# PROSOBRANCH GASTROPODS FROM SIGNY ISLAND, ANTARCTICA: BUCCINACEA AND MURICACEA

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ABSTRACT. Descriptions of new species of neogastropod belonging to the genera *Prosipho*, *Proneptunea* and *Trophon* are presented along with notes on other species from Signy Island, South Orkney Islands, Antarctica. The majority of species were collected in shallow sublittoral habitats. It is suggested that in the sublittoral zone considerable local speciation has occurred through both physical and biological isolation of the islands within the Scotia Arc.

## INTRODUCTION

This paper is the third in a series on new and interesting species of prosobranch gastropods from Signy Island, South Orkney Islands, Antarctica (60° 43′ S, 45° 38′ W). The material was collected by one of us (G.B.P.) between 1975 and 1977. Most of the specimens were collected at rocky sites in the depth range 2–15 m by divers using a portable suction sampler (Hiscock and Hoare, 1973). This was the first time that an Antarctic sublittoral area had been sampled by this method with the result that a considerable number of new prosobranch taxa have been discovered (Oliver, 1982, and in press; Ponder, in press).

## COLLECTION SITES

Borge Bay, on the sheltered east coast of Signy Island, is fringed by a rocky coastline and dotted with numerous islands and submerged rocky outcrops. In the sublittoral, hard substrates of bedrock, boulders, cobbles, stones and pebbles extend from the shore to no more than 15 m depth before merging with the soft sediment of the bay. On islands and submerged outcrops, hard substrates can be found down to 30 m. Depths ranging from 30 to 100 m are encountered in the basin of the bay, which has a gently sloping bottom.

All sites in the depth range 2–30 m, and Balin Rocks, Bare Rock, Billie Rocks and Cam Rock, have a hard substrate. Although ice-scour prevents the establishment of a permanent algal cover in the 0–2 m depth range, many areas in Borge Bay below the level of scour bear a profuse and diverse cover of perennial macroalgae. This in turn provides food and shelter for a rich epifaunal community. Characteristic algae are the Phyophyceae *Himantothallus grandifolius*, *Desmarestia anceps* and *Ascoseira mirabilis*, and the Rhodophyceae *Plocamium secundatum*, *Gigartina apoda*, *Leptosarca simplex* and *Phyllophora* sp. Vertical and concave surfaces lacking algae usually support sponges, bryozoans, brachiopods, anemones and gorgonians. The variety and abundance of epifauna varies with location, but generally includes amphipods, isopods, pycnogonids, holothurians, starfish, sea urchins, nemertean worms, molluscs and fish. A detailed account of the shallow rocky substrates in

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Borge Bay, their macroalgal cover and some of the animals found in association with the algae, is given in Richardson (1979).

Sites at 35 m depth and in the range 80–100 m are in the basin of the bay, with a substrate of patchily distributed small stones and cobbles set in muddy sand. Collection at all these sites was by means of an Agassiz trawl. Macrofauna at the 35 m site consisted of sponges, holothurians and starfish. Sites in the 80–100 m range were in an area of the bay approximately 2 km north-east of the British Antarctic Survey station. Principal members of the epifauna in this area are sponges, anemones, alcyonarians, bryozoans, holothurians, isopods, pycnogonids and starfish.

### Ecology of Prosobranchs at Signy Island

Shallow sublittoral sites with a perennial algal cover have a rich prosobranch fauna. Within the depth range 2–12 m at Billie Rocks, for example, areas of only 0.25 $m^2$ may contain up to 7000 individuals and 28 species of prosobranchs. The majority of these are small, cryptic rissoids and eatoniellids, and the most abundant species is *Eatoniella kerguelenensis major* Strebel 1908 (Picken, 1980*b*). The ecology of several of the large species, including the trochid *Margarella antarctica*, and littorinids *Pellilitorina pellita, P. setosa, Laevilacunaria antarctica* and *Laevilacunaria bennetti*, has been studied in some detail. Most species exhibit slow, seasonal growth, are longevious in comparison with temperate species, have a low production to biomass ratio, and reproduce without a free pelagic larval state (Picken, 1979*a, b*, 1980*a*).

Superfamily: BUCCINACEA
Genus: *Prosipho* Thiele, 1912
Type species: *Prosipho gaussianus* Thiele 1912

Shells of this genus are very small, fusiform with a thick epidermis. Some species are sinistral. The sculpture consists of spiral keels which occasionally are nodulose or tuberculate. The central teeth of the radula are tricuspate. The lateral teeth characteristically possess a long basal process and can be biscuspid or fan shaped with up to six denticles. Thirty-two species have been described but no revision has been made.

***Prosipho iodes* n. sp.** (Figs. 1a, b; 5a–c)
*iodes* – Gr. ferrous – pertaining to the colour of the shell.

*Material:* Billie Rocks, Borge Bay, Signy Island, 2–12 m, 3 specimens.
*Holotype:* NMW.1979.002.77.
*Paratype:* NMW.1979.002.76.

| *Dimensions:* Height | Breadth |
|---|---|
| 7.2 mm | 4.0 mm Holotype |
| 3.25 mm | 2.0 mm Paratype |

*Diagnoses*

*Shell:* Small fusiform of 5½ whorls, relatively short-spired with rounded periphery. Protoconch of 1½–1¾whorls (Fig. 9). Teleoconch carinate, spire whorls with increasing 2–3 rounded keels and a narrow subsutural ramp. Body whorl increasing 3–4 rounded keels plus up to 4 basal cords decreasing in size towards the short siphonal canal. Aperture ovate-pyriform, relatively wide, more than $^1/_3$ the

