L/W = 1.18$ – 1.30 . These ratios show *L. georgiana* as presently constituted to be a more narrowly oval form rather than a rounded one as indicated by the type.

The new specimens are all narrowly oval, their L/W ratios ranging from 1.18 to 1.36. The larger specimens show a gentle uniplication not seen in Foster's original lot. The foramen is variable as is the labiation of the beak, both becoming larger with increasing size. All of the elongate oval shells are narrowed anteriorly. The loop is narrow and short, with a broad transverse band like the loop of the type specimen figured by Foster (1974, pl. 5: fig. 13).

Specimens taken by *Islas Orcadas* cruise 575: USNM 551204, sta 66, 56°42.8'S, 026°59.7'W, north off the north end of the South Sandwich Island group, at 121–228 m; USNM 551205, sta 93, 54°38.8'S, 038°51.3'W, north off South Georgia, at 261–270 m, near type-locality of *L. georgiana*.

TYPES.—Holotype: USNM 550017A; paratype: USNM 550017B; hypotypes: USNM 551204, 551205.

Liothyrella hendleri, new species

FIGURE 2; PLATE 4: FIGURES 1–6

DIAGNOSIS.—Large *Liothyrella* with subequally convex valves, thin shell, faintly uniplicate anterior commissure in the adult and rather narrow loop.

DESCRIPTION.—*Exterior*: Large, thin-shelled elongate oval, maximum width at about mid-valve. Valves subequal in depth, sides rounded, anterior margins somewhat narrowly rounded; posterolateral margins forming angle of 67°–90°. Beak moderately long, suberect, narrowly labiate. Foramen small, permesothyridid. Lateral commissure straight; anterior commissure rectimarginate to slightly uniplicate. Surface smooth. White to pale yellow.

Ventral valve moderately convex in lateral view, fairly strongly domed with steep slopes in anterior profile. Anterior slope slightly flattened to form slight anterior tongue.

Dorsal valve moderately convex in side view, fairly strongly and somewhat narrowly domed in anterior view. Umbonal and median regions swol-

len, swelling continued to anterior margin as faint fold.

Interior: Ventral valve interior with small teeth; pedicle collar short.

Dorsal valve with short loop, 1/3 valve length, 1/5 valve width. Cardinal process small, somewhat rectangular, narrow, with roughened myophore facing ventrally. Socket ridges high, slender, curved. Fulcral plates thick, laterally extended. Outer hinge plates narrow, concave, tapering anteriorly to ventral side of crural bases. Crural processes anterior of midloop, bluntly angular with distal extremities approximate. Transverse band fairly strongly arched with flattened crest.

MEASUREMENTS (mm).—

USNM specimen no.	Length	Dorsal valve length	Width	Thickness	Apical angle
551141a	35.0	31.7	26.4	20.0	75°
551141j	26.7	24.6	22.8	14.2	91°
551141k	29.0	25.5	24.4	16.0	91°
551141-l	36.8	33.3	27.5	21.0	81°
551141m	34.0	30.5	26.1	20.0	80°
551141n	17.0	15.1	13.8	9.5	81°

LOCALITY.—*Islas Orcadas* cruise 575, sta 52, 57°38.4'S, 026°26.7'W, east off South Sandwich Islands, Antarctica, at 416–612 m.

TYPES.—Holotype: USNM 551141a; paratypes: 551141b–n.

ETYMOLOGY.—Named for Dr. Gordon L. Hendler of the Smithsonian Oceanographic Sorting Center.

DISCUSSION.—The exterior of this species is most like that of *Liothyrella notorcadensis* (Jackson). It is, however, more delicate, with a smaller foramen and narrower loop. It is about the same size as *L. fosteri*, new species, but has more convex valves and is elliptical in outline rather than widely oval like *L. fosteri*.

Liothyrella notorcadensis (Jackson), new status

FIGURE 2; PLATE 3: FIGURES 10–21

Liothyrella uva var. *notorcadensis* (Jackson).—Jackson, 1912:153–156, pl. 1: figs. 1–3.—Foster, 1974:73, 74, pl. 5: figs. 14–19.

This is a large elongate, thick-shelled *Liothyrella* with wide but variable loop usually having a very narrow transverse band. It is abundant in Arthur Harbor in the Palmer Peninsula and ranges, according to Foster (1974:30), from about 90°W to about 45°W.

Five lots of specimens from just north of the South Sandwich Islands extend the range of this species to the east. The depths at which they occur are 51–480 m. The specimens deviate somewhat from the Arthur Harbor examples in being thinner shelled and slightly narrower in the dorsal umbonal region and in having a loop with a somewhat broader transverse band; however, the proportions of the shells are about the same as typical specimens.

MEASUREMENTS (mm).—

USNM specimen no.	Length	Dorsal valve length	Width	Thickness	Apical angle
551197a	36.4	31.7	24.4	22.0	68°
551197b	36.4	31.9	26.0	22.8	68°
551197c	26.6	23.2	20.0	15.2	72°
551198a	24.2	21.4	20.5	11.7	79°
551198b	31.2	27.9	23.7	15.5	67°
551199a	36.0	32.0	25.0	20.0	73°
551199b	25.5	23.6	19.3	13.4	73°

LOCALITIES.—USNM 551219, *Hero* cruise 731, sta 1871, 65°14.7'S, 064°13.5'W to 65°14.3'S, 064°12'W, off Anvers Island, Antarctica, at 180–240 m; USNM 551206, *Islas Orcadas* cruise 575, sta 53, 57°41'S, 026°22.3'W, off South Sandwich Islands, at 355–468 m; USNM 551200, sta 62, 54°40.6'S, 027°00.8'W, at 360–480 m; USNM 551243, sta 70, 56°23.8'S, 027°24.6'W, at 161–210 m; USNM 551199, sta 73, 56°16.0'S, 027°30.0'W, at 208–375 m; USNM 551197, sta 78, 56°20.2'S, 027°30.4'W, at 122–141 m; all off South Sandwich Islands, Antarctica; USNM 551198, *Islas Orcadas* cruise 876, sta 108, 60°25.9'S, 046°23.6'W, north off Coronation Island, at 152–159 m.

A deformed specimen (USNM 551190) has an undamaged loop, which is wide and has a very narrow transverse band typical of the species. This specimen was taken by *Hero* cruise 721, sta

702, 62°16.8'S, 058°32.8'W, north of the east end of the South Shetland Islands, at 51 m.

TYPES.—Hypotypes: USNM 550917, 550918a, 551190, 551197a-c, 551198a,b, 551199a,b, 551219, 551243.

Liothyrella uva (Broderip)

PLATE 2: FIGURE 24

The interior of a dorsal valve of this species is introduced to show the present conception of the genus with its wide loop and thin transverse band.

LOCALITY.—*Eltanin* cruise 6, sta 370, 55°55'W, 064°52'W, off southeast end of South America, at 104–115 m.

TYPE.—Hypotype: USNM 551069.

Liothyrella? vema Cooper

FIGURE 2; PLATE 3: FIGURES 22–25

Three specimens, two of them unusually large, are referred here. The two adults have broadly uniplicate anterior commissures. Both have deep valves, the ventral one slightly deeper than the dorsal one. Both valves are fairly strongly convex in both profiles. The beaks are short and strongly truncated with a moderately large foramen, small for such large shells. The rims of the foramen show evidence of wear because of close attachment to the substrate. The beak is slightly labiate. The loop of the largest specimen (USNM 551191a) is narrow and has subparallel sides like the type of the species. The outer hinge plates are narrow, and the crural bases broad. There is a trace of inner hinge plates, which show as a marginal thickening on the inside of the crural bases opposite the outer hinge plates. The crural processes are obtusely angular, and the descending lamellae are short. The transverse band is broad and has a median lobe on the posterior side, which is set off by lateral indentations near the descending lamellae. The lobe is medially indented by a narrow V-shaped incision. The band is moderately arched and has a small notch just inside the anterolateral angles of the loop.

The youngest specimen is nearly circular and has subequally convex valves. Its anterior commissure is rectimarginate.

MEASUREMENTS (mm).—

<i>USNM specimen no.</i>	<i>Length</i>	<i>Dorsal valve length</i>	<i>Width</i>	<i>Thickness</i>	<i>Apical angle</i>
551191a	41.4	35.8	35.0	26.0	75°
551191b	33.7	30.0	28.4	22.3	71°
551191c	23.7	20.6	22.0	13.0	77°
550480a	32.5	29.2	28.6	19.8	83°

TYPES.—Holotype: USNM 550480a; hypotypes: USNM 551191a-c.

LOCALITY.—*Eltanin* cruise 9, sta 678, 54°49'S–54°48'S, 38°01'W–37°53'W, north off South Georgia, at 814–732 m.

DISCUSSION.—This species approaches *L. neozelandica* Thomson in size but differs in having a less-rounded anterior, narrower beak angle, more convex valves, and fairly strong uniplication.

Genus *Platidia* Costa, 1852

***Platidia* species**

FIGURE 2; PLATE 2: FIGURE 1

A small *Platidia* was taken off the easternmost tip of South America. It measures 2 mm long by 1.5 mm wide. Both valves are convex, and the dorsal beak is well excavated.

LOCALITY.—*Hero* cruise 715, sta 875, 54°55'S, 64°00'W–063°53'W, at 771–903 m.

TYPE.—USNM 551195.

DISCUSSION.—*Platidia* has a wide distribution, being present in the North Atlantic, Pacific and Indian oceans and in the Caribbean Sea, Gulf of Mexico, and the Mediterranean Sea. Foster (1974:85) found it in the Pacific far west of South America. This is the first report of the genus in the Atlantic at the south end of South America.

Genus *Argyrotheca* Dall, 1900

***Argyrotheca* species**

FIGURE 1; PLATE 1: FIGURES 3, 4

A single, somewhat damaged specimen 1.5 mm long and 1.75 mm wide was taken by *Anton Bruun*

cruise 16, sta 66139, 00°15'55"S, 091°26'41"W, at 3 m, south-southwest of the Galapagos Islands (Isabella Island). The ventral valve is marked by two costae on each side of a narrow sulcus. The dorsal valve is similarly marked. The costae and interspaces are opposite, a characteristic of *Argyrotheca*.

TYPE.—USNM 551196.

DISCUSSION.—This species is interesting because it is a new occurrence for the genus. *Argyrotheca* is rare in the Pacific, and all but one of its contemporary species in the Pacific is small to minute. *Argyrotheca lowei* Hertlein and Grant, occurring off Baja California, is large for the genus, whereas specimens taken off Bikini Atoll (Cooper, 1954) and off Tasmania, *A. mayi* Blochmann, are tiny. Fossil *Argyrotheca* from Eniwetok Atoll (Cooper, 1964) is very small. Elsewhere, *Argyrotheca* is abundant in the Caribbean Sea, where it is represented by many species. It is a genus with a long geological history, because it is one of the few brachiopod genera to cross the Cretaceous boundary into the Tertiary and Recent.

Genus *Megathiris* d'Orbigny, 1847

***Megathiris* species**

FIGURE 3; PLATE 2: FIGURE 2

Small, width about 1.5 times the length, widest at the hinge; cardinal extremities acute on one side, about a right angle on opposite side. Sides rounded, sloping medially; anterior margin broadly rounded. Lateral commissure straight; anterior commissure rectimarginate. Interareas narrow, gently curved, apsacline. Pedicle opening wide; deltidial plates rudimentary. Surface costate, costae opposite, narrowly elevated, separated by spaces equal in width to those of the costae. About 14 costae along the margin, including a short intercalated costa at middle of each valve.

Pedicle plate in ventral valve apex long; dorsal valve with three septa.

MEASUREMENTS (mm).—USNM 551181: length 3.6, dorsal valve length 2.5, width 5.0, thickness 2.3.

LOCALITY.—R/V *Thierry* cruise 1, sta 31/5N₁, 05°09'N, 000°19'W, off the coast of Ghana, at 85 m.

TYPE.—USNM 551181.

DISCUSSION.—Although specimens of *Megathiris detruncata* (Gmelin) are usually wider than long, they may be more rectangular, and the costation more subdued, than the Ghana specimen. The pattern of costae is essentially the same in the two, but the costae of *M.* species are more narrowly rounded and are separated by spaces of approximately the same width as those of the costae. The costae of *M. detruncata* from the Mediterranean are generally broader and with interspaces narrower than the width of the costae. The ventral apical plate is somewhat longer in the Ghana specimen than that of specimens from the Mediterranean.

