



Recent foraminifera from Goulden Cove of King George Island, Antarctica

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ABSTRACT: Recent foraminifera represented by 24 species belonging to 20 genera are recognized in marine and/or glacio-marine sediment samples collected at water depths of up to 75 m in Goulden Cove (Admiralty Bay) on King George Island, West Antarctica. The foraminifer assemblages are dominated by benthic taxa, such as *Globocassidulina bitor* and *Miliammina arenacea*, the two most abundant species in the studied biocenosis.

Key words: Antarctica, King George Island, Foraminifera, Recent.

Introduction

The Recent Antarctic foraminifera have been known since the early part of the XX century (see Heron-Allen and Earland 1922) and have been studied for many years (Crespin 1960), most recently by Fillon (1975), Anderson (1975), Osterman and Kellogg (1979), Bernhard (1987), Ward and Webb (1986), Ward *et al.* (1987), Mackensen *et al.* (1990), Ishman and Domack (1994), Violanti (1996) and Mayer and Spindler (2000).

During the austral summer of 1986/1987 J. Błaszyk i R. Wiśniewski (members of the 11th Polish Antarctic Expedition to *Arctowski* Station) collected surface-sediment samples from Goulden Cove (Ezcurra Inlet) in Admiralty Bay on King George Island (South Shetland Islands), West Antarctica (Fig. 1). Ten of these samples, collected at three stations from the water depths between about 20 and 75 m (Figs 1–2), have been analyzed and the results are presented here. The results represent a pilot investigation, the monographic study on benthic foraminifera from the Admiralty Bay is currently being prepared by the junior author using sediment cores recovered during the 2002/2003 Antarctic season.

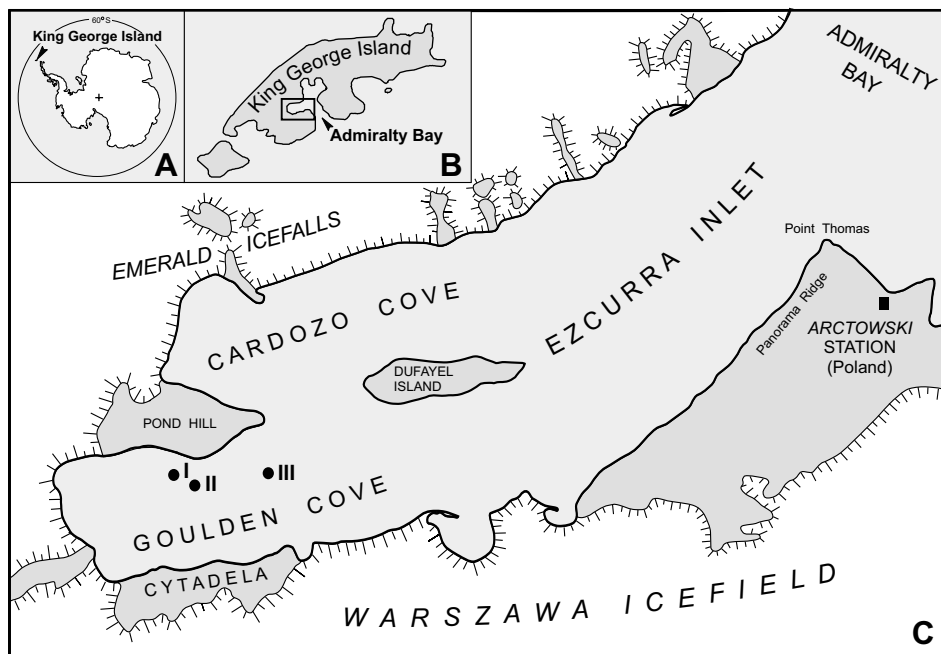


Fig. 1. Map showing the foraminiferal sample locations (Stations I–III) in Goulden Cove, King George Island (C). Insets show the location of King George Island within Antarctica (A) and Admiralty Bay in King George Island (B).

The investigated foraminifer collection is housed at the Institute of Paleobiology of the Polish Academy of Sciences (Warszawa) under the catalogue number ZPAL F.45. All SEM micrographs were also taken at the Institute of Paleobiology.