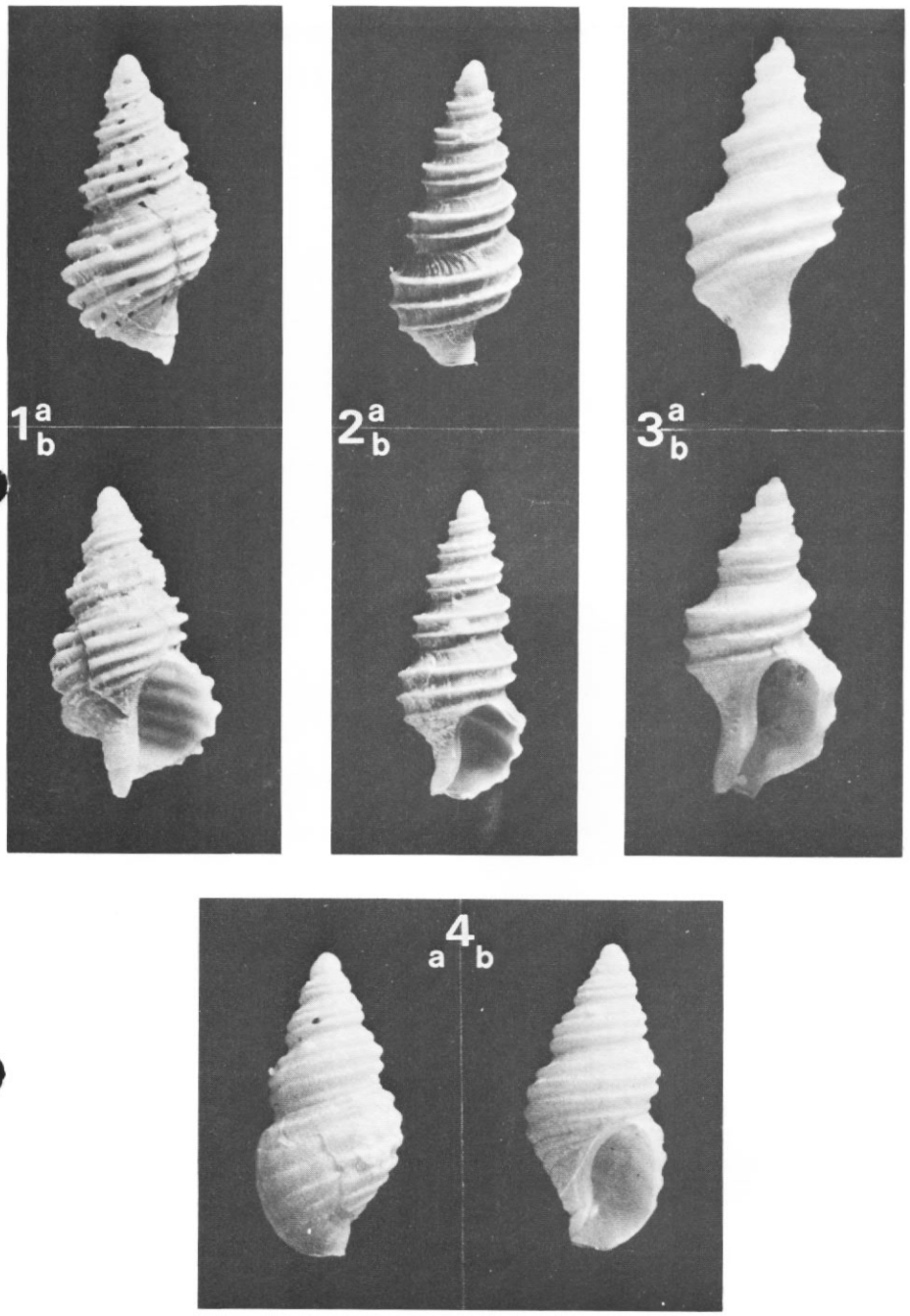
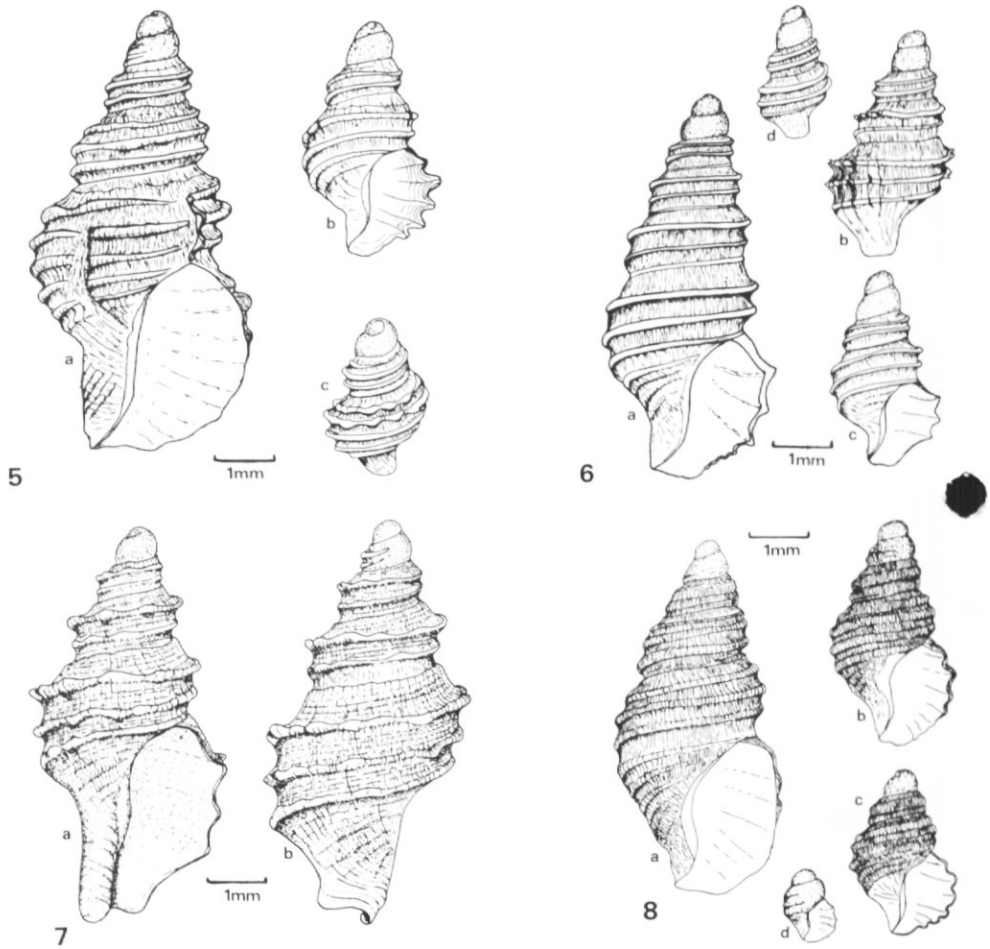



Fig. 1a, b. *Prosipho iodes* n.sp. Holotype, NMW.Z.1979.2.77; ×5.9, real height 7.2 mm.
Fig. 2a, b. *Prosipho turrita* n.sp. Holotype, NMW.Z.1979.2.78; ×5.8, real height 7.3 mm.
Fig. 3a, b. *Prosipho amiantus* n.sp. Holotype, NMW.Z.1979.2.86; ×6.8, real height 6.5 mm.
Fig. 4a, b. *Prosipho crassicostatus* Melvill and Standen. NMW.Z.1979.2.75a; ×6.9, real height 6.1 mm.




Figs. 5–8. Line drawings of four species of *Prosipho* showing size ranges where possible. Figs. 5a–c, *P. iodes* n.sp.; Figs. 6a–d, *P. turrita* n.sp.; Figs. 7a–b, *P. amiantus* n.sp.; Figs. 8a–d, *P. crassicostatus* Melvill and Standen.

height of the shell. Umbilicus absent. Periostracum thin, rust brown, spiral keels and cords paler.

*Operculum:* Ovate with a terminal nucleus.

*Radula:* 1–1–1. Central tooth tricuspid, laterals bicuspid with a long base and prominent inner lateral process (Fig. 13). The authors apologize for the poor quality of this electron micrograph but lack of material prevents the preparation of more mounts.

*Remarks*

The radular form closely allies this species to *P. astrolabiensis* Strebel 1908 from South Georgia. Examination of S. Georgian material shows that *P. astrolabiensis* bears much weaker spiral sculpture than *P. iodes* and has a pale periostracum, giving it a much closer resemblance to *P. crassicostatus*.

***Prosipho turrita* n.sp.** (Figs. 2a, b; 6a–d)
*turrita* – L. pertaining to the tall spired form of the shell.
*Cerithium georgianum* Melvill and Standen, 1907, p. 134.

*Material:* Borge Bay, Signy Island, 2–12 m, 100+ specimens.
*Holotype:* NMW.1979.002.78, stn. CAM A, Cam Rocks.
*Paratypes:* NMW.1979.002.79–85 and AMS.
*Dimensions:*

| Height | Breadth |
|---|---|
| 7.3 mm | 3.1 mm Holotype |
| 7.05 mm | 3.0 mm Paratype |
| 6.3 mm | 2.8 mm Paratype |
| 6.2 mm | 2.9 mm Paratype |
| 4.7 mm | 2.5 mm Paratype |
| 4.2 mm | 2.0 mm Paratype |

*Diagnoses*

*Shell:* Small elongate fusiform, almost cerithiid in form, of 7½ whorls. Protoconch of 2 whorls (Fig. 10). Teleoconch carinate, 2 keels on each spire whorl plus a weak sutural cord, body whorl with 2 keels and a prominent sutural cord. Base with 4–5 cords decreasing in prominence towards the short siphonal canal. Aperture narrowly ovate, pyriform, proportionately small, less than ⅓ the height of the shell. Umbilicus absent. Periostracum thick, forming vertical striae between the keels which may develop as distinct lamellae, rust brown with pale to white cords.

*Radula:* 1–1–1. Central tooth tricuspid, laterals bicuspid with an occasional denticle on the front edge of the inner cusp, base short (Fig. 14).

*Remarks*

Re-examination of the specimens of *Cerithium georgianum* Martens and Pfeffer, 1886, mentioned by Melvill and Standen (1907), shows them to be conspecific with *Prosipho turrita*. Martens and Pfeffer's description of *C. georgianum* is sufficiently clear to dispute Melvill and Standen's assertions that the two were identical; there are distinct differences in the aperture, periostracum and relative whorl number.

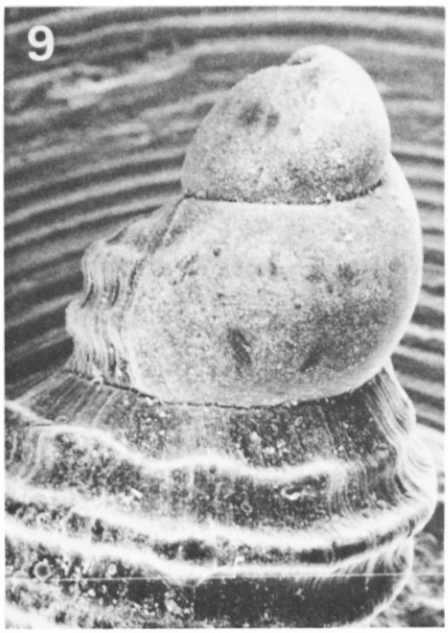
***Prosipho amiantus* n.sp.** (Figs. 3a, b, 7a–c)
*amiantus* – L. having the appearance of a fibrous mineral – referring to the periostracum.