The presence of *Megathiris* off Ghana shows a tendency to southward migration of this Mediterranean and eastern Atlantic genus. The presence of *Megathiris* and *Pantellaria* (see below) in the northern Gulf of Guinea, along with *Kraussina mercatorii* Helmcke from a more southerly location in the same body of water (Cooper, 1975), shows northern and southern types approaching one another.

Genus *Pantellaria* Dall, 1919

Pantellaria monstrosa (Scacchi)

FIGURE 3; PLATE 5: FIGURES 1-6

Terebratula monstrosa Scacchi, 1836:8.—Costa, 1851-1852:43, pl. 9: figs. 4, 5.

Megerlia truncata var. *monstrosa* (Scacchi).—Monterosato, 1875:4.—Davidson, 1878:108, pl. 9: figs. 21, 22a.

Mühlfeldtia monstrosa (Scacchi).—Fischer and Oehlert, 1891:87, pl. 7: fig. 12a-c.

Pantellaria monstrosa (Scacchi).—Dall, 1920:335.—Thomson, 1927:228, fig. 70.

Nine specimens dredged by R/V *Rafale* from waters off the Ivory Coast indicate southward migration of this Mediterranean and eastern Atlantic species. The largest specimen is slightly less than 12 mm in width, and all are distorted from close appression to the substrate. The ventral valve is ornamented by distant costellae bearing

stubby spines or nodes. The dorsal valve is marked by concentric growth lines only.

MEASUREMENTS (mm).—USNM 551180a, length 7.6, dorsal valve length 7.0?, width 10.4, thickness 3.8.

LOCALITY.—*La Rafale* cruise 1, sta 26/6, 04°51'N, 003°23'W, Gulf of Guinea, off Ivory Coast, at 100 m.

TYPES.—Hypotypes: USNM 551180a-c.

Genus *Macandrevia* King, 1859

Macandrevia occurs around the Antarctic Continent and along the west coast of South America, as well as in the North Atlantic where it is fairly common. It has recently been reported from the west coast of Africa (d'Hondt, 1976; Cooper, 1975). Two species occur on the west coast of South America (*M. diamantina* Dall = *Notorygmia* not included): *M. americana* Dall extending from waters off San Diego south to the Antarctic; the other *M. craniella* Dall, confined to the Gulf of Panama. Two species, *M. vanhoeffeni* Blochmann and *M. lata* Thomson, have been described from the east side of the Antarctic Continent. Foster (1974:88-97) studied material from waters off South America and from the west and south sides of Antarctica. These studies led him to recognize only two species in the Antarctic: *M. americana* and *M. vanhoeffeni*. Foster distinguished the usually deeper-water *M. americana* from the usually shallow-water *M. vanhoeffeni*, on minor characters such as width of the foramen, usually variable, lower puncta density, also variable, and larger deltidial plates. This latter feature is difficult to discern because, throughout the genus, deltidial plates are rudimentary at best, or lacking. Foster regarded *M. lata* as a synonym of *M. vanhoeffeni*. Zezina (1975:255) hinted at the possible identity of *M. americana* and *M. vanhoeffeni*.

In checking all of Foster's material at the National Museum of Natural History, and the additional specimens noted below, it was discovered that the proportions of *M. americana* and *M. vanhoeffeni* are very close, except for one specimen (USNM 550116A), a very large, narrowly oval form. Thomson's specimens of *M. lata* and *M.*

vanhoeffeni are very similar. Specimens labelled as *M. vanhoeffeni* usually occur in waters less than 1000 meters, whereas specimens labelled as *M. americana* occur in waters ranging in depth from 112 meters to 2507 meters. I find it impossible to detect any significant or persistent differences between the two species and therefore suggest that *M. vanhoeffeni* be regarded as a synonym of *M. americana*, a quite variable species. Occurrences are recorded below by research vessel and cruise number.

Macandrevia americana Dall

FIGURE 4; PLATE 4: FIGURES 14–32; PLATE 6: FIGURES 9–12

Macandrevia americana Dall, 1895:721, pl. 32: figs. 1, 4, 7; 1908:444.—Foster, 1974:93, fig. 3 (part 3), pl. 8: figs. 5–11, pl. 10: fig. 8.—Hertlein and Grant, 1944:154, pl. 13: figs. 11, 13, 17.—Zezina, 1975:253, 255.

M. vanhoeffeni Blochmann, 1906:690.—Eichler, 1911:391, pl. 42: figs. 8a,b, 9a-d, pl. 43: figs. 14, 15, 21.—Thomson, 1918:35, 36, pl. 15: fig. 10, pl. 16: fig. 43, pl. 17: figs. 57–59.

M. lata Thomson, 1918:33–35, fig. 3 (parts 14, 27), pl. 8: figs. 12–21, pl. 10: fig. 9.

Magellania fragilis Joubin, 1914:40–42, figs. 4–7 [not Smith, 1907].

Three specimens of medium size for the genus were taken by *Islas Orcadas* off the south end of the South Sandwich Islands. These vary in shape from somewhat narrowly oval in outline to sub-rhomboidal. The maximum width is at midvalve, the anterior margins narrowed and rounded, not truncated as in some specimens of *Macandrevia* regardless of species. The beaks are short and narrow and have a moderately large foramen. The deltidial plates are narrow, marginal, and do not restrict the pedicle opening. Punctae number $130/\text{mm}^2$ at about 10 mm anterior to the beak.

Inside the ventral valve the teeth are hooklike and fairly large. The pedicle collar is long and sessile. The dental plates are short and receding. The narrow loop takes up about 1/4 the valve length and a third of its width, the lateral branches strongly approximate. The anterior ends of the loop bear two fairly large spines and three smaller ones.

MEASUREMENTS (mm).—

USNM specimen no.	Length	Dorsal valve length	Width	Thickness	Apical angle
551182a	25.0	22.6	21.8	10.7	87°
551182b	23.7	21.6	19.3	12.2	88°
551182c	24.2	21.0	18.5	?	88°

LOCALITY.—*Islas Orcadas* cruise 876, sta 133, 59°25.9'S, 026°55.8'W, off the south end of the South Sandwich Islands, at 1071–1052 m.

TYPES.—Hypotypes: USNM 551182a-c.

DISCUSSION.—These specimens are very similar to the type specimen of *M. americana* (USNM 87547), as they have similar measurements. The anterior margin is rounded like that of the type-species. They differ from the type specimen in inhabiting much deeper water, over 1000 m, in contrast to the type, which was taken from waters of 122 fms (= 233 m).

ADDITIONAL SPECIMENS REFERRED TO *M. americana*.—*Eltanin* cruise 4, sta 138, 62°00'S–62°05'S, 61°09'W–61°09'W, north of the South Shetland Islands, at 1430 m. Measurements in mm: length 28.7, dorsal valve length 25.8, width 25.5, thickness 13.7; apical angle 90°. The loop occupies 70% of the dorsal valve length and 40% of its width. The loop ends are without spines.

Types: Hypotypes, USNM 551183a,b.

Anton Bruun cruise 18A, sta 699, 33°39'S, 072°10'W off Valparaiso, Chile, at 1170–1480 m. The lot consists of three fairly large specimens, one attached to a volcanic rock pebble (Plate 4: figures 14, 15). They are rather flattish and sub-pentagonal in outline with a narrowly truncated anterior margin. The loop occupies about 2/3 the dorsal valve length and 35% of its width. There are two small spines at the anterior of the loop extremities. The largest of the three specimens measures in mm: length 21, width 20.

Types: Hypotypes, USNM 551184a-c.

Hero cruise 721, sta 1144, 64°51.9'S–64°52.4'S, 063°49.6'W–063°50.7'W, north off Anvers Island, at 440–480 m.

Type: Hypotype, USNM 551185.

USS Edisto AGB2, oceanographic sta ED 23, 77°40'S, 40°50'W at 440 fms (= 805 m), Weddell Sea.

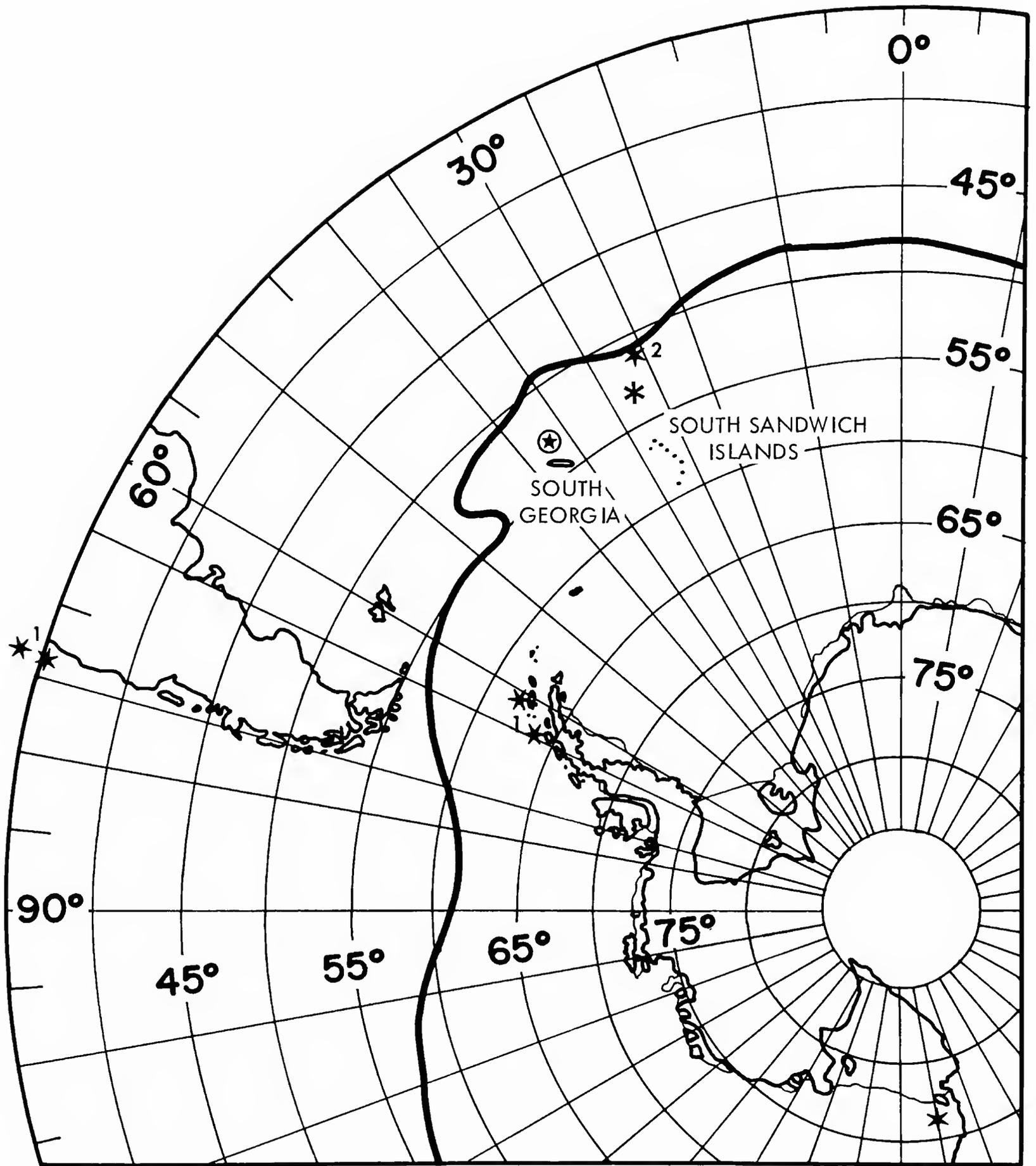


FIGURE 4.—Map of the northwest quadrant of Antarctica showing position of species (six-rayed star = (1) *Macandrevia americana* Dall, (2) *Macandrevia* species; asterisk = *Syntomaria curiosa*, new species; star in circle = *Dyscritosia secreta*, new species).

Type: Hypotype, USNM 551186.