Setting

The fjord-like Admiralty Bay, the largest bay on King George Island consists of Martel Inlet in the east, Mackellar Inlet in the center, and Ezcurra Inlet in the west (see Battke 1990). The Ezcurra Inlet is subdivided by Dufayel Island and Pond Hill into Cardozo Cove in the north-west and Goulden Cove in the south-west (Figs 1–2). The Admiralty Bay coastline is heavily glaciated with ice cliffs terminating at sea level. The submarine morphology of the bay and its inlets is a result of glacial erosion, mainly during the Pleistocene (Birkenmajer and Marsz 1999).

The Goulden Cove is about 20–80 m deep. The surface sediment samples were collected from the cove at three stations: I – from 20 m, II – from 35 m, and III – from 75 m water depth (Fig. 1C).



Fig. 2. View of Ezcurra Inlet and Goulden Cove as seen from the Point Thomas (Panorama Ridge).

Methods

Ten undisturbed sediment samples were collected using a tube-sampler. The sediment was washed over a 125 μm sieve. Several hundred of benthic and a few planktic foraminifera were picked from residue recovered at each station; however, the number of specimens picked from each sample varied significantly which prevented quantitative analysis of the foraminiferal material. Nevertheless, the large number of recovered specimens justified presenting the qualitative results. The classification scheme of the Order Foraminiferida used here is that of Loeblich and Tappan (1988).

Results

Foraminifera were a common constituent of all samples collected at stations I, II, and III. We recognized 20 genera and 24 species (Figs 3–7, Table 1), but the number of taxa varies between the three stations. The most diverse fauna was recovered from the shallowest Station I (20 m). It included 23 species grouped into 19 genera. In contrast, foraminifera from Station II (35 m), representing intermediate water-depths among the three sites, included 9 species belonging to 7 genera. The deepest fauna from Station III (75 m), exhibited comparatively high diversity with 21 species and 18 genera. Both calcareous and agglutinated benthic foraminifera were found at all stations; however, the planktic *Neogloboquadrina pachyderma* (Fig. 7.1–2) was found only at Stations I and III.

Table 1
Foraminiferal occurrences at Goulden Cove (Admiralty Bay), King George Island. Surface sediment samples have been taken at three stations from different water-depths.

Taxa	Stations		
	I 20 m	II 35 m	III 75 m
<i>Psammosphaera fusca</i>	×		×
? <i>Saccamina</i> sp.	×		×
<i>Lagenamina arenulata</i>	×		×
<i>Miliammina arenacea</i>	×	×	×
<i>Reophax</i> sp.	×		×
<i>Labrospira jeffreysii</i>	×	×	×
<i>Labrospira wiesneri</i>	×	×	×
<i>Paratrochammina bartrami</i>	×		
<i>Portatrochammina antarctica</i>	×	×	×
<i>Spiroplectammina biformis</i>	×	×	×
<i>Pyrgo elongata</i>	×		×
<i>Bolivina pseudopunctata</i>	×		
<i>Rosalina globularis</i>	×	×	×
<i>Cibicides refulgens</i>	×		×
<i>Fursenkoina fusiformis</i>	×		×
<i>Astrononion antarcticum</i>	×		×
<i>Astrononion echolsi</i>	×		×
<i>Nonionella iridea</i>	×		×
<i>Pullenia subcarinata</i>			×
<i>Cassidulinoides parkerianus</i>	×	×	×
<i>Cassidulinoides</i> sp.	×		
<i>Globocassidulina bora</i>	×	×	×
<i>Globocassidulina</i> sp.	×	×	×
<i>Neogloboquadrina pachyderma</i>	×		×

Foraminiferal assemblages were dominated by *Globocassidulina bora* (Fig. 6.4–5) at all sites. However, faunas at Station I and to a lesser extent at Station III, included significant numbers of other taxa, predominantly *Globocassidulina* sp. (Fig. 6.6–7), *Miliammina arenacea* (Fig. 3.6), and *Portatrochammina antarctica* (Fig. 4.4). At Station I, *Spiroplectammina biformis* (Fig. 4.5), *Cassidulinoides parkerianus* (Fig. 6.2), *Reophax* sp. (Fig. 3.7), *Nonionella iridea* (Fig. 5.8) and *Fursenkoina fusiformis* (Fig. 5.5) also occurred in significant numbers.