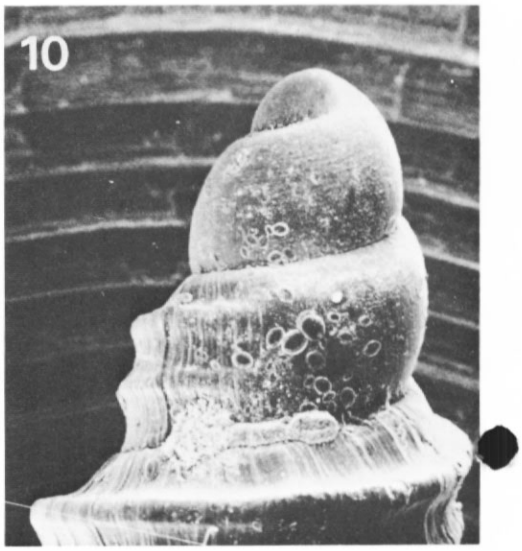
*Material:* Borge Bay, Signy Island, 80–100 m, 24 specimens.
*Holotype:* NMW.1979.002.86
*Paratypes:* NMW.1979.002.87 and AMS.
*Dimensions:*

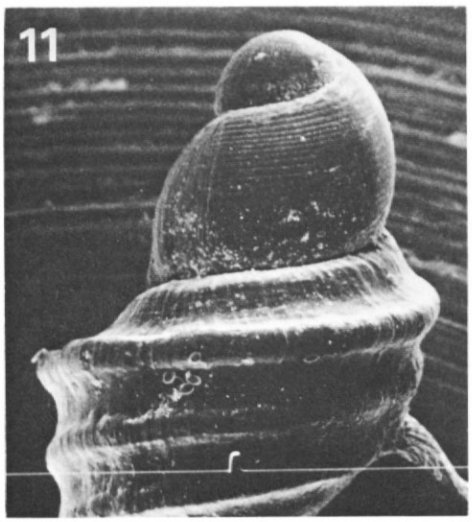
| Height | Breadth |
|---|---|
| 6.5 mm | 3.3 mm Holotype |
| 6.65 mm | 3.6 mm Paratype |
| 6.3 mm | 3.2 mm Paratype |
| 6.1 mm | 3.4 mm Paratype |
| 4.4 mm | 2.6 mm Paratype |
| 4.1 mm | 2.45 mm Paratype |

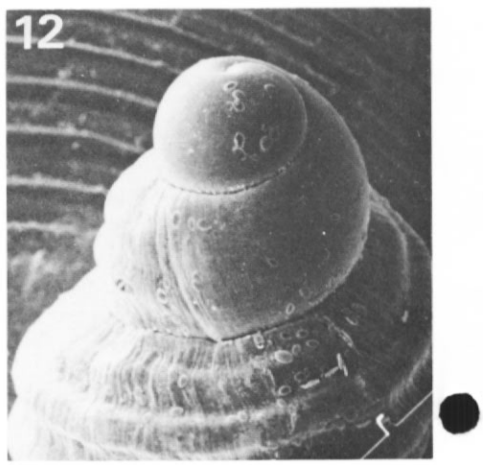
*Diagnoses*

*Shell:* Small, fusiform, short spire, of 5½ whorls. Protoconch of 1½ whorls (Fig. 11). Teleoconch carinate with 2 keels on the spire whorls and 3 on the body whorl.



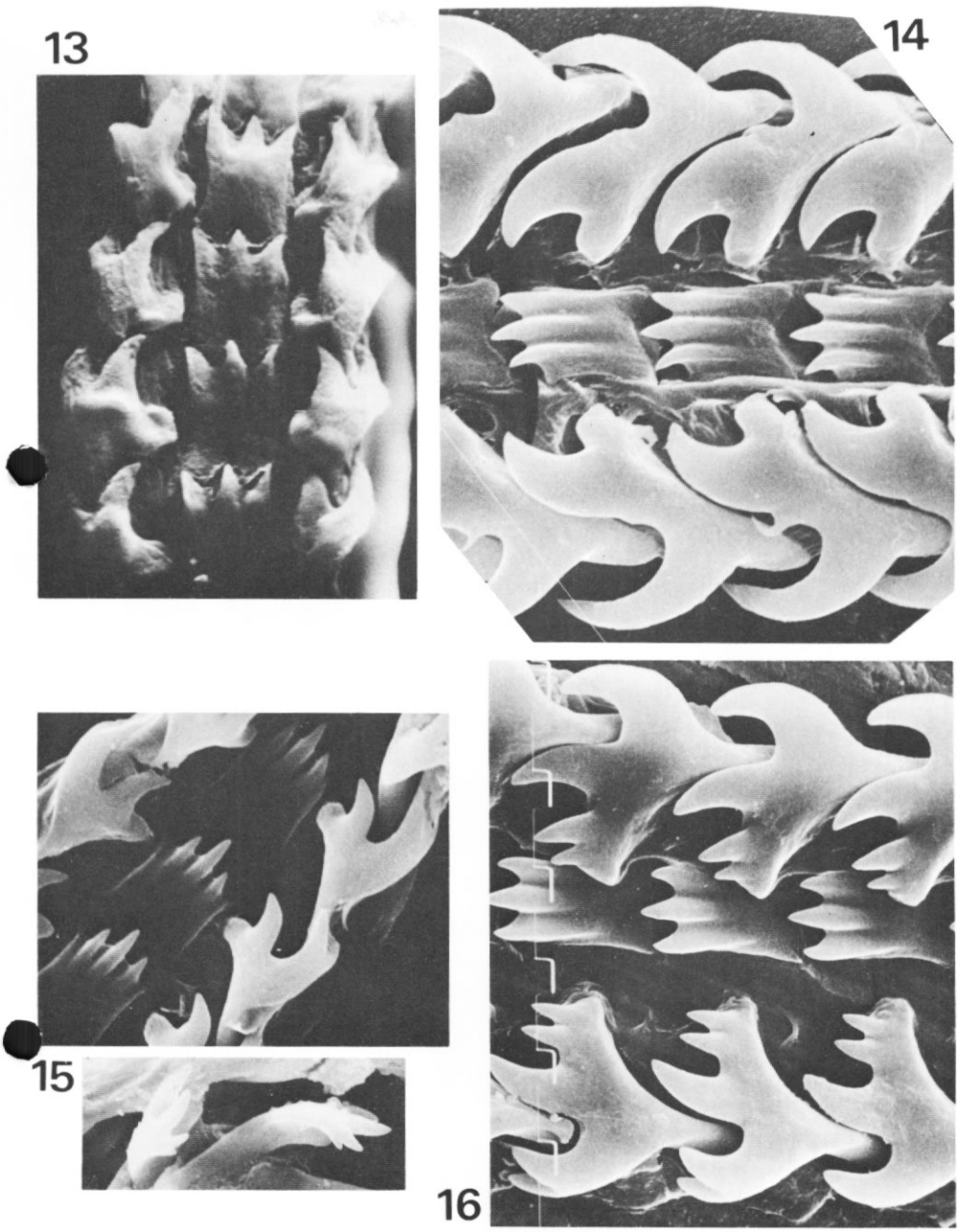




Figs. 9–12. Scanning electron micrographs of the protoconchs of *Prosipho* species. All ×50. Fig. 9, *P. iodes* n.sp.; Fig. 10, *P. turrita* n.sp.; Fig. 11, *P. amiantus* n.sp.; Fig. 12, *P. crassicostatus* Melvill and Standen.

The apical keel is the more prominent and clearly shows their irregular undulating formation. Apical region of each whorl ramped, suture slightly channelled. Aperture large, almost half the height of the shell, elongate pyriform. Siphonal canal prominent. Base with 3 weak spiral ridges. Umbilicus absent. Periostracum very thick, white, shining, with numerous vertical striae giving a resemblance to the structure of fibrous minerals such as asbestos.




Figs. 13–16. Scanning electron micrographs of the radulae of *Prosipho* species. Fig. 13, *P. iodes* n.sp., ×1000; Fig. 14, *P. turrita* n.sp., ×1000; Fig. 15, *P. amiantus* n.sp., ×1500; Fig. 16, *P. crassicostatus* Melvill and Standen, ×1500.

*Operculum:* Ovate with a terminal nucleus.

*Radula:* 1–1–1. Central tooth tricuspid, laterals with a long base, basically biscuspid (Fig. 15) but with two small denticles (Fig. 15b) on the outer cusp.

*Remarks*

Of the numerous species of *Prosipho* already described, *P. amiantus* most clearly resembles *P. nodosus* Thiele 1912. The radulae are very similar but differences are found in the sculpture; *P. nodosus* has a distinct transverse element in the form of prominent ridges on the ramp of each whorl. *Prosipho nodosus* is known only from the Davis Sea.

***Prosipho crassicostatus*** Melvill and Standen, 1907 (Figs. 4a, b; 8a–d)
*Chrysodomus (Sipho) crassicostatus* Melvill and Standen, 1907, p. 138, figs. 10, 10a

Material: Billie Rocks, Borge Bay, Signy Island, 2–12 m, 40 specimens. NMW.1979.002.74, 75.

*Diagnoses*

*Shell:* Small (max. height 7.1 mm), fusiform, of 5½ whorls. Protoconch of 1¼–1½ whorls (Fig. 12). Teleoconch cordate, 3 cords on each spire whorl and 4 on the body whorl; the subsutural cord is weak. Base with 4–5 cords or ridges decreasing in development towards the short siphonal canal. Aperture narrowly ovate, outer lip smooth in large individuals but in others distinctly indented by presence of spiral cords. Umbilicus absent. Periostracum thick, pale straw coloured.