Eltanin cruise 51, sta 5765, 76°07'S–76°07.4'S, 170°12.1'W–170°11.7'W at 71–87 m, off Ross Ice Shelf.

Types: USNM 51187, 551201.

Anton Bruun cruise 18A, sta 698, 34°54'S, 072°44'W, southwest of Valparaiso and northwest of Constitucion, Chile, at 780–925 m. Found with *Terebratulina kiiensis* Dall and Pilsbry. This lot consists of nine specimens of large size, elongate oval in outline with the somewhat narrowed anterior margin truncated. Pale yellowish brown. The specimens conform to the general characteristics of this variable species, being somewhat larger than usual but resembling a number of the extremes of *M. americana*, especially *M. a. diegensis* Dall (Plate 4: figures 33–35). Measurements (mm):

USNM specimen no.	Length	Dorsal valve length	Width	Thickness	Apical angle
551237a	33.0	29.7	25.8	15.7	84°
551237b	29.8	27.8	24.0	15.0	81°
551237c	33.3	30.7	25.9	16.5	83°

Types: Hypotypes, USNM 551237a-d.

Eltanin cruise 32 (Harvard University sta 28, M.W. Foster), 78°23.1'S, 173°06.1'W to 78°23.3'S, 173°02'W, Antarctica, at 470–478 m. One large specimen, 35 mm long by 28.7 mm wide and with truncated anterior.

Type: Hypotype, USNM 551202.

Hero cruise 731, sta 1947, 65°00'26"S–65°00'36"S, 063°28'12"W–063°28'00"W, off Antarctic Peninsula, at 204–250 m. A single specimen of medium size, truncated anteriorly and fairly convex, from relatively shallow water.

Type: Hypotype, USNM 551222.

Macandrevia americana diegensis Dall

PLATE 4: FIGURES 33–35

Figures of this subspecies are introduced for comparison with *M. americana* from southwest of Valparaiso, Chile. This subspecies is usually strongly truncated anteriorly.

LOCALITY.—U.S. Bureau of Fisheries sta 5693,

100 miles south-southwest of San Diego, California, at 1994 m.

TYPE.—Lectotype (Hertlein and Grant, 1944:212):USNM 265902a.

Macandrevia species

FIGURE 4; PLATE 5: FIGURES 28–31

One specimen of *Macandrevia* occurred with *Liothyrella hendleri*, new species, and is completely different from those referred to *M. americana*. It is narrowly oval, longer than wide with strongly convex valves. The sides and anterior are rounded, and the apical angle is 71°. The beak is moderately long and has a large, wide foramen unrestricted by deltidial plates. The commissures are rectimarginate. The surface is marked by numerous closely crowded growth lines. The color is pale brown. The anterior of the ventral valve has short dental plates. The septal plates are thick and form a shallow chamber.

MEASUREMENTS (mm).—Length 19.6, dorsal valve length 17.3, width 14.6, thickness 11.7; apical angle 71°; L/W = 1.34.

LOCALITY.—*Islas Orcadas* cruise 575, sta 52, 57°39.4'S, 026°26.7'W, off the South Sandwich Islands, Antarctica.

TYPE.—USNM 551172.

DISCUSSION.—Because of its narrowly oval form and strongly convex valves, this *Macandrevia* is unlike any of those taken off the southern tip of South America and around the Antarctic Continent. It is unlike *M. cranium* Müller, from more northern seas, which is rounder, larger, and wider than *M. species*. *Macandrevia craniella* Dall from the Gulf of Panama is similar to *M. species* in size and elongate oval form but differs in being less thick and in having a smaller foramen.

Genus *Notorygmia* Cooper, 1972

Notorygmia species

FIGURE 2; PLATE 2: FIGURE 3

A fragment of the dorsal valve showing evidence of sulcation shows the characteristic cardi-

nalial of the Macandreviidae with the septal plates meeting the valve floor. *Notorygmia* is often found in the abyss in company with *Abyssothyris* and *Neorhynchia* (Cooper, 1972). The fragment in question was taken with *Abyssothyris wyvillei*.

LOCALITY.—62°40'S, 064°06'W, to 62°37'S, 063°57'W, at 3715-3752 m, off the South Shetland Islands.

TYPE.—USNM 551234.

Genus *Terebratella* d'Orbigny, 1847

Terebratella dorsata (Gmelin)

PLATE 7: FIGURE 25

A view of the interior of the dorsal valve of this common species is introduced for comparison with the loop of *Terebratella?* species from waters off southern Australia.

LOCALITY.—*Eltanin* cruise 11, sta 974, 53°32'S, 064°55'W, east of Rio Grande, Argentina, at 124-119 m.

TYPE.—Hypotype: USNM 551244.

Terebratella? species

PLATE 5: FIGURES 7-13

DESCRIPTION.—About medium size (22 mm long), somewhat pentagonal in outline with greatest width at midvalve, subequally biconvex, ventral valve somewhat less convex than dorsal one. Sides narrowly rounded, anterolateral margins sloping medially; posterolateral margins forming an angle of 86°. Lateral commissure straight; anterior commissure narrowly sulcate. Beak moderately long, suberect; beak ridges angular; foramen large, submesothyridid; deltidial plates conjunct. Surface marked by closely spaced incremental lines of growth and obscure costae on the anterolateral flanks. Faintly pink.

Ventral valve moderately convex in lateral profile; most convex at umbo; anterior profile narrowly domed with sides forming an angle of 98°. Umbonal region narrowly convex, convexity continuing to anterior margin as prominent fold.

Dorsal valve in lateral profile more convex than opposite valve, most convex at about midvalve. Anterior profile broadly and fairly evenly domed with slopes forming angle of 115°. Umbonal and median regions swollen; sulcus originating at midvalve, occupying about 60° of valve width. Sides bounding sulcus flatly convex.

Ventral valve interior with stout teeth, narrow delthyrial cavity, short sessile pedicle collar. Muscle scars deeply impressed. Diductor scars long and narrow, pedicle muscle scars long and slender, accessory diductor scars small, rounded. Palial trunks deeply impressed, vascula media direct; vascula genitalia short.

Dorsal valve interior with narrow cardinalia, socket ridges stout, septal plates short, obscured by excess shell. Cardinal process narrow, semi-elliptical with raised lateral margins and short wide shaft. Median ridge thick where joining notothyrial callosity, tapering to midvalve, having narrow ridge on its ventral edge. Loop terebratelliform (trabecular of Richardson, 1975); crural processes long, needle sharp; descending lamellae narrow, ascending lamellae broadening into wide transverse band, deeply notched on dorsal edge; lateral connecting bands slender.

MEASUREMENTS (mm).—

USNM specimen no.	Length	Dorsal valve length	Width	Thickness	Apical angle
551194a	21.9	19.0	20.4	11.4	86°
551194b	21.9	19.0	20.0	?	89°

LOCALITY.—*Eltanin* cruise 35, sta 2276, 33°14.5'S, 126°20.0'E, south off Eyre, West Australia, Australia, at 192-183 m.

TYPES.—USNM 551194a,b.

DISCUSSION.—That these two specimens are adults is shown by the strong calcification of the interior of the shells, the thick cardinalia, and stout loop. This brachiopod, in its beak characters and incipient costae, has the aspect of *Magellania*, which occurs along the south coast of Australia from east to west. No Recent *Magellania* in the National Museum of Natural History collection has the shape of these specimens, and ones of the same size have a magellianiform loop. Except for

the incipient nature of their costae, these specimens are very similar to *Terebratella*, which has a loop in the trabecular stage. This genus, however, has never been reported off the south coast of Australia.

Syntomaria, new genus

TYPE-SPECIES.—*Syntomaria curiosa*, new species.

DIAGNOSIS.—Small, narrowly biconvex, rectimarginate, wide foramen, loop in haptoid or magelliform stage.

DESCRIPTION.—Biconvex, elongate oval. Both commissures straight. Beak suberect, short, foramen deltoid, deltidial plates rudimentary, marginal. Surface marked by concentric lamellae.

Ventral valve interior with large, elongate teeth; pedicle collar sessile. Muscle and pallial marks not discernible.

Dorsal valve interior with small cardinal process; umbonal chamber formed by descending septal plates coalesced with a thin, strongly elevated medium septum. Septal plates excavate. Loop magelliform, delicate, with small ring and thin descending branches.

ETYMOLOGY.—From the Greek *syntomos* (shortened), alluding to the abbreviated loop development.

DISCUSSION.—In size and loop development, this little brachiopod resembles *Pirothyris* from South Australia. *Pirothyris* is also small with maximum length of 7 or 8 mm, but its bright red color, long beak, and conjunct deltidial plates separate it externally from *Syntomaria*. The interior characters of the two genera are essentially the same except for the extravagant development of the cardinal process and hinge plates of *Pirothyris*. The loop development is similar, the final stage of both genera attaining only the magelliform stage.

It may be suggested that *Syntomaria* represents the young of a larger form not yet discovered. This is unlikely, because these shells show adult characters, except for the loop, and more than 400 specimens from 1 mm to many above 5 mm occurred. Moreover, four other localities pro-

duced specimens of the genus. Some of the specimens are attached to small bits of volcanic rock.

Syntomaria curiosa, new species

FIGURE 4; PLATE 5: FIGURES 14–20; PLATE 6: FIGURES 13–36

DIAGNOSIS.—Small, dark brown, biconvex, elongate oval shells with rudimentary deltidial plates and wide foramen.

DESCRIPTION.—Small, maximum observed length 6.7 mm, narrowly oval, widest at midvalve, posterior narrow, tapering. Lateral margins rounded, anterior margin narrowly rounded. Valves subequal in depth and convexity. Lateral commissure straight; anterior commissure rectimarginate. Beak short, blunt, suberect, foramen wide; deltidial plates rudimentary, marginal, obliquely elevated not noticeably restricting pedicle opening. Dark brown when fresh, grayish yellow to white in dead shells. Pedicle moderately long.

Ventral valve moderately convex in lateral view, broadly domed in anterior profile, more so than dorsal valve. Umbonal and median regions swollen. Anterior slope somewhat flattened; lateral slopes steep.

Dorsal valve moderately convex in lateral view, slightly more so than the ventral valve; anterior view broadly domed, less so than the ventral valve. Median region swollen, sides gently descending.

Interior as for the genus.

Loop Development of Specimens from Station 70: At 1.5 mm length (USNM 551174a), pillar well developed, posterior ridgelike extension of pillar just meeting thickening of floor of delthyrial chamber; septal plates defined, anteriorly slightly excavate. Pillar triangular in side view with rounded narrow crest and perpendicular anterior edge. Ventral valve with linear teeth, flat, plate-like. No deltidial plates.

At 2.0 mm length (USNM 551174b), both valves identical to preceding.

At 2.5 mm length (USNM 551174c), pillar as in preceding, septum posterior to pillar crest,

moderately elevated changing from ridge to septum. Ventral valve as in preceding.

At 3.0 mm length (USNM 551174d), cardinal process forming small, narrow rhomb; septal plates strongly developed; septum high; crus formed; pillar very high, ventral edge serrate toward ventral valve becoming concave posteriorly, tip with short unsymmetrical ring or posteriorly open cone. Ventral valve with narrow pedicle collar.

At 4 mm length (USNM 551174e), cardinal process more expanded, septum and pillar high. Septal plates attached to median septum; apex of pillar narrow, protruding antero-ventrally beyond open cone or ring, ventral narrow portion flattened. Ventral valve with rudiments of deltidial plates.

At 4.5 mm length (USNM 551174f), cardinal process expanded; septal plates as above attached to more elevated median septum. Pillar narrowed, anterior end about flush with cone, serrate at dorsal tip. Crural processes developed. One descending branch united with septum, other branch incomplete showing ascending and descending rudiments. Cone enlarged, flattened ventrally with wide attachments to septum. Ventral valve with rudimentary dental plates.

At 5.25 mm length (USNM 551174g), cardinal process, septal plates, and crural processes as in preceding. Pillar elevated, part holding cone with serrate dorsal edge. Anterior and posterior descending rudiments not quite meeting about 2/3 from posterior. Deltidial plates in ventral valve rudimentary. Shell not quite adult.