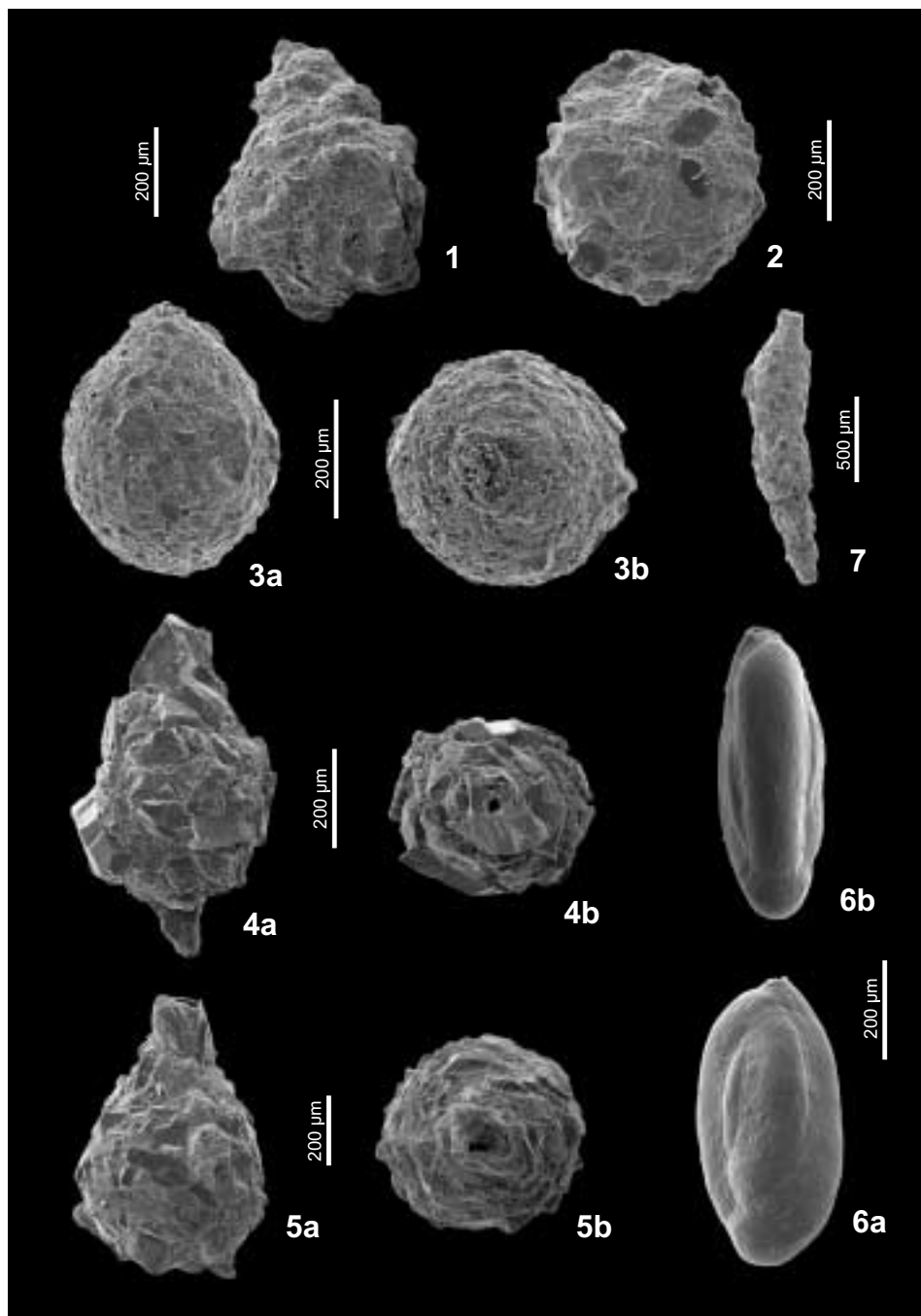


Fig. 3. 1–2. *Psammosphaera fusca* Schulze, 1875; 3a–b. ?*Saccamina* sp.; 4a–b, 5a–b. *Lagenamina arenulata* (Skinner, 1961); 6a–b. *Miliammina arenacea* (Chapman, 1916); 7. *Reophax* sp. 1–3, 6 – Station III; 4, 5, 7 – Station I.