*Operculum:* Ovate with a terminal nucleus.

*Radula:* Central tooth tricuspid, laterals with a long base, 2 large cusps, the outer with 1 denticle and the inner process with 2 denticles (Fig. 16).

*Remarks*

*Prosipho chordatus* (Strebel 1908) from South Georgia is similar to *P. crassicostatus* but, as Powell (1951) noted, the number of prominent cords in the former increases from four to six whereas in the latter it is from 3 to 4, including the weak subsutural ridge.

Genus: *Proneptunea* Thiele, 1912
Type species *Proneptunea amabilis* Thiele, 1912

Shells of this genus are small, fusiform with a thick epidermis and are sculptured with prominent spiral keels. The central teeth of the radula are tricuspate. The characteristic laterals are squarish with 5–6 well-formed cusps on the upper edge and a series of small denticles down the outer margin.

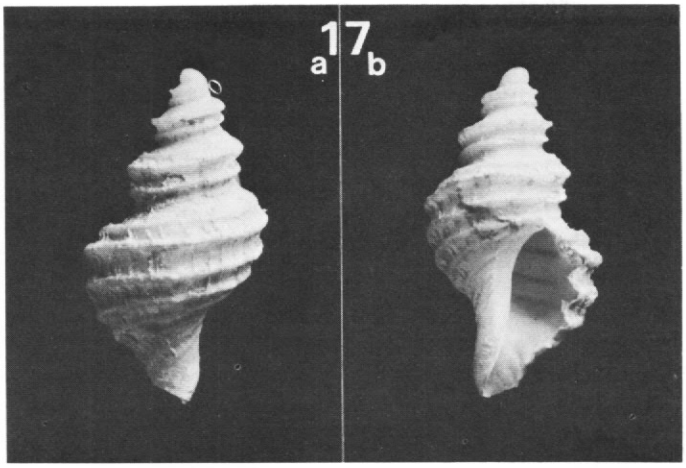
***Proneptunea subfenestrata* n.sp.** (Figs. 17a, b, 19a–c).
*subfenestrata* – L. partly fenestrate (windowed) pertaining to the periostracal lamellae.

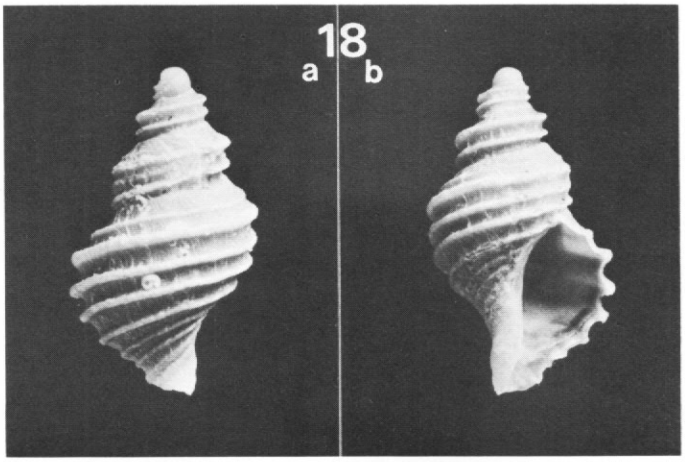
*Material:* Borge Bay, Signy Island, 80–100 m, 3 specimens.
*Holotype:* NMW.1979.002.94.
*Paratypes:* NMW.1979.002.95 and AMS

| *Dimensions:* Height | Breadth | |
|---|---|---|
| 14.8 mm | 8.2 mm | Holotype |
| 14.1 mm | 7.3 mm | Paratype |
| Apex broken | 7.0 mm | Paratype |

*Diagnoses*

*Shell:* Small, fusiform of 5 whorls. Protoconch of 1½ whorls. Periphery of teleoconch rounded with 2 simple prominent keels on each whorl. Subsutural ramp




Figs. 17a, b. *Proneptunea subfenestrata* n.sp. Holotype. NMW.Z.1979.2.94; ×3.1, real height 14.6 mm.
Figs. 18a, b. *Proneptunea rufa* n.sp. Holotype. NMW.Z.1979.2.90; ×3.5, real height 12.3 mm.

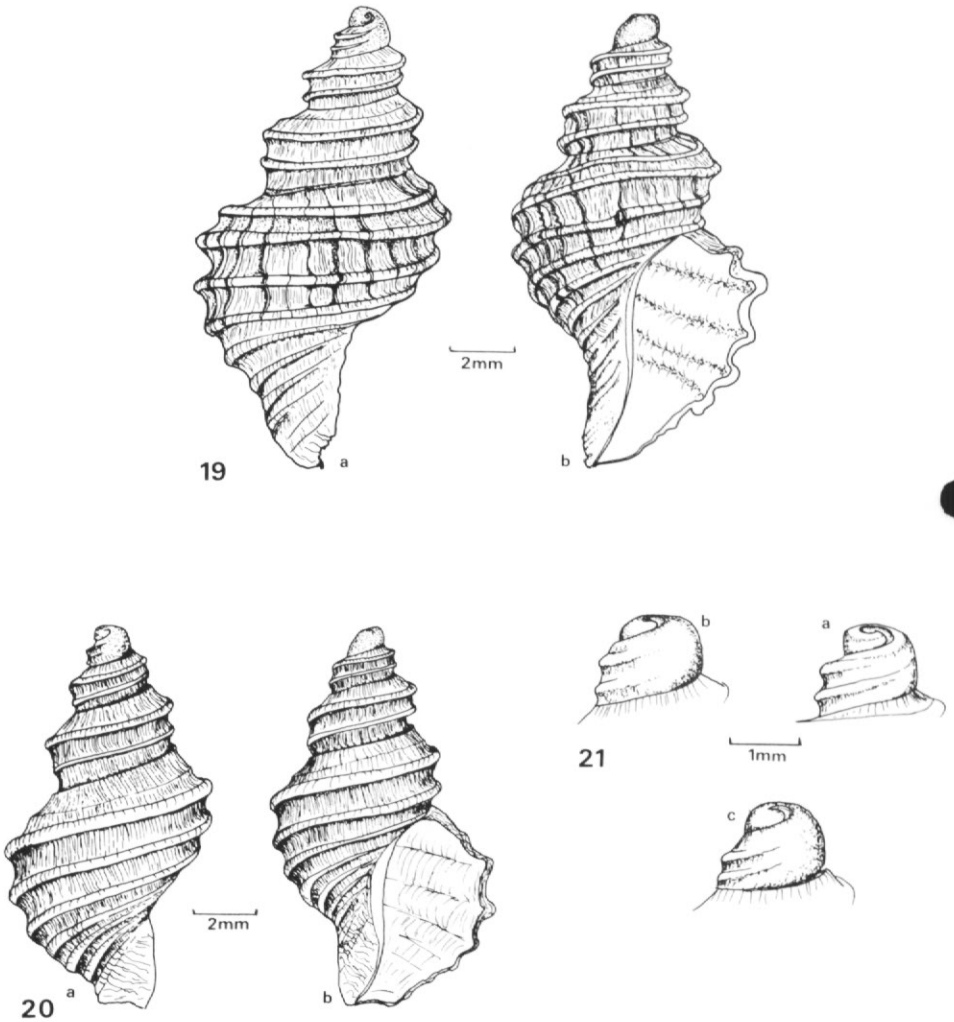
nterrupted by a spiral cord. Base with 5 cords which decrease in size towards the siphonal canal. The ramp and intercarinal areas transversed by very fine axial periostracal lamellae which are often lost. Aperture ovate pyriform, outer lip crenate, siphonal canal short. Periostracum thick, pale straw coloured.

*Operculum:* Small ovate, with a terminal nucleus.

*Radula:* Formula 1–1–1. Central tooth tricuspid, the central cusp is much larger and the lateral cusps may be irregular or even bifid. Lateral teeth broad, with five prominent cusps, the outer cusp bears a number of denticles on its outer edge (Fig. 25).

*Remarks*

Although there are similarities between this species and *Proneptunea fenestrata*, Powell 1951 from South Georgia, there are also significant differences. *P. fenestrata* has a straight-sided, depressed protoconch (Fig. 21a), the periostracal lamellae are




Figs. 19–21. Line drawings of species of *Proneptunea*. Figs. 19a, b. *Proneptunea subfenestrata* n.sp. Figs. 20a, b, *Proneptunea rufa* n.sp. Figs. 21a–c, protoconchs of three species of *Proneptunea*: (a) *P. fenestrata* Powell; (b) *P. subfenestrata* n.sp.; (c) *P. rufa* n.sp.

stronger and the apical keel is bifid (compare Fig. 23 with Fig. 24), and the lateral teeth of the radula have an extra cusp (Fig. 26).