Loop Development of Specimens from Station 74: Twenty-six specimens ranging in size from 1.7 mm to 5 mm show the loop in various stages. Specimen USNM 551175a, 1.7 mm in length, shows the pillar not extended posteriorly and incipient septal plates; specimen USNM 551175b, 2 mm long, with septal plates partly excavated, slight slit in pillar indicating origin of cone; specimen 551175c, same size as preceding with less development of septal plates and no evidence of cone; specimen 551175d, 2.5 mm long, with well-marked septal plates and begin-

ning of descending rudiments, pillar somewhat thickened anteriorly; specimen 551175e, 3 mm long, with cone developing and descending rudiments advancing; specimen 551175m, 4.2 mm long, with well-developed cone changing to ring, elongating posterior descending rudiments, cardinal process well developed; specimen 551175t, 5 mm long, posterior and anterior rudiments developed, cone now a ring, cardinal process prominent; specimen 551175n, 4.5 mm long, with essentially adult loop although a smaller specimen than the preceding. Loop development retarded in some specimens, accelerated in others as shown by another series from the same station.

Developmental Series of Additional Specimens from Station 74: Smallest specimen at about 1.5 mm length (USNM 551176a), with well-developed pillar not extended posteriorly to notothyrial chamber. First appearance of cone on pillar at about 3.0 mm (USNM 551176b). At 4.5 mm, distal end of pillar protrudes antero-dorsally of cone (USNM 551176g). Posterior descending rudiments appearing at 2.5 mm (USNM 551176b). Anterior end of pillar with one or more spines on its dorsal edge (USNM 551176e,i). Ascending anterior rudiments of descending branch of loop appear at 4.5 mm length (USNM 551176e). Cardinal process first identified in specimen of 3.0 mm length (USNM 551176c).

MEASUREMENTS (mm).—

USNM specimen no.	Length	Dorsal valve length	Width	Thickness
551173a	6.0	5.2	4.4	3.2
551173b	6.7	5.7	5.3	3.4
551173c	5.2	4.4	4.0	2.6
551173d	6.2	5.5	4.5	3.7
551173e	5.6	4.9	4.2	2.8
551173f	5.8	5.0	4.6	3.4
551173g	5.2	4.3	4.1	2.5
551173h	5.7	4.8	4.3	3.0
551173i	5.7	5.0	4.1	3.1
551173j	6.5	5.7	4.7	3.7

LOCALITIES.—*Islas Orcadas* cruise 575, sta 62, 56°40.6'S, 027°00.8'W at 360–486 m; sta 65, 54°44.3'S, 026°58.6'W, at 302–375 m; sta 70, 56°23.8'S, 027°24.6'W at 161–210 m; sta 74,

56°12.0'S, 027°23.9'W, at 179–238 m; all off the South Sandwich Islands.

TYPES.—Holotype: USNM 551173a; paratypes: USNM 551173b–k, 551174a–g, 551175a–z, 551176a–i.

Dyscritosia, new genus

TYPE-SPECIES.—*Dyscritosia secreta*, new species.

DIAGNOSIS.—Shells just under medium size, roundly oval, biconvex, externally like *Waltonia inconspicua* (Sowerby) but unlike that species in having rectimarginate anterior commissure and only rudimentary deltidial plates.

DESCRIPTION.—Roundly oval to almost circular; ventral valve deeper than dorsal valve; anterior commissure rectimarginate; beak wide; foramen wide not constricted by deltidial plates; surface smooth; white to yellowish gray.

Ventral valve interior with small, narrow teeth; pedicle collar short, sessile; muscle and pallial marks lightly impressed.

Dorsal valve interior moderately calcified; cardinal process small; umbonal chamber triangular, bounded by well-excavated septal plates; median septum strong; socket ridges thin; crural processes narrow, short, acutely pointed, supported by short crura. Loop terebratelliform in adult.

ETYMOLOGY.—From the Greek *dyscritos* (hard to determine), in allusion to aberrant exterior and loop characters.

DISCUSSION.—The size and general expression of this genus are those of *Waltonia* (type *Terebratula inconspicua* Sowerby) from both islands of New Zealand. The differences between the two genera are important. The foramen of *Dyscritosia* is large and open without constriction by deltidial plates, whereas *Waltonia* has a wide foramen partially covered by large deltidial plates, usually disjunct but becoming conjunct in old specimens. The anterior commissure of *Waltonia* is deeply and conspicuously sulcate while that of *Dyscritosia* is rectimarginate. No peripheral costae are developed in *Dyscritosia*, although they occur in old shells of *Waltonia*. Of less importance is the yellow color of *Dyscritosia* compared to the bright red of *Waltonia*.

Waltonia generally inhabits rather shallow water, whereas the range of *Dyscritosia* is from 144–612 m. *Dyscritosia* inhabits a realm far distant from that of *Waltonia* of New Zealand, which is about 115 degrees east of South Georgia.

Dyscritosia secreta, new species

FIGURE 4; PLATE 6: FIGURES 1–8; PLATE 7: FIGURES 1–22

DIAGNOSIS.—As for the genus.

DESCRIPTION.—Near medium size, maximum observed length 17.5 mm; sides rounded, anterior margin rounded to subnasute. Posterolateral margins forming an angle of 75°–104°. Lateral commissure straight; anterior commissure rectimarginate with faint sulcation occasionally developed in subnasute specimens. Beak wide, short, suberect; foramen wide, unrestricted. Surface marked by concentric ridges; no radial marks seen. Yellowish gray; white when dead. Punctae count 109/mm² at 7 mm anterior to beak in a shell 14 mm long.

Ventral valve moderately convex in lateral profile, roundly subcarinate in anterior view. Umbonal region swollen, swelling extending to anterior margin, forming poorly defined fold and slightly nasute anterior in some specimens. Lateral slopes steep. Pedicle short, stout, distally frayed, rarely long.

Dorsal valve gently convex in lateral view, less so than ventral valve; anterior profile broadly domed, without subcarination. Lateral slopes moderately steep.

Interior as for genus.

LOOP DEVELOPMENT.—Specimens from stations 22, 26, and 89 give a fairly complete picture of the development of the loop.

Specimens from Station 26: Specimen (USNM 551168f) about 1.5 mm long, shows the median pillar somewhat thickened on its ventral edge extending posteriorly nearly to the notothyrial cavity. Floor of notothyrial cavity thickened, thickening extending to socket ridge, which is elevated beyond posterior margin.

Specimen (USNM 551168g), 2 mm long, essentially same as preceding except septal plates clearly visible and septum extending to notothy-

rial cavity. Distal end of pillar without trace of hood and no indication of descending branch rudiments.

Specimen (USNM 551168h), 3 mm long, anteriorly heightened pillar with abrupt anterior edge and minute cone on its distal tip. Ridge from pillar to septal plates now become a septum; septal plates well defined and anteriorly excavate. Thickened floor of notothyrial cavity continuous with low septum. Crura appearing as minute points from anterodorsal ends of socket ridges at contact with septal plates. No trace yet of anterior ascending rudiments of descending branches of loop.

Specimen (USNM 551168i), a precocious youngster 4 mm long, exhibiting well-advanced hood, long descending and ascending rudiments almost meeting, posterior pair longer than anterior pair. Septal plates excavate, their tapered ends embracing high septum. Rudiments of crural processes present.

Another specimen of 4 mm length (USNM 551168n), less advanced with smaller cone and only posterior rudiments of descending lamellae developed. Distal ends of septal plates embracing posterior of median septum.

Specimen (USNM 551168j), about 4.5 mm long, less advanced than specimen 551168i in some of its parts. Cone larger and longer and open posteriorly forming broad ring. Septal plates excavate, their anterior ends embracing posterior end of septum now high. Descending rudiments unequal, one on right almost meeting its anterior counterpart. Left side descending rudiment short, and ascending rudiment just forming. Crural process on right descending rudiment. Anterior edge of pillar serrate, not protruding beyond anterior margin of ring.

Specimen (USNM 551168k), 6 mm long, imperfect. Descending rudiments broad; septal plates attached to septum with deep chambers beneath.

Specimen (USNM 551168-1), 6.5 mm long, with large ring, narrow ventrally, wide where attached to pillar. Distal end of pillar slightly protuberant anterior to base of ring. Crural processes sharp points; lateral branches complete.

Septal plates forming chamber attached to septum. Cardinal process represented by two patches below apex. Descending branches wide at attachment to pillar.

Specimen (USNM 551168p), 15 mm long, nearly adult with broad ribboned loop with broad connections to slender septum. Anterior ends of loop closely approximate.

Specimen from Station 22: (USNM 551171a), 5 mm long, with completely joined lateral branches, high median septum with septal plates attached and broad ring or posteriorly truncated cone.

Specimens from Station 89: None of small size. Specimen (USNM 551169b), 8 mm long, with receding pillar mounted by broad ring. Median septum high.

Specimen (USNM 551169c), 11 mm long, with pillar much resorbed anteriorly making deep reentrant between anterior ends of loop. Ring and septum broad ribboned with lateral branches not yet formed.

Specimen (USNM 551169d), 12 mm long, like preceding except that loop more mature in having narrow connecting bands freed from septum but still joined to septum at junction of bands having been resorbed. Suggests possibility of magellaniform loop stage as culmination of development of loop. There is also the possibility that in removing the fleshy lophophore a thin portion of the septum was dissolved.

Specimen (USNM 551169e), 16 mm long, less advanced than preceding one, although larger. All elements of loop broad ribboned, including connecting bands. Broad reentrant in transverse element on dorsal side.

MEASUREMENTS (mm).—

<i>USNM specimen no.</i>	<i>Length</i>	<i>Dorsal valve length</i>	<i>Width</i>	<i>Thickness</i>	<i>Apical angle</i>
551168a	17.5	15.7	14.6	9.8	86°
551168b	16.2	14.4	14.9	8.9	93°
551168c	15.8	14.0	13.2	10.5	87°
551168d	15.2	13.5	13.8	7.6	92°
551168e	15.7	14.0	14.6	7.7	92°
551169a	16.4	14.2	15.2	10.1	99°
551170a	17.2	15.5	16.1	8.6	104°
551170b	14.2	12.6	13.0	6.8	104°

LOCALITIES.—*Islas Orcadas* cruise 575, sta 12, 53°38.2'S, 037°54.7'W, at 130–137 m; sta 13, 53°44'S, 037°59.5'W, at 128–137 m; sta 14, 53°41.8'S, 037°57.2'W, at 144–150 m; sta 16, 53°38.2'S, 038°01.1'W, at 130–133 m; sta 17, 53°36'S, 038°03.0'W, at 122–144 m; sta 22, 54°02.8'S, 037°23.7'W, at 66–75 m; sta 24, 54°01.3'S, 036°50.7'W, at 108–119 m; sta 26, 53°43.1'S, 036°49.3'W at 188–192 m; sta 27, 53°34.9'S, 036°47.8'W, at 448–872 m; sta 31, 54°05.6'S, 036°30.8'W, at 130–143 m; sta 32, 54°21.6'S, 035°58.7'W, at 144–164 m; sta 89, 54°44.2'S, 037°11.2'W, at 225–265 m; sta 97, 54°12.4'S, 037°40.1'W, at 69–90 m; sta 101, 54°14.1'S, 037°54.2'W, at 164–183 m; all north off South Georgia.

TYPES.—Holotype: USNM 551169a; paratypes: 551168a–p, 551169b–g, 551170a, 551171a.

DISCUSSION.—This species is most like *Waltonia inconspicua* (Sowerby) from New Zealand, differing radically as described above. No other congeneric species is known.

VARIATION.—This is a variable species, young specimens being round (USNM 551170a), older ones becoming thick-shelled and narrower (USNM 551168a). Variation is also shown in the development of the anterior margin, the younger ones with thinner shells having a tendency to become subnasute and in some specimens producing a faint sulcation of the anterior commissure.

Some specimens taken were attached to echinoid spines and others were attached to individuals of their own species.

Genus *Neothyris* Douvillé, 1879

Neothyris parva, new species

PLATE 5: FIGURES 21–27

DIAGNOSIS.—Small, rotund *Neothyris*.

DESCRIPTION.—Small for the genus, maximum observed length 22 mm; roundly oval, biconvex, ventral valve slightly deeper than dorsal valve; sides broadly rounded; anterior margin narrowly rounded to truncate. Apical angle 89°–107°. Maximum width at midvalve. Lateral commissure straight; anterior commissure rectimarginate. Beak narrow, erect, moderately long; beak

ridges narrowly rounded, prominent, defining concave interareas. Foramen small, round, mesothyridid; deltidial plates conjunct. Surface marked by crowded concentric growth lines. Yellowish to dark brown.