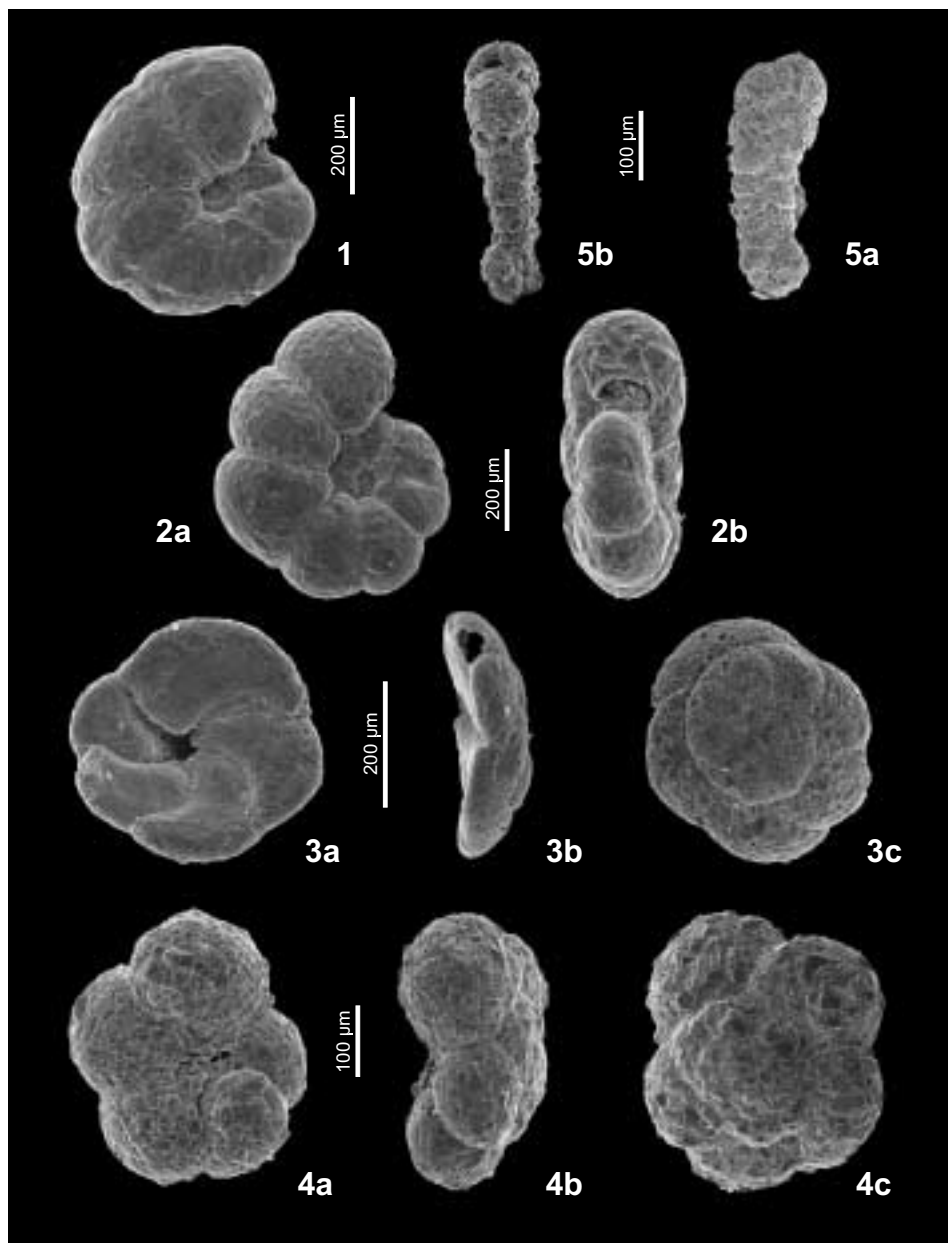


Fig. 4. 1. *Labrospira wiesneri* Parr, 1950; 2a–b. *Labrospira jeffreysii* (Williamson, 1858); 3a–c. *Paratrochammina bartrami* (Hedley, Hurdle et Burdett, 1967); 4a–c. *Portatrochammina antarctica* (Parr, 1950); 5a–b. *Spiroplectammina biformis* (Parker et Jones, 1865).
 1, 3, 5 – Station I; 2, 4 – Station III.