***Proneptunea rufa* n.sp.** (Figs 18a, b, 20a, b).
*rufa* – L. rust coloured – pertaining to the periostracum.

*Material:* Borge Bay, Signy Island, 5–13 m, 6 specimens.
*Holotype:* NMW.1979.002.90, Balin Rock 6. VIII.1976.

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Figs. 22–26. Scanning electron micrographs: Fig. 22, *Proneptunea rufa* n.sp., radula, ×500; Fig. 23, *Proneptunea subfenestrata* n.sp., apical keel on body whorl, ×35; Fig. 24, *Proneptunea fenestrata* Powell, apical keel on body whorl, ×35; Fig. 25, *Proneptunea subfenestrata* n.sp., radula, ×500; Fig. 26, *P. fenestrata,* radula, ×750.


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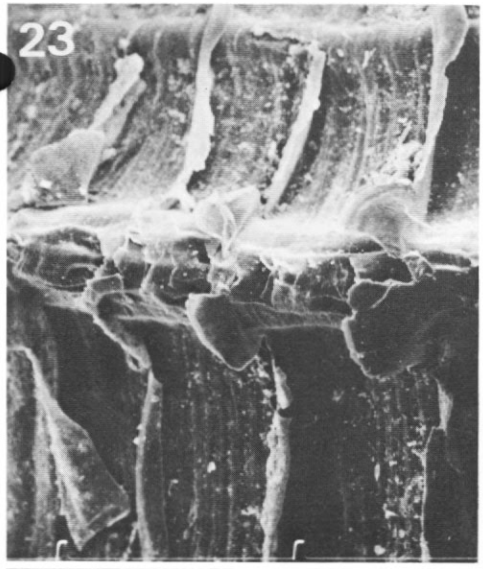
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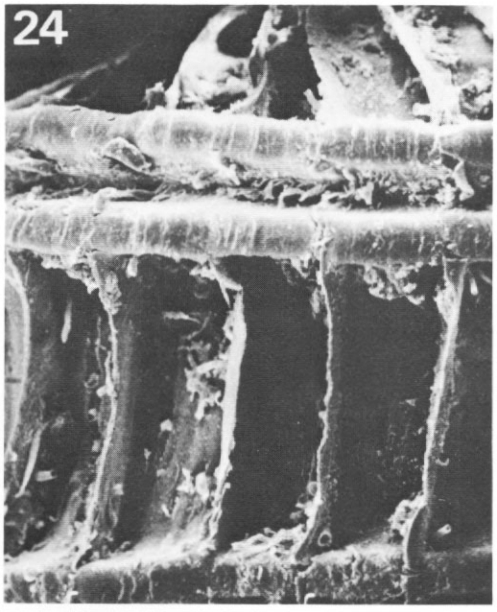
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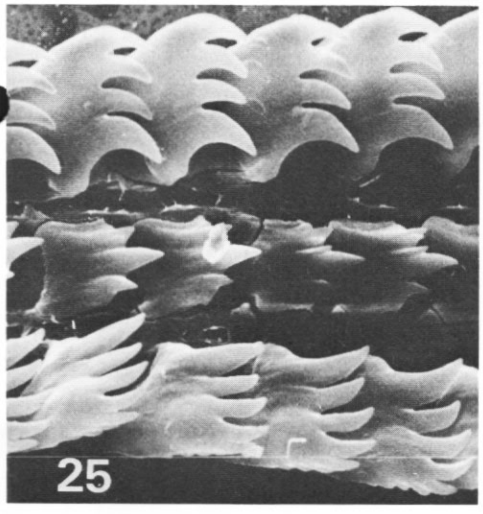
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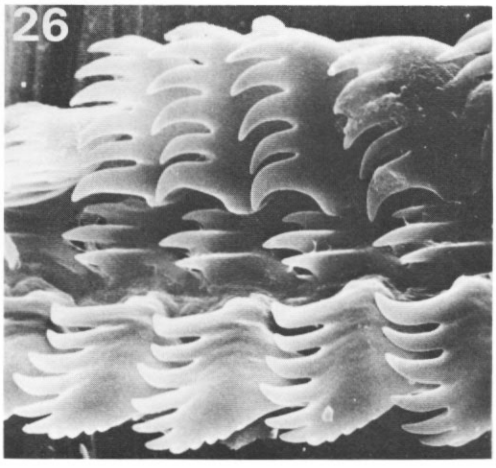
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*Paratypes:* NMW.1979.002.88, 89, 92, 93 and AMS.

| *Dimensions:* Height | Breadth |
|---|---|
| 12.35 mm | 7.15 mm Holotype |
| 12.35 mm | 7.5 mm Paratype |
| 13.1 mm | 7.6 mm Paratype |
| 10.65 mm | 6.6 mm Paratype |
| 10.0 mm | 6.1 mm Paratype |
| 6.1 mm | 4.0 mm Paratype |

*Diagnoses*

*Shell:* Small, fusiform of 4½ whorls. Protoconch of 1¼ whorls (Fig. 21c). Teleoconch carinate, 2 keels on each whorl, sub-sutural ramp large with a very weak ridge, suture sunken, base delineated by a prominent keel and with 5–6 cords decreasing in size towards the siphonal canal. Fine transverse periostracal striations are present over all the surface excluding the keels. Aperture ovate pyriform, outer lip crenate, siphonal canal very short. Umbilicus absent. Periostracum thick, rust brown, keels yellowish.

*Operculum:* Ovate, small, nucleus terminal.

*Radula:* Formula 1–1–1. Central tooth tricuspid, central cusp is much larger than the lateral cusps which may be irregular or bifid. Lateral teeth broad with five prominent cusps, the outer cusp bears a number of denticles on its outer edge (Fig. 22).

*Remarks*

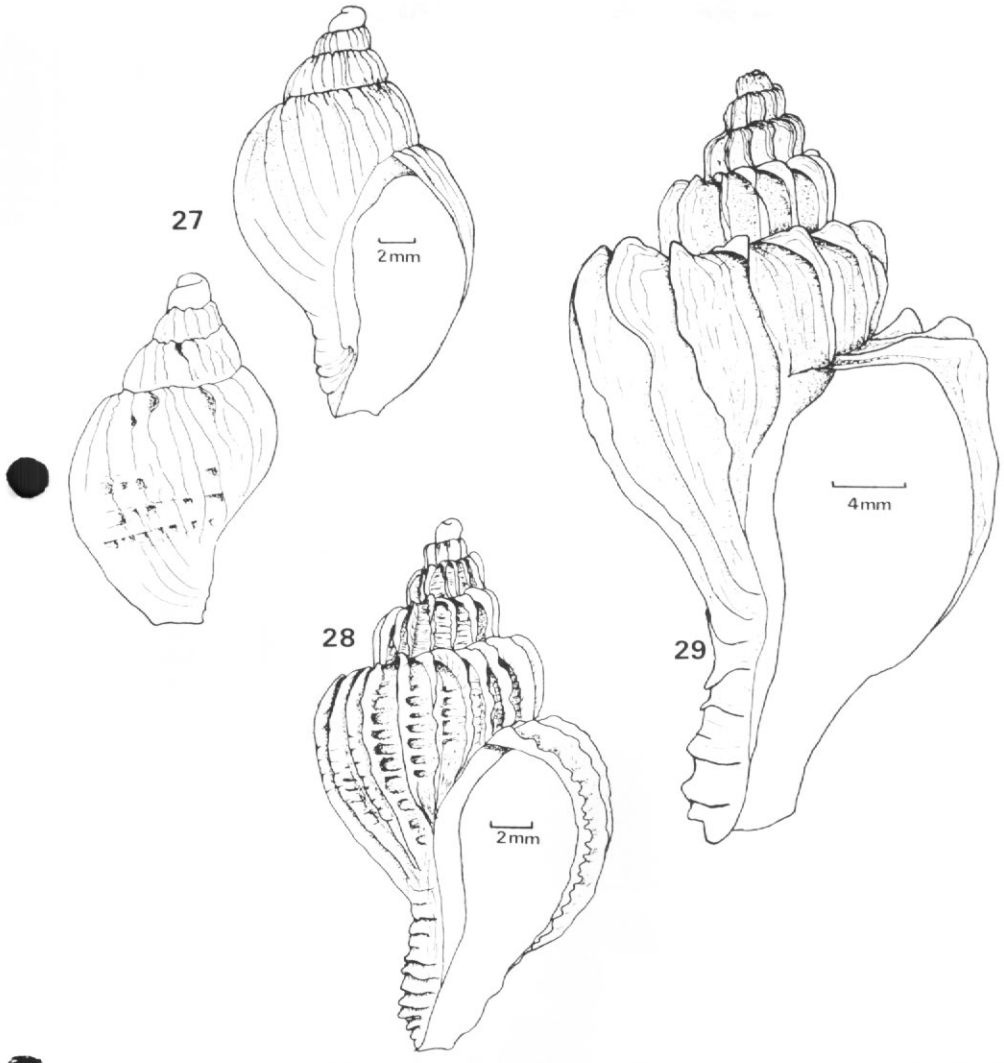
*Proneptunea rufa* is quite distinct from other species of the genus. It has no periostracal fenestrations as in *P. fenestrata* and *P. subfenestrata*. The keels are simple unlike those of *P. duplicarinata* Powell. *Proneptunea amabilis* Thiele has more keels on the body whorl (9–10 against 5–6), has an indistinct subsutural ramp, has a narrower aperture and a thick periostracum which obscures the sculpture.