Ventral valve moderately convex in lateral view, most convex in umbonal region; anterior profile strongly domed, sides convex, moderately steep. Umbonal region narrowly swollen, swelling extending to anterior margin, not forming fold.

Dorsal valve moderately convex in lateral view; broadly domed in anterior profile, not narrowly convex as ventral valve. Umbonal region narrowly swollen, swelling extending anteriorly to disappear in the generally tumid anterior. Lateral slopes gently convex, moderately steep.

Ventral valve interior with moderately thickened floor; teeth ponderous, supported by thick callus. Umbonal chamber narrow; muscle area large, reaching midvalve; diductor scars long, narrow; adductor scars narrow, elongate. Pallial trunks not clearly impressed.

Dorsal valve interior greatly thickened; cardinal process a deep pit bounded by upturned lateral margins on a bulbous shaft. Socket ridges elevated posterior to posterior margin, thick, overflowing onto and almost hiding septal plates. Median septum thick posteriorly, tapering to midvalve. Crura short. Loop magellaniform. Crural processes sharply pointed. Adductor scars well imprinted, anterior ones somewhat triangular; posterior ones small and subtriangular.

MEASUREMENTS (mm).—

USNM specimen no.	Length	Dorsal valve length	Width	Thickness	Apical angle
549618a	22.4	19.6	18.8	13.7	87°
549618b	21.0	18.0	18.0	?	95°
549618c	20.6	17.8	18.0	13.3	98°

LOCALITY.—Otago Heads, South Island, New Zealand.

TYPES.—Holotype: USNM 549618a; paratypes: USNM 549618b–d.

DISCUSSION.—Small size and deep-brown color distinguish this species from *N. lenticularis* (Deshayes). Small size and rotundity distinguish *N. parva* from *N. dawsoni* Neall, which is a gray species much smaller than *N. lenticularis* but about 1.5 times the size of *N. parva*.

Genus *Waltonia* Davidson, 1850***Waltonia inconspicua* (Sowerby)**

PLATE 7: FIGURES 23, 24

Views of the loop of this common species are

introduced for comparison with the loop of *Dyscritosia*.

LOCALITY.—From Guano Rocks, north of Bream Head, North Island, New Zealand, in shallow water.

TYPE.—Hypotype: USNM 551244a.

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PLATES

PLATE 1

FIGURE 1.—*Discina striata* (Schumacher): Dorsal view of a young specimen, hypotype, USNM 551188, showing completely costellate exterior, $\times 4$ (*La Rafale* cruise 1, sta 20/2, $04^{\circ}31'N$, $007^{\circ}10'W$, off Ivory Coast, Africa, at 30 m).

FIGURE 2.—*Discinisca laevis* (Sowerby): Dorsal view of a young adult, hypotype, USNM 551179 (*Anton Bruun* cruise 18B, sta 758, $06^{\circ}44'S$, $080^{\circ}18'W$, off northern Peru, at 30 m).

FIGURES 3, 4.—*Argyrotheca* species: Dorsal and ventral views of a small, damaged specimen, USNM 551196, $\times 10$ (*Anton Bruun* cruise 16, sta 66139, $00^{\circ}15'55''S$, $91^{\circ}26'41''W$, off the Galapagos Islands, at 3 m).

FIGURES 5–7.—*Terebratulina* species: Dorsal, anterior, and side views, $\times 1$, of a finely costellate, large specimen, USNM 208868a, intermediate in size between *T. crossei* Davidson and *T. kiiensis* Dall and Pilsbry (off Santa Barbara, California, at 439 m).

FIGURES 8–18.—*Terebratulina kiiensis* Dall and Pilsbry: 8, dorsal view of a whole specimen, hypotype, USNM 550850, $\times 1$; 9, interior of the dorsal valve of the same specimen, $\times 2$, showing loop with disjunct crural processes, a characteristic of this species (*Anton Bruun* cruise 17, sta 660-G, $12^{\circ}58'S$, $077^{\circ}16'W$, off Pisco, Punta Huacas, Peru, at 1000 m). 10–12, anterior, side, and dorsal views of the holotype, USNM 128463, $\times 1$; 13, dorsal exterior of the holotype showing fine, somewhat worn costellae, $\times 2$ (Inland Sea, coast of Kii Province, Japan). 14–16, side, anterior, and dorsal views of another specimen, $\times 1$, hypotype, USNM 551236a; 17, the preceding in dorsal view, $\times 2$, showing details of the ornament; 18, posterior of a dorsal valve, hypotype, USNM 551236c, showing loop with disjunct crural processes, $\times 2$ (*Anton Bruun* cruise 18A, sta 698, $34^{\circ}54'S$, $072^{\circ}44'W$, southwest of Valparaiso and northwest of Concepcion, Chile, at 780–925 m).



PLATE 2

FIGURE 1.—*Platidia* species: Dorsal view of a small, immature specimen, USNM 551195, ca. \times 12 (*Hero* cruise 715, sta 875, $54^{\circ}55'S$, $064^{\circ}00'W$ – $54^{\circ}54'S$, $063^{\circ}53'W$, Atlantic Ocean, off southeasternmost tip of South America, at 771–903 m).

FIGURE 2.—*Megathiris* species: Dorsal view of a strongly costate specimen, USNM 551181, \times 5 (*Thierry* cruise 1, sta 31/5N, $05^{\circ}09'N$, $000^{\circ}19'W$, off the coast of Ghana, West Africa, at 85 m).

FIGURE 3.—*Notorygmia* species: Fragment of a dorsal valve preserving characteristic macandreviid cardinalia, USNM, 551234, \times 3 (*Eltanin* cruise 4, sta 135, $62^{\circ}40'S$ – $62^{\circ}37'S$ to $064^{\circ}06'W$ – $063^{\circ}57'W$, northwest off the South Shetland Islands, Antarctica, at 3715–3752 m).

FIGURES 4–7.—*Abyssothyris* cf. *elongata* Cooper: Dorsal view, \times 1, anterior, side, and dorsal views, \times 2, hypotype, USNM 551225 (station and locality same as for *Notorygmia* species).

FIGURES 8–12.—*Abyssothyris?* species: 8–11, dorsal views, \times 1, anterior, dorsal, and side views, \times 2, of a rectimarginate specimen, USNM 551242; 12, the preceding, \times 3, with loop visible through the shell. (*Eltanin* cruise 8, sta 616, $61^{\circ}59'S$ – $62^{\circ}00'S$, $027^{\circ}40'W$ – $027^{\circ}40'W$, west off the South Sandwich Islands, at 3349–3038 m.).

FIGURES 13–17.—*Abyssothyris wyvillei* (Davidson): 13–16, dorsal view, \times 1, anterior, side, and dorsal views, \times 2, of a strongly sulcate individual, hypotype, USNM 551224a; 17, interior of the dorsal valve, \times 3, showing loop, hypotype, USNM 551224b. (Locality same as for *Notorygmia* species.)

FIGURES 18–23.—*Liothyrella delsolari*, new species: 18–20, dorsal, anterior, and side views, \times 1, of the holotype, USNM 551061; 21–23, dorsal view of the interior showing loop, \times 1, and side and dorsal views, \times 2, of the dorsal valve of the holotype showing loop. ($4^{\circ}00'S$, $80^{\circ}30'W$, between Mancora and Chicama, Peru, at 760–1000 m.)

FIGURE 24.—*Liothyrella wa* (Broderip): Dorsal and partial side views, \times 2, of the dorsal valve of a typical specimen (as now understood) showing wide loop with thin transverse band, hypotype, USNM 551069 (*Eltanin* cruise 6, sta 370, $53^{\circ}54'S$ – $55^{\circ}55'S$, $064^{\circ}36'W$ – $064^{\circ}52'W$, east-southeast of Rio Grande, Argentina, at 104–115 m).

FIGURES 25–35.—*Cryptopora hesperis*, new species: 25–28, ventral, dorsal, anterior, and side views, \times 5, of the holotype, USNM 331098a; 31, the same at \times 10; 29, exterior of another specimen in ventral view, \times 4; 30, dorsal view and dorsal view tilted of the same specimen to show deltidial plates, teeth, pedicle collar, and short dental plates, \times 10, paratype, USNM 331098b; 32, 33, ventral view of the dorsal interior and the same, tilted to show cura and median septum, \times 10, paratype, USNM 331098c; 34, 35, ventral and partial side views of another dorsal interior, \times 10, showing median septum and maniculifer crura, paratype, USNM 331098b. (U.S. Bureau of Fisheries sta 3080, $43^{\circ}58'N$, $124^{\circ}36'W$, off southern Oregon, at 170 m.)

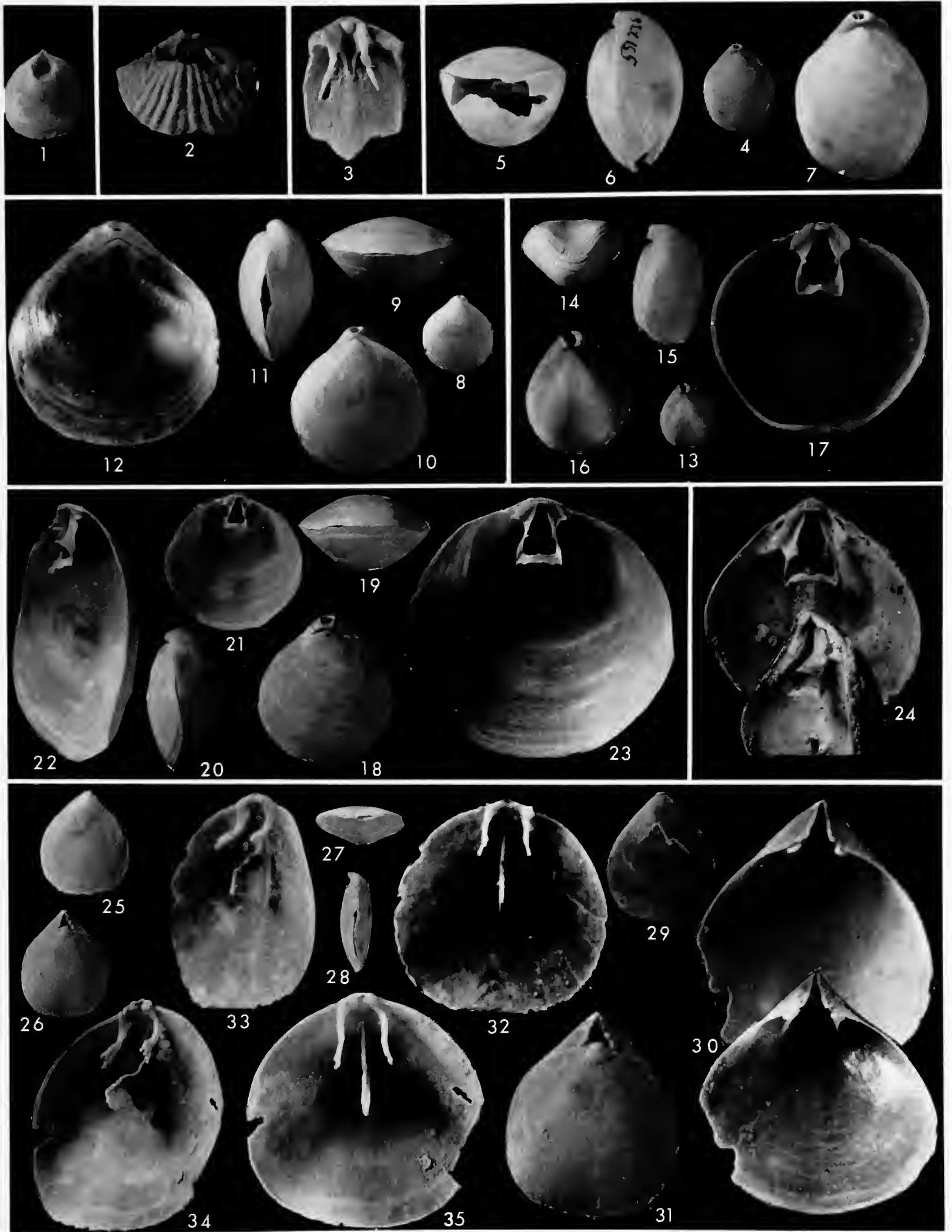


PLATE 3

FIGURES 1-4.—*Liothyrella expansa*, new species: 1-3, dorsal, anterior, and side views, $\times 1$, of the holotype, USNM 551153b; 4, posterior of the dorsal valve interior of the holotype, $\times 2$, showing wide loop (*Islas Orcadas* cruise 575, sta 89, $54^{\circ}44.2'S$, $037^{\circ}11.2'W$, south of South Georgia, Antarctica, at 265 m).