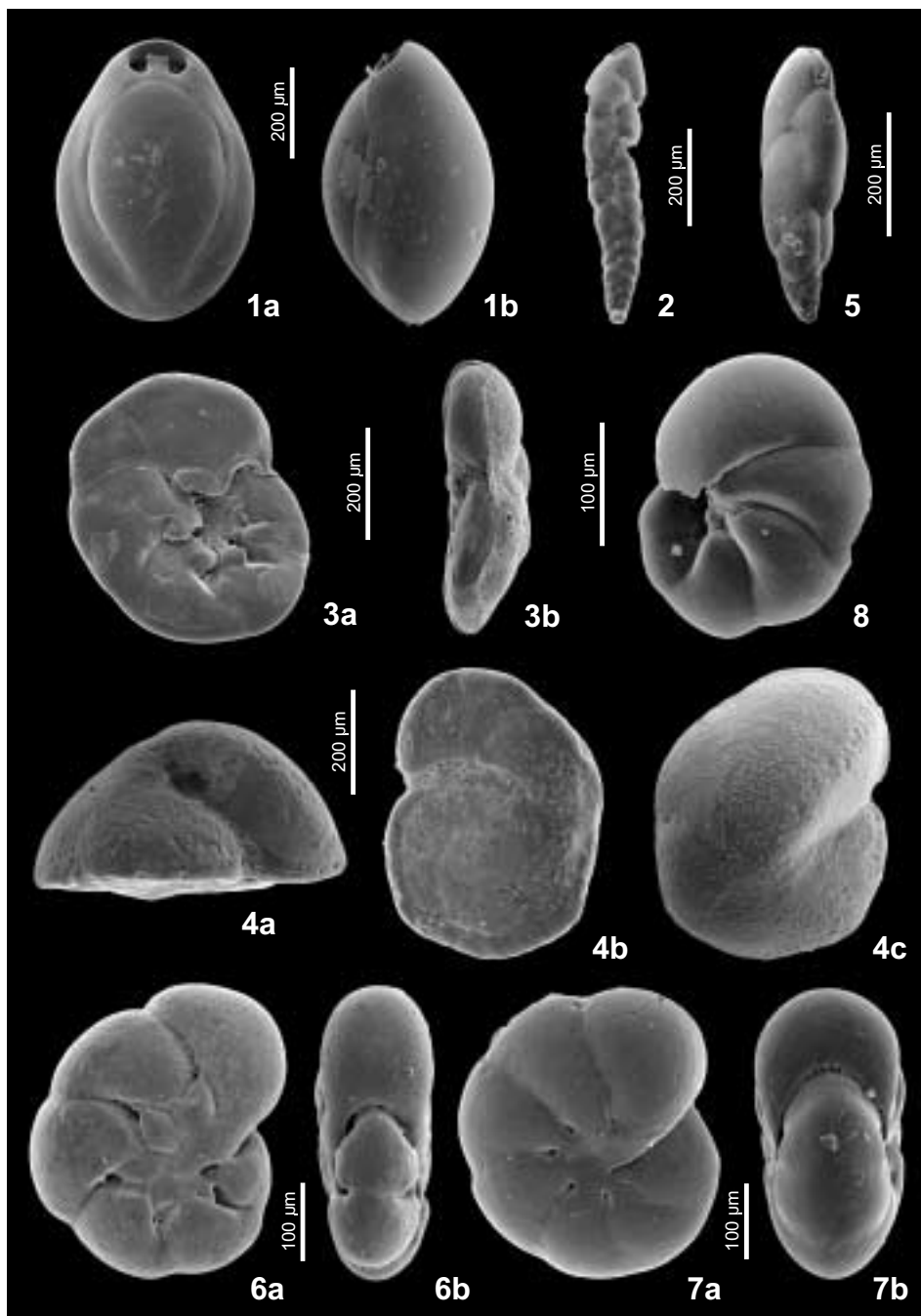


Fig. 5. 1a–b. *Pyrgo elongata* (d’Orbigny, 1826); 2. *Bolivina pseudopunctata* Höglund, 1947; 3a–b. *Rosalina globularis* d’Orbigny, 1826; 4a–c. *Cibicides refulgens* de Montfort, 1808; 5. *Fursenkoina fusiformis* (Williamson, 1858); 6a–b. *Astrononion antarcticum* Parr, 1950; 7a–b. *Astrononion echolsi* Kennett, 1967; 8. *Nonionella iridea* Heron-Allen et Earland, 1932. 1–3, 5, 7–8 – Station I; 4, 6 – Station III.