Superfamily: MURICACEA
Family: TROPHONIDAE
Genus: *Trophon* Montfort, 1810
Type species: *Trophon magellanicus* Gmelin, 1792 (= *geversianus* Pallas, 1769)

Typical *Trophon* has a medium to large globose, thin shell, with axial lamellae and a smooth paucispiral asymmetrical protoconch. The radula consists of a central tooth with an L-shaped lateral on each side. The central tooth is broad and shallow with three main cusps and two intermediates. Operculum horny, ovate with a terminal nucleus. This definition is taken from Powell 1951 and it should be noted that the axial lamellae can be very poorly developed in some species. Powell (1951) using protoconch characters separated all Antarctic and sub-Antarctic species from warm water groups and restricted the genus *Trophon* to the southern cold water forms. In the arctic and northern boreal regions the Trophoninae are assigned to *Boreotrophon* and *Trophonopsis* on the basis of opercular and small sculptural differences. Houart (1981) in a review of European Trophoninae remained sceptical about the separation of the northern and southern coldwater forms. This paper uses Powell's (1951) definition with the realization that the current generic separations are based on few species and variable shell characters.

***Trophon nucelliformis* n.sp.** (Figs. 27a, b: 30a, b).

*nucelliformis* – L. having the appearance of Nucella.

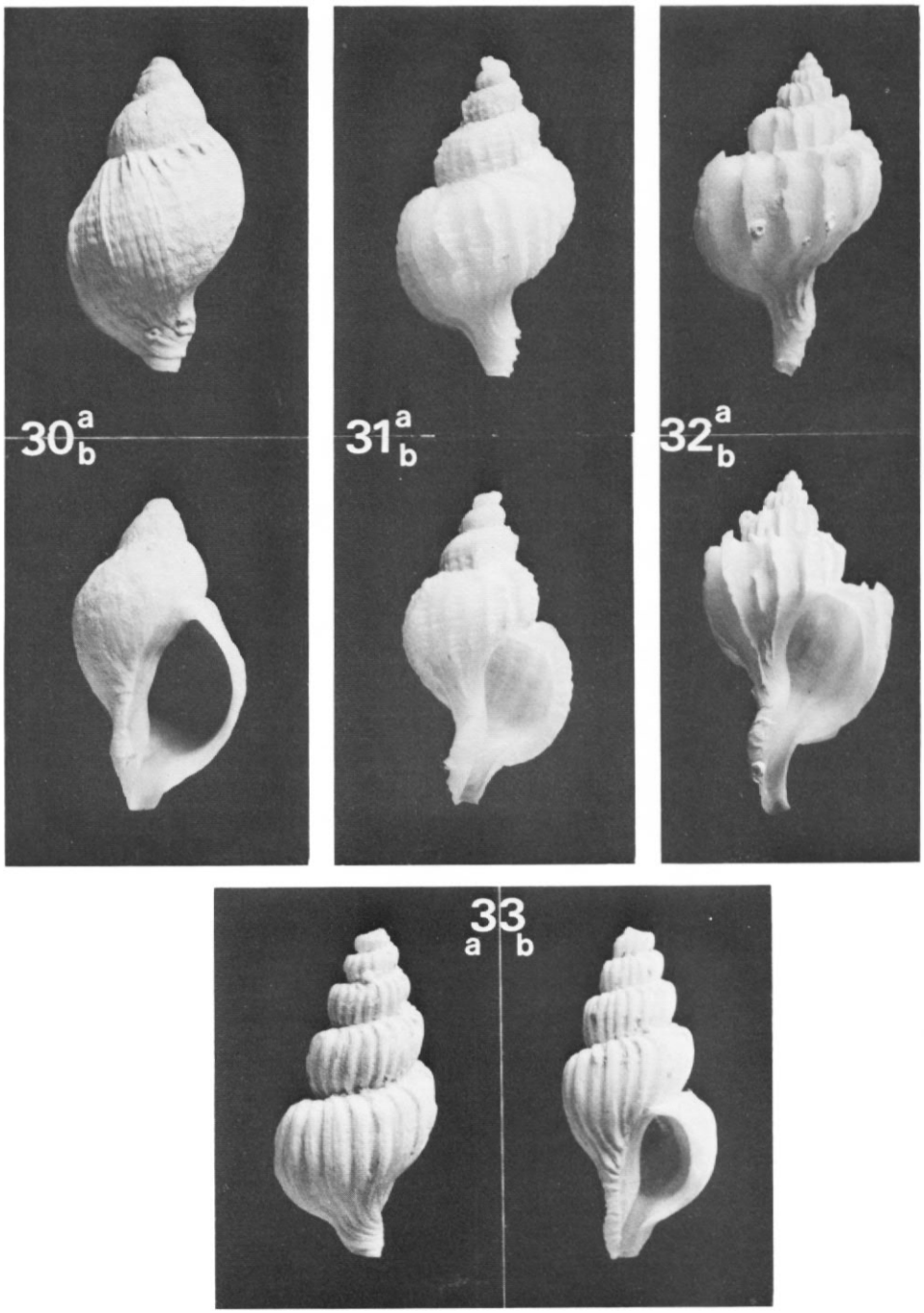



Figs. 27–29. Line drawings of three species of *Trophon*. Figs. 27a, b. *T. nucelliformis* n.sp.; Fig. 28, *T. leptocharteres* n.sp. Fig. 29, *T. shackletoni* Hedley.

*Trophon cinguliferus* Melvill and Standen 1907, p. 136.

*Material:* Borge Bay, Signy Island, 2–20 m, 21 specimens.
*Holotype:* NMW.1979.002.64 st. XI, Cam Rock 04.I.1977.
*Paratypes:* NMW.1979.002.58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70 and AMS.

| *Dimensions:* Height | Breadth | |
|---|---|---|
| 21.6 mm | 12.6 mm | Holotype |
| 23.4 mm | 13.5 mm | Paratype |
| 18.1 mm | 10.9 mm | Paratype |
| 13.6 mm | 8.3 mm | Paratype |
| 9.3 mm | 5.7 mm | Paratype |
| 6.4 mm | 4.1 mm | Paratype |




Figs. 30a, b. *Trophon nucelliformis* n.sp. Holotype. NMW.Z.1979.64; ×2, real height 21.7 mm.
Figs. 31a, b. *Trophon leptocharteres* n.sp. Holotype. NMW.Z.1979.2.54; ×1.8, real height 24.3 mm.
Figs. 32a, b. *Trophon shackletoni* Hedley. NMW.Z.1979.2.73a; ×1.2, real height 40.8 mm.
Figs. 33a, b. *Trophon minutus* Melvill and Standen. NMW.Z.1979.2.72a; ×4.9, real height 9.3 mm.

*Diagnoses*

*Shell:* Moderate size, fusiform, thick, short-spired of 5 whorls. Protoconch 1¼–1½ whorls. Teleoconch with a short spire and a relatively expanded body whorl which makes up approximately 80% of the height. Sculpture weak, of irregular growth lines which may be developed as low ridges adjacent to the impressed sutures. A very weak spiral sculpture of widely spaced lines or low ridges is present in some shells. Aperture large, approximately 65% of the height, oval, outer lip thin, columella smooth, shining. Siphonal canal very short, siphonal fasciole poorly developed. Periostracum very thin, usually worn. Shell dull greyish white except for the pale brown aperture.

*Operculum:* Horny, ovate, nucleus terminal.

*Radula:* Formula 1–1–1. Central tooth tricuspid with a large denticle between the cusps. Lateral teeth simple, L-shaped (Fig. 34).