FIGURES 5-9.—*Liothyrella fosteri*, new species: 5-7, dorsal, anterior, and side views, $\times 1$, of the holotype, USNM 551070; 8, 9, ventral and partial side views of the posterior of the dorsal valve of the holotype, $\times 2$, showing loop. (*Eltanin* cruise 6, sta 410, $61^{\circ}18'S$ - $61^{\circ}20'S$, $056^{\circ}09'W$ - $056^{\circ}10'W$, northeast off Elephant Island, Antarctica, at 220-240 m.)

FIGURES 10-21.—*Liothyrella notorcadensis* (Jackson): 10, 11, dorsal and side views of a typical specimen, $\times 1$, hypotype, USNM 550917 ($64^{\circ}36'S$, $064^{\circ}03'29''W$, Arthur Harbor, Antarctic Peninsula, Antarctica, at 30 m). 12-14, dorsal, anterior, and side views of another specimen, $\times 1$, hypotype, USNM 551197a; 20, posterior of the dorsal valve of the preceding showing wide loop, $\times 2$, hypotype, USNM 551243. (*Islas Orcadas* cruise 575, sta 78, $56^{\circ}20.2'S$, $027^{\circ}30.4'W$, off South Sandwich Islands, at 122-141 m.) 15-17, side, anterior, and dorsal views of a young specimen, $\times 1$, hypotype, USNM 551198a (*Islas Orcadas* cruise 876, sta 108, $60^{\circ}25.9'S$, $046^{\circ}23.6'W$, north of Coronation Island, Antarctica, at 152-159 m). 18, 19, dorsal and partial side views, $\times 2$, of the loop of a typical specimen, hypotype, USNM 550918a (near Palmer Research Station, Arthur Harbor, Antarctica, at 6-60 m). 21, deformed specimen with characteristic wide loop with thin transverse band, $\times 2$, hypotype, USNM 551190 (*Hero* cruise 721, sta 702, $62^{\circ}16.8'S$, $058^{\circ}32.8'W$, north off east end of South Shetland Islands, at 51 m).

FIGURES 22-25.—*Liothyrella? vema* Cooper: 22-24, side, anterior, and dorsal views, $\times 1$, of a large individual, hypotype, USNM 551191a; 25, dorsal valve of the preceding specimen. $\times 2$, showing aberrant loop. (*Eltanin* cruise 9, sta 678, $54^{\circ}49'S$, $038^{\circ}01'W$ to $037^{\circ}53'W$, southwest off South Georgia, at 814-732 m.)

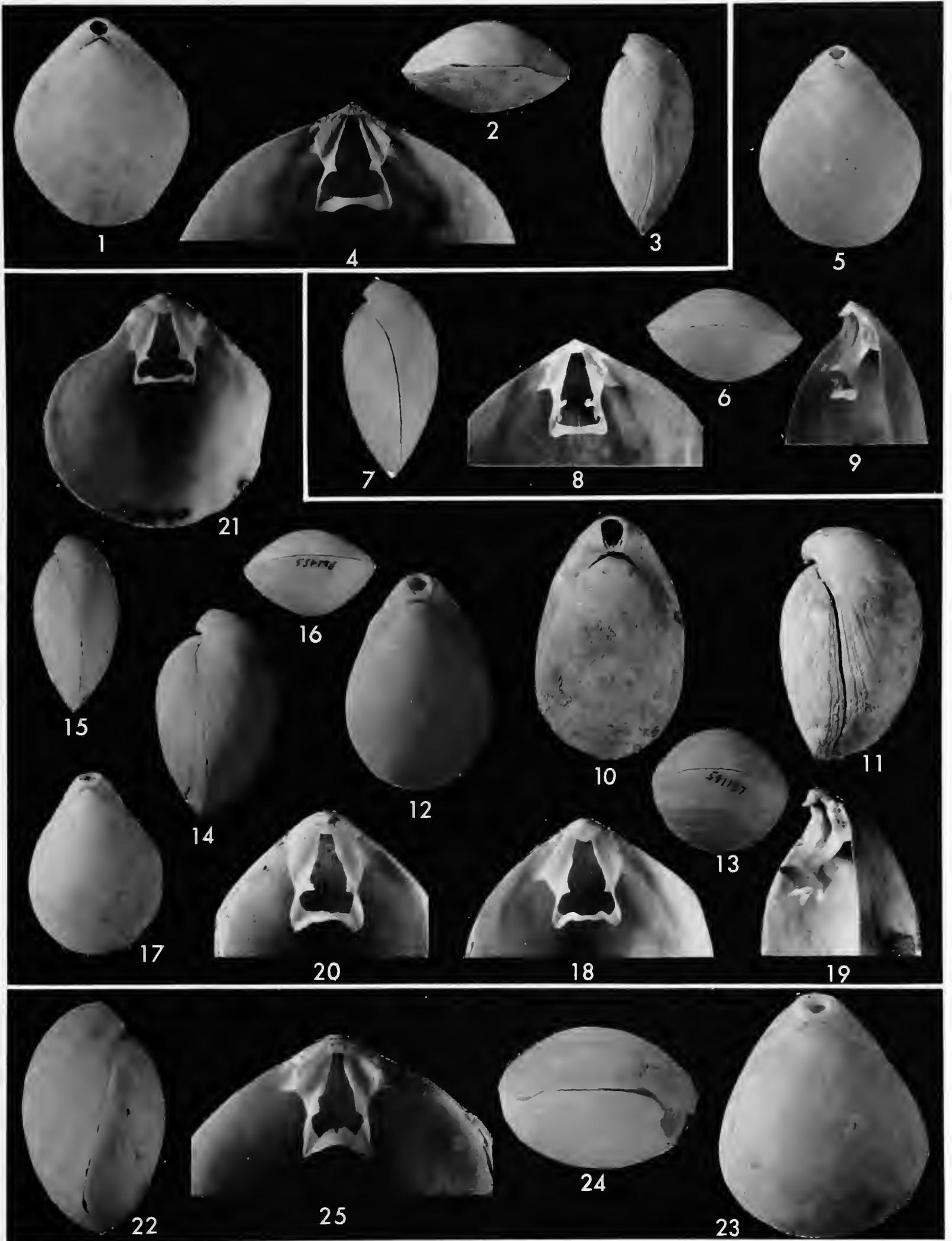


PLATE 4

FIGURES 1–6.—*Liothyrella hendleri*, new species: 1–3, anterior, side, and dorsal views, $\times 1$, of the holotype, USNM 551141a; 4, interior of the dorsal valve, $\times 1$, paratype, USNM 551141g; 5, 6 ventral and partial side views, $\times 2$, of the dorsal valve posterior showing loop, paratype, USNM 551141e. (*Islas Orcadas* cruise 575, sta 52, $57^{\circ}39.4'S$, $026^{\circ}26.7'W$, off South Sandwich Islands, at 416–512 m.)

FIGURES 7–13.—*Liothyrella georgiana* Foster: 7, Dorsal view of the holotype, $\times 1$, USNM 550017A; 8, interior of the dorsal valve of the holotype, $\times 1$; 9, dorsal view of a larger specimen, $\times 1$, paratype, USNM 550017B; 10, interior of the paratype showing the loop, $\times 2$. (*Eltanin* cruise 9, sta 671, $54^{\circ}41'S$, $038^{\circ}38'W$ to $54^{\circ}38'S$, $038^{\circ}38'W$, off South Georgia, at 220–320 m.) 11–13, dorsal, side, and anterior views of a large specimen, $\times 1$, hypotype, USNM 551204. (*Islas Orcadas* cruise 575, sta 66, $56^{\circ}42.8'S$, $026^{\circ}59.7'W$, off northeast end of South Sandwich Islands, at 121–228 m.)

FIGURES 14–32.—*Macandrevia americana* Dall: 14, 15, ventral and side views of a small specimen attached to a volcanic pebble, $\times 1$, hypotype, USNM 551184a; 16, interior of the dorsal valve of another specimen showing long loop, $\times 2$, hypotype, USNM 551184b. (*Anton Bruun* cruise 18A, sta 699, $33^{\circ}39'S$, $072^{\circ}10'W$, off Valparaiso, Chile, at 1170–1480 m.) 17–19, side, dorsal, and anterior views, $\times 1$, of a large, somewhat elongated specimen, hypotype, USNM 551237c; 20–22, anterior, dorsal, and side views of an elongate specimen, $\times 1$, hypotype, USNM 551237a; 23, 24, interior of the dorsal valve showing loop and ascending branches of the loop with deep reentrant in transverse band, $\times 1.5$, hypotype, USNM 551237d. (*Anton Bruun* cruise 18A, sta 698, $34^{\circ}54'S$, $072^{\circ}44'W$, southwest of Valparaiso and northwest of Concepcion, Chile, at 780–925 m.) 25–27, dorsal, anterior, and side views, $\times 1$, of a large specimen, hypotype, USNM 551183a; 28, interior of the dorsal valve showing loop, $\times 1.5$, hypotype, USNM 551183b. (*Eltanin* Cruise 4, sta 138, $62^{\circ}00'S$ – $62^{\circ}05'S$, $061^{\circ}09'W$ – $061^{\circ}08'W$, north of South Shetland Islands, at 1437 m.) 29–31, anterior, side, and dorsal views of an unusually large specimen, $\times 1$, hypotype, USNM 551202 (*Eltanin* cruise 32, Harvard University sta 32–28, $78^{\circ}23.1'S$ – $78^{\circ}23.3'S$, $173^{\circ}06.1'W$ – $173^{\circ}02'W$, Ross Sea, Antarctica, at 470–478 m). 32, dorsal view of a fairly round specimen, $\times 1$, hypotype, USNM 551222 (*Hero* cruise 731, sta 1947, $65^{\circ}00'26''S$ – $65^{\circ}00'36''S$, $063^{\circ}28'12''W$ – $063^{\circ}28'00''W$, off Palmer Peninsula, Antarctica, at 204–250 m).

FIGURES 33–35.—*Macandrevia americana diegensis* Dall: anterior, side, and dorsal views, $\times 1$, lectotype, USNM 265902a (U.S. Bureau of Fisheries sta, 100 miles south-southwest of San Diego, California, at 1994 m).