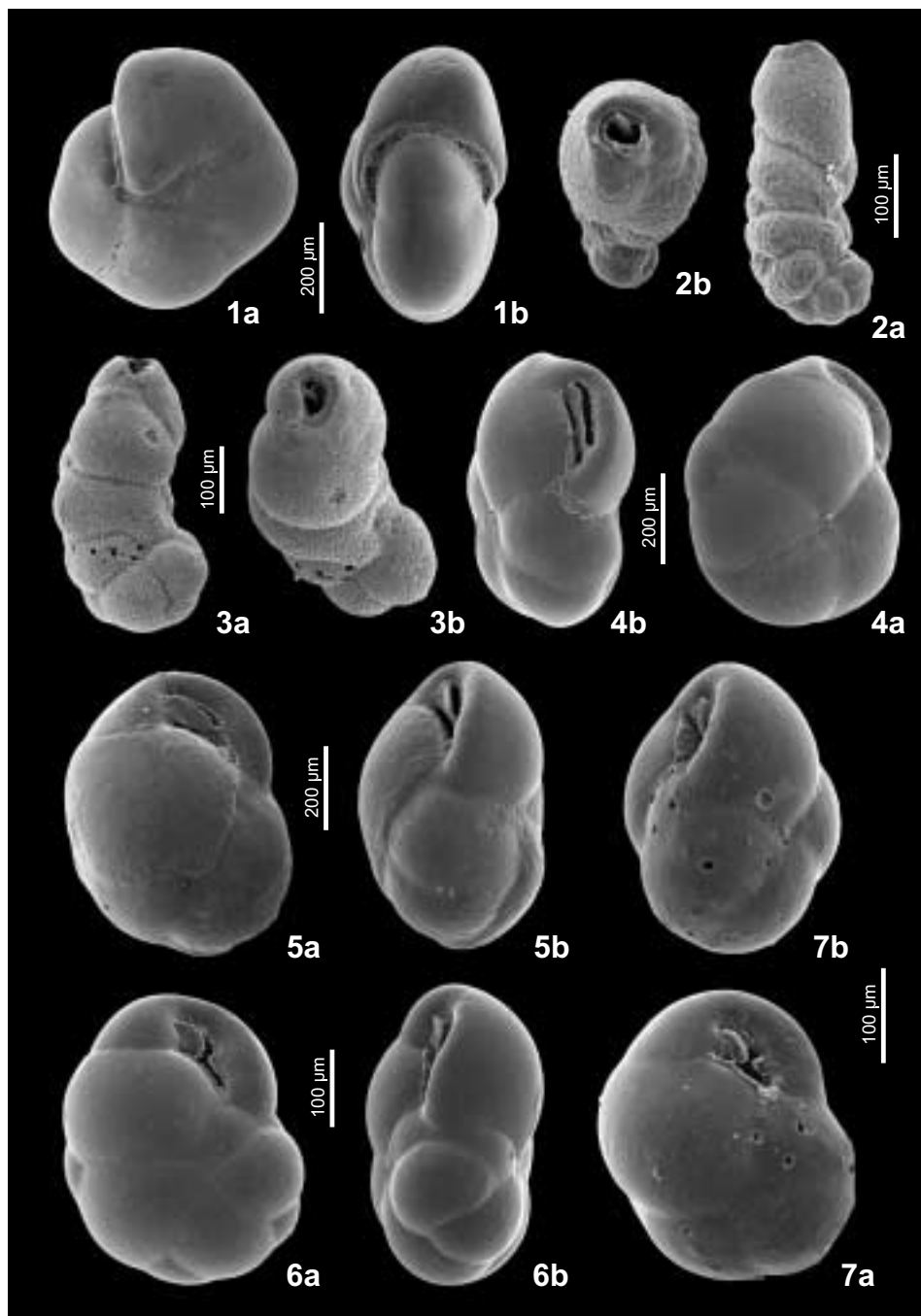


Fig. 6. 1a–b. *Pullenia subcarinata* (d'Orbigny, 1839); 2a–b. *Cassidulinoides parkerianus* (Brady, 1881); 3a–b. *Cassidulinoides* sp.; 4a–b, 5a–b. *Globocassidulina bora* (Crespin, 1960); 6a–b, 7a–b. *Globocassidulina* sp. 1, 4 – Station III; 2–3, 5–7 – Station I.

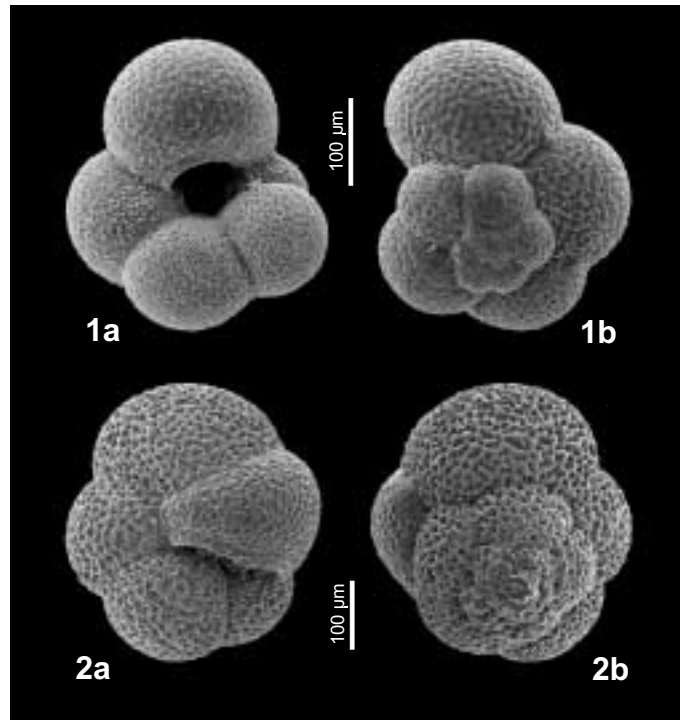


Fig. 7. 1a–b, 2a–b. *Neogloboquadrina pachyderma* (Ehrenberg, 1861). Station I.

Comparative and concluding remarks

The Antarctic bays and fjords like Admiralty Bay on King George Island, represent areas in which glacio-marine sediments have been accumulating at least since the Pleistocene. The occurrence of Recent foraminifera in such areas depends on numerous physical factors including lithology of sediments, oxygen and organic concentrations, as well as bathymetry. Unfortunately, at present, our data do not allow us to assess the importance of these factors to our samples.

The most dramatic differences in foraminiferal composition from Golden Cove are between Station I, and Stations II and III. These differences are difficult to explain in ecological terms. The absence of planktic foraminifera and significantly reduced diversity of faunas recovered from Station II, suggest either preservational biases or preparational artefacts. Nevertheless, the overall composition of benthic assemblages, with the clear dominance of *Globocassidulina bitor*, with *Miliammina areanacea* as the second abundant species, and with *Psammosphaera fusca*, *Spiroplectammina biformis*, and *Portatrochamina antarctica* relatively common are in agreement with foraminiferal assemblage data presented by Li and Zhang (1986) and Zhang (1994) from the surface sediments of the Great Wall Bay (Maxwell Bay) on King George Island.

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