*Remarks*

There are a number of Antarctic trophons which superficially resemble *Nucella*-like thaids. All, to some degree, have a sculpture of low spiral and axial ridges and the apertures are dull orange to brown in colour. The group includes *T. albolatratus* Smith (1875), *T. cinguliferus* Martens and Pfeffer (1886), *T. brevispira* Martens and Pfeffer (1886), and *T. mawsoni* Powell (1951). Melvill and Standen (1907) recorded *T. nucelliformis* from the South Orkney Islands under the name of *T. cinguliferus*. Strebel 1908 concluded that *T. cinguliferus* was a juvenile *T. albolabratus* and this synonymy persists to this today. Strebel (1908) also noted that no specimen like *cinguliferus* was collected by the Swedish South Polar Expedition although many specimens of *T. brevispira* were found. Specimens resembling *T. cinguliferus* are found only around Îles Kerguelen which is the type locality of *T. albolabratus*. *T. albolabratus* and *T. mawsoni* possess a well-developed spiral sculpture overlain with weak axial ridges. The whorls are rounded and meet the sutures at approximately 90°. In *T. brevispira* and *T. nucelliformis* the sculpture is reduced and the whorls slope into the sutures at an angle. In young specimens of *T. brevispira* (Fig. 39) the sculpture is well formed and consists of raised axial lamellae and spiral ridges in the interspaces. Young *T. nucelliformis* have only irregular axial ridging. In old shells of *T. brevispira* only the flattened remains of the sculpture are present. These larger specimens of *T. brevispira* (Fig. 40) show the characteristic expansion of the aperture making the body whorl up to 2.5 times the breadth of the preceding whorl. In *T. nucelliformis* this expansion does not take place and the body whorl does not exceed 1.8 times the breadth of the preceding whorl.

Picken (1979) discussed the reproductive biology of *T. nucelliformis* (Trophon Species A, p. 119) and described the egg capsules and emerging juveniles. It can be assumed that similar strategies are employed by both *T. brevispira* and *T. albolabratus*. The direct life cycle and great inter-island distance must effectively isolate these forms from each other. For these reasons as well as the morphological differences, they can be regarded as distinct species.

***Trophon leptocharteres* n.sp.** (Figs. 28: 31a, b).

*leptocharteres* – Gr. having slender lamellae – pertaining to the axial sculpture.

*Material:* Borge Bay, Signy Island, 15–30 m, 8 specimens.
*Holotype:* NMW.1979.002.54, Bare Rock, 01.IX.1976.
*Paratypes:* NMW.1979.002.50, 51, 52, 53, 55, 56, 57 and AMS.

| *Dimensions:* Height | Breadth | |
|---|---|---|
| 24.25 mm | 13.9 mm | Holotype |
| 26.2 mm | 15.9 mm | Paratype |
| 19.6 mm | 12.2 mm | Paratype |
| 17.4 mm | 10.7 mm | Paratype |
| 15.5 mm | 8.7 mm | Paratype |
| 13.5 mm | 7.9 mm | Paratype |
| 10.1 mm | 6.2 mm | Paratype |

*Diagnoses*

*Shell:* Moderate size, brittle, fusiform, short-spired of 6 whorls. Protoconch 1¼–1½ whorls. Teleoconch with a short spire, body whorl 73–80% of total height. Periphery rounded, sutures slightly impressed. Sculpture of thin raised axial lamellae numbering 17–22 on the body whorl. The lamellae are sinuous, the waves corresponding to weak spiral ridges in the interspaces. In large shells the lamellae are frequently broken and worn and the whole shell is extensively encrusted. Aperture large, ovate pyriform, outer lip thin, columella smooth, siphonal canal short. Shell white to grey.

*Operculum:* Horny ovate, nucleus terminal.

*Radula:* Formula 1–1–1. Central tooth tricuspid with a small denticle between the cusps. Lateral teeth simple, L-shaped (Fig. 35).

*Remarks*

*Trophon leptocharteres* resembles a small form of the magellanic *T. gervesianus*. Of the Antarctic species it is close to *T. echinolamellatus* Powell (1951) and *T. distantelamellatus* Strebel (1908). In *T. echinolamellatus* hollow spines are present at the intersections of the axial and spiral elements of the sculpture. *T. distantelamellatus* (Fig. 41) has well developed but low axial lamellae which are more sinuous due to the deeper fluting at their intersections with the spiral elements. The number of axial lamellae are generally greater in *T. distantelamellatus*; 16–28 on the body whorl compared 16–22 in *T. leptocharteres*. The spacing of the ribs in *T. distantelamellatus* is less; 0.8 mm ± 0.17 on the body whorl in shells ranging in height from 14.3 to 18.6 mm compared to 1.3 mm ± 0.22 in *T. leptocharteres* ranging in height from 15.4 to 17.4 mm. The spiral sculpture of *T. distantelamellatus* is well developed around the siphonal canal giving rise to 2–3 scaled ridges. This feature is entirely absent in *T. leptocharteres*.

***Trophon shackletoni shackletoni*** Hedley, 1911 (Figs. 29; 32a, b)

*Trophon shackletoni* Hedley, 1911 p. 7, pl. 1, fig. 13.
*Trophon shackletoni* Smith, 1915, p. 73.
*Trophon shackletoni* Hedley, 1916, p. 61.
*Trophon shackletoni shackletoni* Powell, 1951, p. 153.
*Trophon shackletoni* Powell, 1958, p. 198.

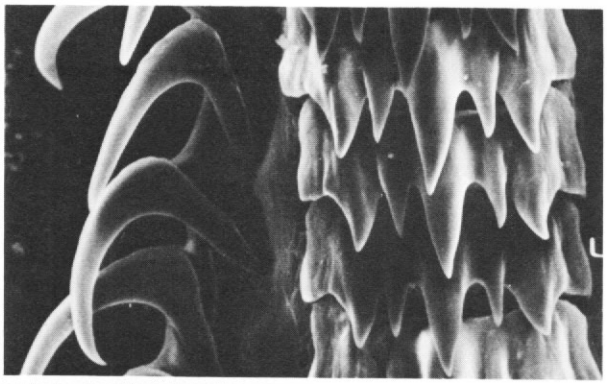
*Material:* Borge Bay, Signy Island, 35 m; 12 specimens. NMW.1979.002.73.

*Remarks*

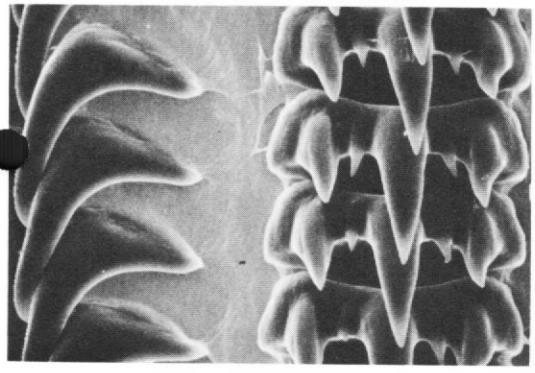
*Trophon s. shackletoni* belongs to a group of Antarctic species which possess prominent raised axial lamellae which are typically projected towards the apex. This

Figs. 34–38. Scanning electron micrographs of the radulae of *Trophon* species. Fig. 34, *T. nucelliformis* n.sp., ×500; Fig. 35, *T. leptocharteres* n.sp., ×350; Fig. 36, *T. minutus* Melvill and Standen, ×750; Fig. 37, *T. shackletoni* Hedley, ×350; Fig. 38, *T. shackletoni paucilamellatus* Powell, ×350.