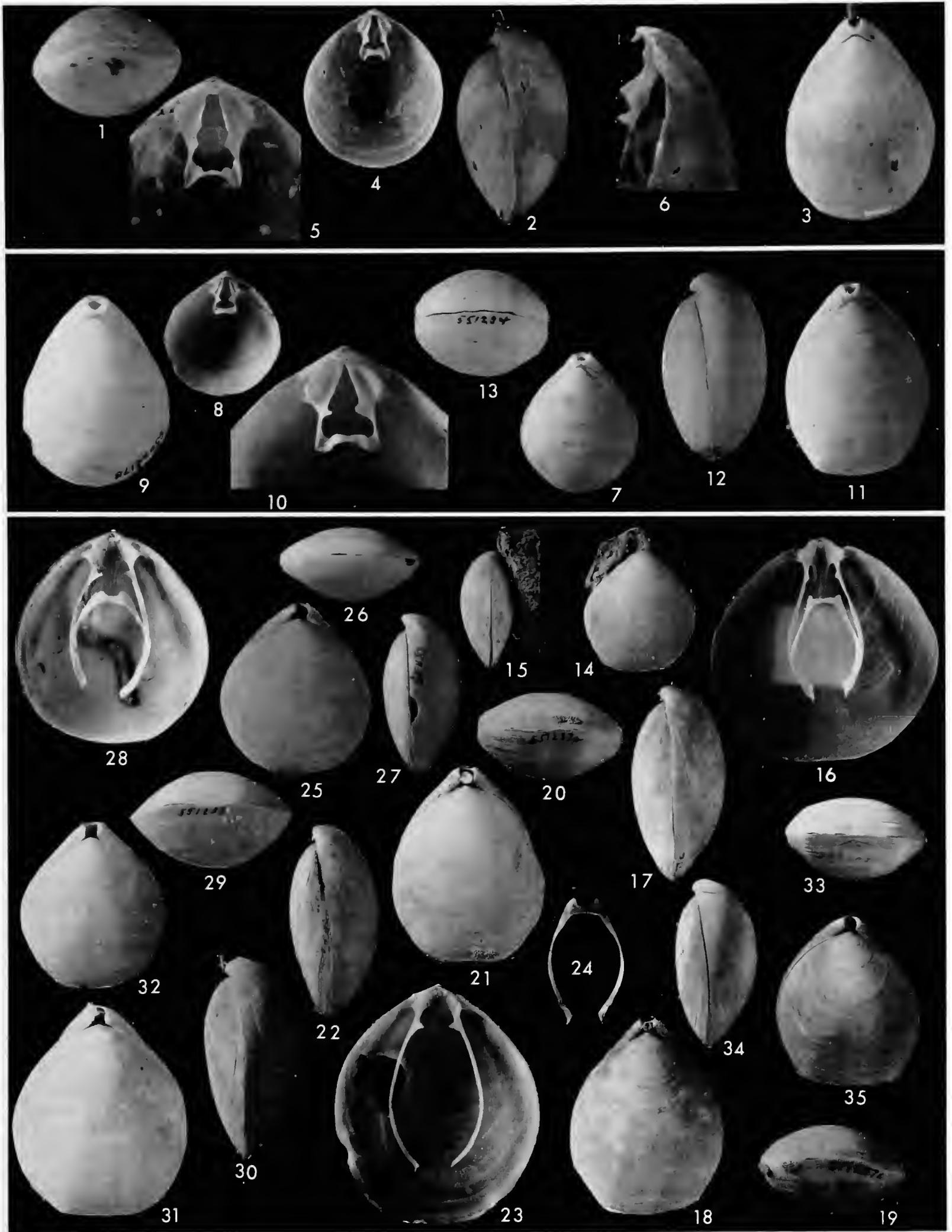


PLATE 5

FIGURES 1–6.—*Pantellaria monstrosa* (Scacchi): 1–4, dorsal view, $\times 1$, ventral, dorsal, and side views, $\times 3$, hypotype, USNM 551180a; 5, interior of a dorsal valve preserving the lophophore, $\times 3$, hypotype, USNM 551180c; 6, another dorsal valve preserving the loop, $\times 3$, hypotype, USNM 551180b. (*La Rafale* cruise 1, sta 26/6, $04^{\circ}57'N$, $003^{\circ}23'W$, Gulf of Guinea, off Ivory Coast, at 100 m.)

FIGURES 7–13.—*Terebratella?* species: 7–9, side, dorsal, and anterior views, $\times 1$, USNM 551194; 10, 11, interior of the ventral valve showing teeth and conjunct deltidial plates, and latex impression of the interior showing the muscle marks and pallial impressions, $\times 2$, USNM 551194a; 12, 13, interior of the dorsal valve of the same specimen as preceding, $\times 2$, tipped to show the lateral connecting bands and in normal view showing the broad transverse band and large cardinal process. (*Ellanin* cruise 35, sta 2276, $33^{\circ}14.5'S$, $126^{\circ}20'E$, south of Eyre, South Australia, Australia, at 192–183 m.)

FIGURES 14–20.—*Syntomaria curiosa*, new species: 14–16, dorsal, side, and anterior views, $\times 5$, paratype, USNM 551173b; 17, interior of the dorsal valve showing a nearly complete loop, $\times 5$, paratype, USNM 551173k; 18–20, anterior, side, and dorsal views of the holotype, $\times 5$, USNM 551173a. (*Islas Orcadas* cruise 575, 74, $56^{\circ}12'S$, $027^{\circ}23.9'W$, off the South Sandwich Islands, Antarctica, at 179–238 m.)

FIGURES 21–27.—*Neothyris parva*, new species: 21–24, anterior, dorsal, and side views, $\times 1$, and dorsal view, $\times 2$, of the holotype, USNM 549618a; 25, 26, interior of the ventral valve showing deltidial plates and teeth, and latex impression of the interior showing muscle scars, $\times 2$, paratype, USNM 549618b; 27, interior of the dorsal valve, $\times 2$, showing magellaniform loop and large cardinal process. (Off Otago Heads, Dunedin, New Zealand.)

FIGURES 28–31.—*Macandrevia* species: Dorsal view, $\times 1$, and anterior, side, and dorsal views, $\times 2$, USNM 551172. (*Islas Orcadas* cruise 575, sta 52, $57^{\circ}38.4'S$, $026^{\circ}26.7'W$, off the South Sandwich Islands, Antarctica, at 415–612 m.)

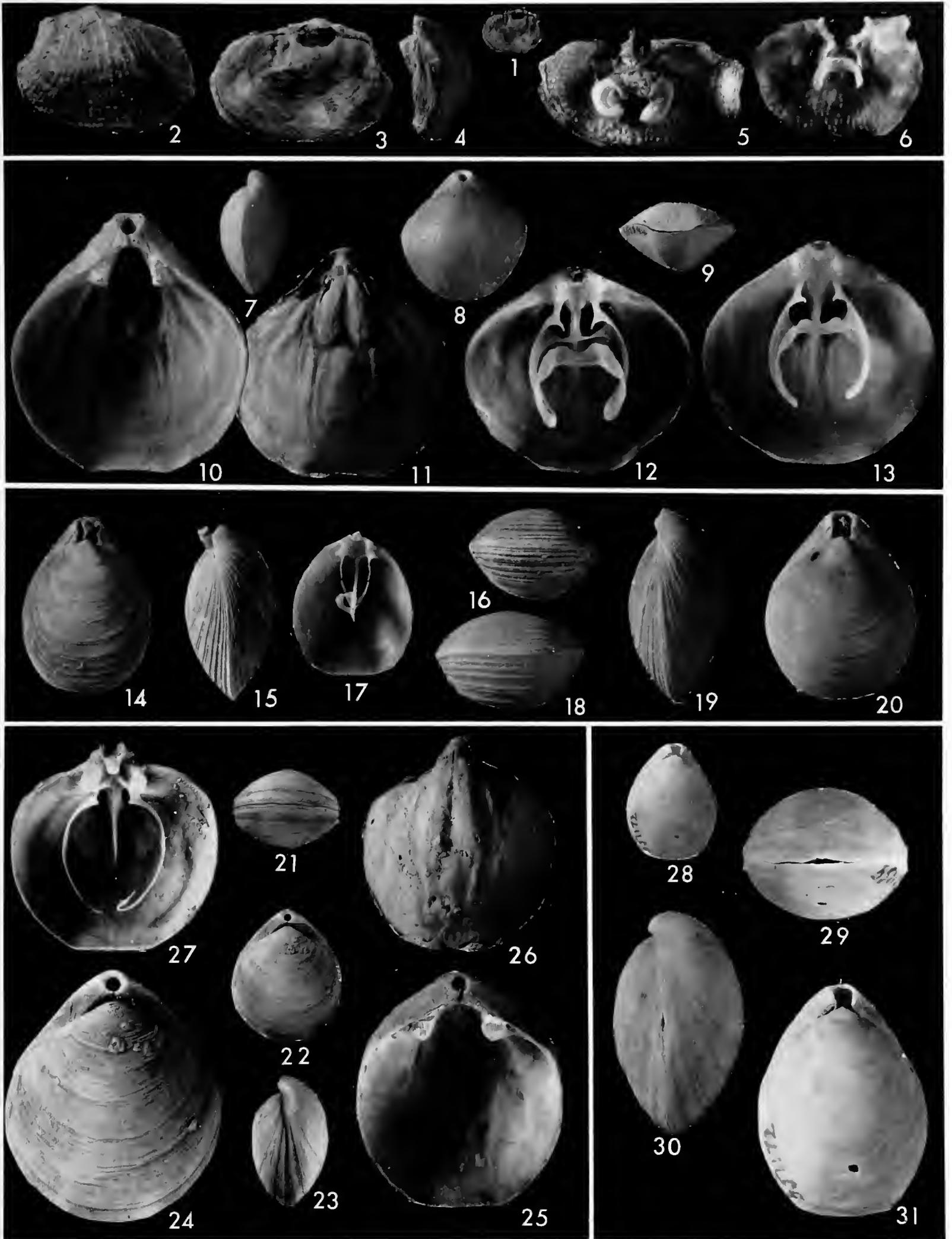


PLATE 6

FIGURES 1–8.—*Dyscritosia secreta*, new species: 1–4, anterior, side, and dorsal views, $\times 1$, and dorsal view, $\times 2$, of a paratype, USNM 551168b (*Islas Orcadas* cruise 575, sta 26, $53^{\circ}43.1'S$, $036^{\circ}49.3'W$, northeast of the South Sandwich Islands, Antarctica, at 188–192 m). 5–8, dorsal, anterior, and side views, $\times 1$, and dorsal view $\times 2$, of the holotype, USNM 551169a (*Islas Orcadas* cruise 575, sta 89, $54^{\circ}43.1'S$, $036^{\circ}48.3'W$, off the South Sandwich Islands, at 225–265 m).

FIGURES 9–12.—*Macandrevia americana* Dall: 9–11, anterior, side, and dorsal views of a specimen similar to the type, $\times 1$, hypotype 551182a; 12, interior of the dorsal valve, showing loop, $\times 2$, hypotype, USNM 551182c. (*Islas Orcadas* cruise 876, sta 133, $59^{\circ}25.9'S$, $026^{\circ}55.8'W$, off south end of South Sandwich Islands, Antarctica, at 1071–1052 m.)

FIGURES 13–37.—*Syntomaria curiosa*, new species: 13, early stage showing pillar, $\times 10$, paratype, USNM 551176a; 14, 15, later stage than preceding showing 2 specimens, $\times 10$, of nearly the same size with more advanced development of the cone in Figure 14, and the initial development of descending lamellae, paratypes, USNM 551176b, c; 16, 17, 2 specimens of nearly the same size, $\times 10$, the first with open ring but incomplete development of descending lamellae, the other with less advanced ring but with completion of 1 descending lamella, the other probably broken, paratypes, USNM 551176f, h; 18, posterior of the ventral valve of paratype, USNM 551176f, showing teeth and rudimentary deltidial plates, $\times 10$; 19, dorsal valve slightly tilted to show ring, complete median septum, start of the descending lamellae and one of the rudiments of the ascending lamellae, $\times 10$, paratype, USNM 551176g; 20, posterior of the ventral valve, $\times 10$, showing rudimentary deltidial plates. (*Islas Orcadas* cruise 575, sta 74, $56^{\circ}12'S$, $027^{\circ}23.9'W$, off the South Sandwich Islands, Antarctica, at 179–238 m.) 21, 22 specimens, $\times 10$, of nearly the same size with pillar developed but not reaching notothyrial cavity, one, figure 22, slightly more advanced than the other in showing the initiation of a cone as a small slit in the pillar, $\times 10$, paratypes, USNM 551175b, c; 24, a slightly larger individual than the preceding but not showing any sign of a cone, $\times 10$, paratype, USNM 551175d; 25, a slightly larger specimen, $\times 10$, with incipient cone and rudiments of the descending lamellae, paratype, USNM 551175e; 26, a nearly full-grown specimen with well-developed cone and descending rudiments, $\times 10$, paratype, USNM 551175m; 27, nearly full-grown specimen with well-developed ring, complete median septum with traces of ascending and descending rudiments, $\times 10$, paratype, USNM 551175t; 28, a fully adult specimen with lateral lamellae complete and ring fully developed, $\times 10$, paratype, USNM 551175n. (*Islas Orcadas* cruise 575, sta 74, $56^{\circ}12'S$, $027^{\circ}23.9'W$, off the South Sandwich Islands, Antarctica, at 179–238 m.) 29, young specimen with developed pillar, $\times 10$, paratype, USNM 551174a; 30, a larger specimen with pillar extending posteriorly but not yet reaching the notothyrial platform, $\times 10$, paratype, USNM 551174b; 31, a larger specimen than the preceding, $\times 10$, with the developing septum but without appearance of cone or loop rudiments, paratype, USNM 551174c; 32, specimen with cone and rudiments of the descending branches, $\times 10$, paratype USNM 551174d; 33 a larger specimen with cone altered to a ring, nearly complete median septum and descending rudiments, $\times 10$, paratype, USNM 551174c; 34, nearly adult specimen, $\times 10$, showing complete median septum, excavate septal plates and 1 lateral lamella complete, also a large ring and cardinal process, paratype, USNM 551174f; 36, a fully adult specimen, $\times 10$, but with descending and ascending rudiments not quite joined and well-formed descending septal plates united with the septum, paratype, USNM 551174g; 35, 37, views of the posterior of the ventral valve showing teeth and rudimentary deltidial plates, $\times 10$, respectively USNM 551174f, g. (*Islas Orcadas* cruise 575, sta 70, $56^{\circ}23.8'W$, $027^{\circ}24.6'W$, off the South Sandwich Islands, Antarctica, at 161–210 m.)