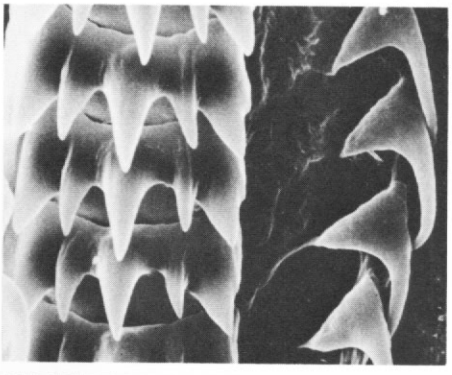
34



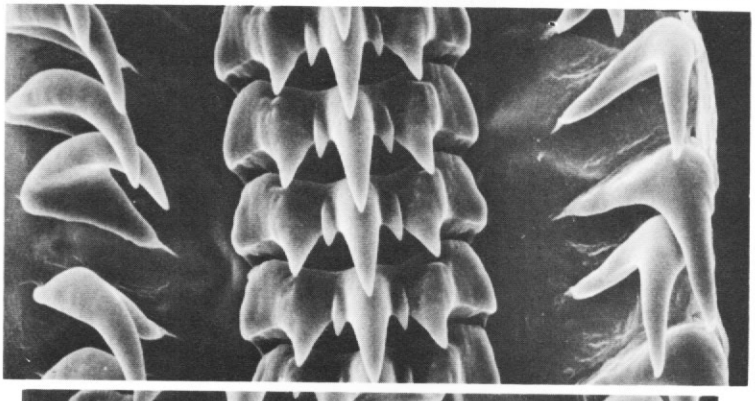
35



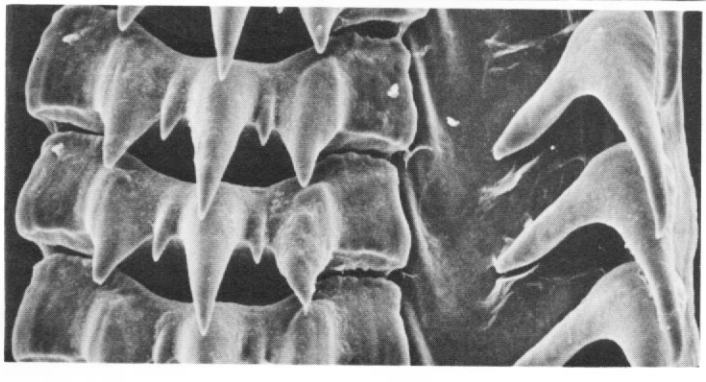
36

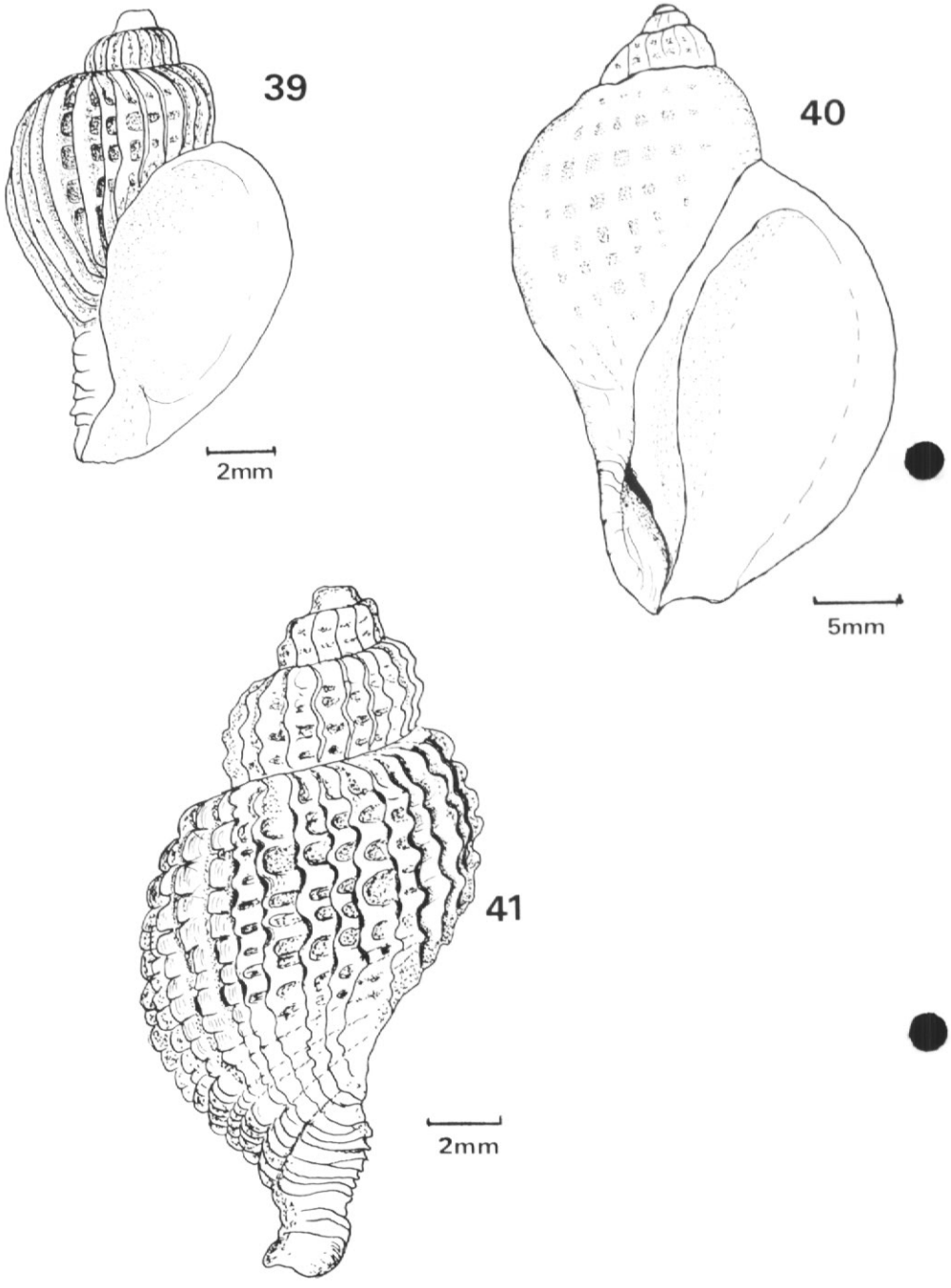


37



38






Figs. 39–41. Line drawings of two species of *Trophon*. Fig. 39, *T. brevispira* Martens and Pfeffer, S. Georgia; juvenile. Fig. 40, *T. brevispira*, S. Georgia; worn, adult shell. Fig. 41, *T. distantelamellatus* Strebel, S. Georgia.

group includes *Trophon longstaffi* Smith, 1907; *Trophon coulmanensis* Smith, 1907 and *Trophon s. paucelamellatus* Powell, 1951. In the Signy Island *T. s. shackletoni* material the number of axial lamellae on the body whorl ranges from 12 to 20. The lamellae are often worn and consequently the degree of projection is also variable. Because of these variations, the taxonomic status of both *T. coulmanensis* and *T. longstaffi* will require reconsideration, but there is insufficient material to do so now. *T. s. paucelamellatus* remains distinct from *T. s. shackletoni*, however, despite the fact that their radulae are similar (Figs. 37, 38), because its spire is relatively shorter and there are only 8 axial lamellae on the body whorl. It is noted that *T. coulmanensis* and *T. longstaffi* occur only in the Ross Sea, that *T. s. shackletoni* is circumAntarctic (including the Ross Sea), but that *T. s. paucelamellatus* is the only species of the group from South Georgia.

***Trophon minutus*** Melvill and Standen, 1907 (Figs. 33a, b)

*Trophon minutus* (Strebel ms.) Melvill and Standen, 1907, p. 107, pl. 1, figs. 7, 7a.
*Trophon minutus* Strebel, 1908, p. 44, pl. 4, fig. 47a, b.
*Trophon minutus* Melvill and Standen, 1912, p. 354.
*Trophon minutus* Powell, 1951, p. 155.

*Material:* Borge Bay, Signy Island, 2–20 m, 25 specimens. NMW.1979.002.71–72.

*Remarks*

This small species (max. height 9.1 mm) with its turreted whorls and numerous (18–23) strong axial lamellae is very distinctive. The radula is typical of the genus but in the central teeth the intermediate denticles are almost equal in size to the three major cusps (Fig. 36). Only *T. condensatus* Hedley, 1916 is comparable but is distinguished by possessing 30 lamellae on the body whorl. *T. condensatus* is recorded only from Terre Adélie. It is possible that *T. condensatus* is a variety of *T. minutus* but of the former only the six original specimens are known and there are no specimens from intermediate localities on which the hypothesis could be tested.

## Discussion

A feature common to many of the species described here from the South Orkney Islands is their similarity to South Georgian congeners. This is especially striking in *Proneptunea subfenestrata* and *Trophon nucelliformis*. The faunistic similarities between South Georgia and South Orkney are noted by a number of workers for different classes of animals (summarized by Knox (1977)) and both island groups are placed within the Antarctic area (Knox, 1977). The Scotia Arc is regarded as a major route for the migration of shelf-dwelling species into the Antarctic area but the presence of distinct but closely related species suggests that there are barriers to the interaction of the populations, at least between South Georgia and South Orkney Islands. Two barriers, one physical the other physiological, may limit genetic exchange and promote speciation.

The lateral distances between the South Orkney Is., South Sandwich Is. and South Georgia are not great, but water depths between each group exceed 2000 m. Although a high proportion of Antarctic shelf species have a eurybathic distribution (Dell, 1966; Knox, 1977) it is not at all certain that adult prosobranchs favouring shallow sublittoral habitats with rocky substrates could successfully migrate between the island groups. Transport on floating algae might occur, but this would be rare and always proceed in an easterly direction in response to the prevailing west wind. There

would therefore appear to be little opportunity for the exchange of adults between the islands. The prospects of interchange by eggs or juveniles are equally remote. All but one of the 13 Antarctic prosobranchs studied so far reproduce without a pelagic larval phase. The eggs they deposit on algae or rocks give rise to fully competent crawling juveniles which are immediately recruited to the adult population (Picken, 1979*a*). Egg masses might be transported between island groups on detached algal fronds, but the level of immigration by this method will be low.

Further intensive, efficient sampling at other locations in the Scotia Arc, particularly South Georgia, the South Sandwich Is. and the South Shetland Is., will provide material for a fuller taxonomic reassessment of Antarctic prosobranchs. At each island group, we expect to find more examples of distinct but closely related gastropod species.

## Abbreviations

NMW.Z.: National Mueum of Wales. Department of Zoology.
AMS: Australian Museum, Sydney.

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