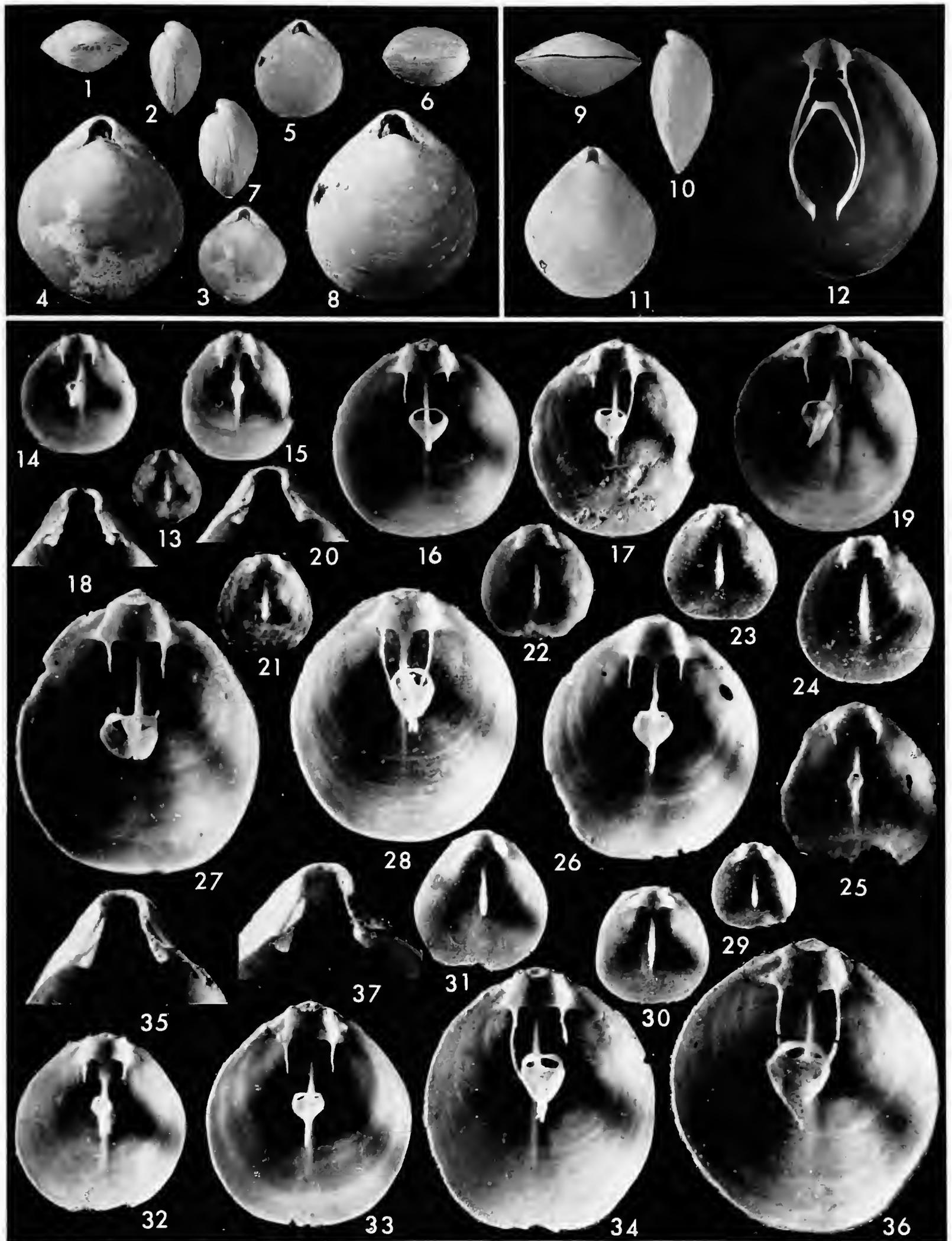
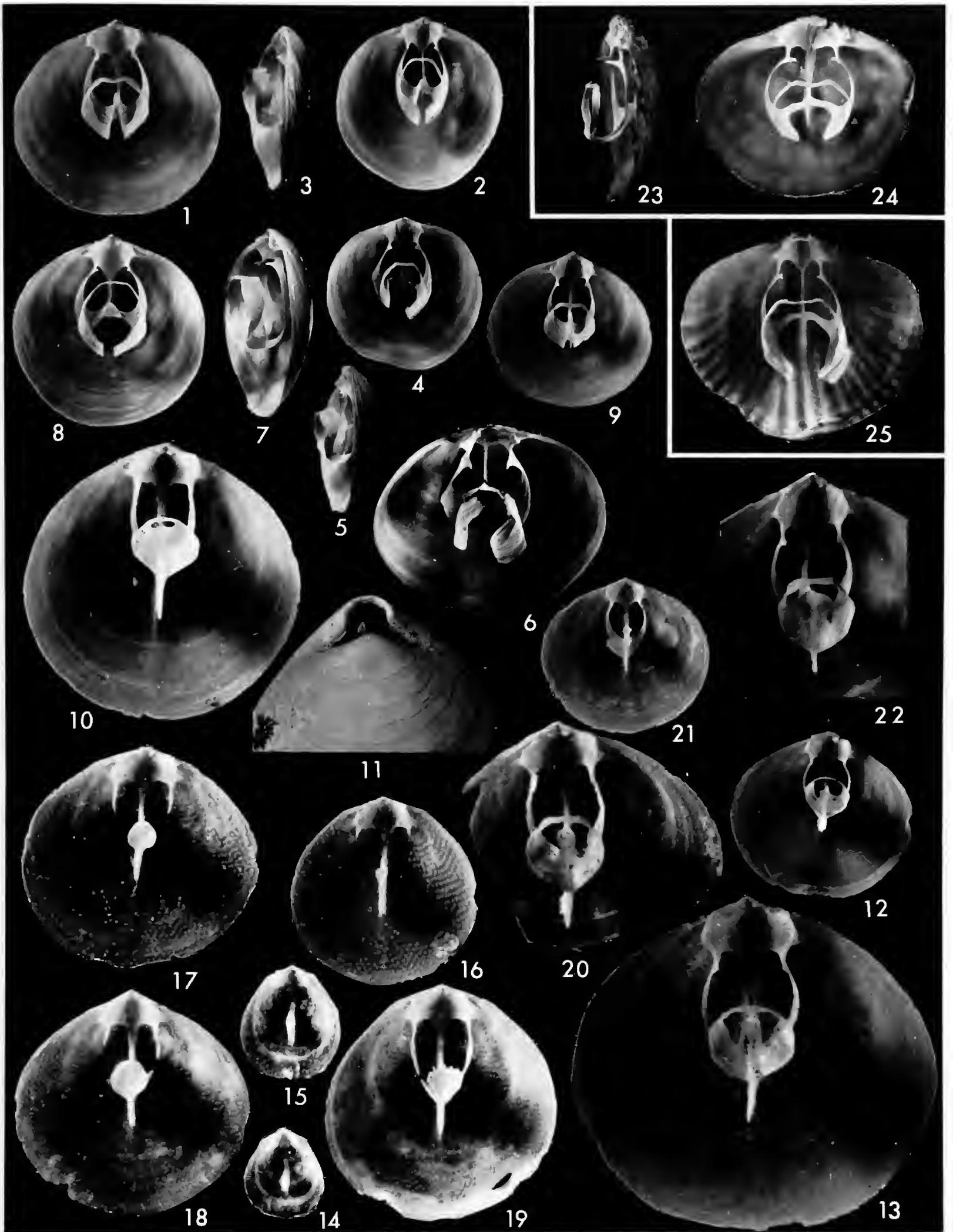


PLATE 7

FIGURES 1-22.—*Dyscritosia secreta*, new species: 1, young adult with loop almost in adult stage, $\times 3$, paratype, USNM 551169c; 2, 3, ventral and side views of a young adult, $\times 2$, USNM 551168p; 4, 5, adult individual in ventral and side views, $\times 2$, showing broad ascending and transverse bands of the loop, paratype, USNM 551169d; 6, the same, $\times 3$, with transverse band broken and showing lateral connecting bands freed from median septum; 7, 8, side and ventral views of another large adult, $\times 2$, showing broad ascending and transverse bands, paratype, USNM 551169e; 9, young specimen with well-developed ring and descending and ascending branches joined, $\times 3$, paratype, USNM 551169b; 10, ventral view of a young dorsal valve with well-developed ring, $\times 10$, USNM 551171a. (*Islas Orcadas* cruise 575, sta 22, $54^{\circ}02.8'S$, $037^{\circ}23.7'W$, at 66-75 m.) 11, posterior of the holotype, $\times 3$, showing wide foramen, unmodified by deltidial plates, USNM 551169a; 12, 13, 2 specimens of nearly the same size, 1 at $\times 5$, the other at $\times 10$, showing large ring and the septum with deep depression dividing it into 2 ridges, paratypes, USNM 551169g, f. (*Islas Orcadas* cruise 575, sta 89, $54^{\circ}44.2'S$, $037^{\circ}11.2'W$, northeast side of South Georgia, at 225-265 m.) 14, 15, young specimens, $\times 10$, with pillar developed, the larger showing a swelling on the crest of the pillar, the start of the cone, paratypes, USNM 551168f, g; 16, a larger specimen, $\times 10$, showing initial cone, septum extending posteriorly and rudiments of the descending branches just appearing, paratype, USNM 551168h; 17, a specimen larger than preceding, $\times 10$, showing expanding cone and lengthening descending branch rudiments but no indication of the ascending branch rudiments, paratype, USNM 551168n; 18, specimen of nearly the same size as the preceding, $\times 10$, and showing large cone not yet breached, and ascending branch rudiments, paratype, USNM 551168j; 19, young specimen, $\times 10$, with broken ring but descending and ascending rudiments joined, paratype, USNM 551168i; 20, incomplete specimen with enlarged ring and lateral elements of the loop complete, $\times 10$, note small cardinal process, paratype, USNM 551168o; 21, specimen, $\times 5$, with broken ring showing lateral elements attached to septum (pillar) under remnants of the ring, paratype, USNM 551168k; 22, well-preserved juvenile loop, $\times 10$, paratype, USNM 551168-1. (*Islas Orcadas* cruise 575, sta 26, $53^{\circ}43.1'S$, $036^{\circ}49.3'W$, northeast side of South Georgia, at 188-192 m.)

FIGURES 23, 24.—*Waltonia inconspicua* (Sowerby): Side and ventral views, $\times 2$, of the dorsal valve interior showing the adult loop, hypotype, USNM 551244a. Introduced for comparison with the loop of *Dyscritosia* (see Figure 8). (Guano Rocks, north of Bream Head, North Island, New Zealand.)

FIGURE 25.—*Terebratella dorsata* (Gmelin): Interior of the dorsal valve showing adult loop, $\times 2$, for comparison with *Terebratella* species, on Plate 5: figures 12, 13 (*Eltanin* cruise 11, sta 974, $53^{\circ}32'S$ - $53^{\circ}34'S$, $064^{\circ}57'W$ - $064^{\circ}55'W$, east of Rio Grande, Argentina, at 124-119 m).



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