

Paleontological studies
on King George Island,
West Antarctica, 1986

Introduction

The summer working group participating in the Xth Antarctic Expedition of the Polish Academy of Sciences (austral summer 1985/1986), organized by the Institute of Ecology and led by Prof. Dr. Edward Kołakowski, comprised 4 geoscientists: Doc. Dr. Andrzej Gaździcki and Dr. Ryszard Wrona of the Institute of Paleobiology, and Dr. Antoni K. Tokarski and Władysław Danowski of the Institute of Geological Sciences. The expedition reached the Polish Arctowski Antarctic Station on King George Island (South Shetland Islands) aboard the M/S *Koral* (Polish Ship Salvage Company) commanded by Captain Jan Boruta. The ship left Gdynia on December 21, 1985, to stop at Las Palmas, Rio de Janeiro, and Berkeley Sound (Falkland Islands), and reached King George Island on January 29, 1986. Field works were conducted till February 21, 1986, and two days later (February, 23) the summer working group left the Arctowski Station and returned to Gdynia on April 6, 1986 along the same route.

Field works

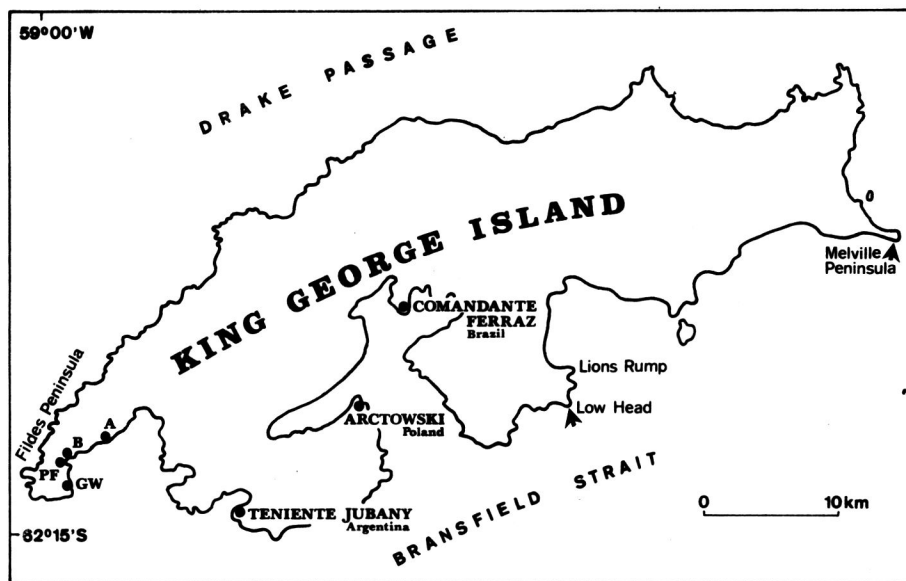
The field works of two paleontologists from the Xth Polish Antarctic Expedition (A. Gaździcki and R. Wrona) were aimed mainly at exploration of the Tertiary fossiliferous glaciomarine sediments of the Melville Peninsula and Low Head — Lions Rump area, King George Island (Text—fig. 1). The studies formed a continuation of those ones initiated during previous expeditions to the Arctowski Station (Błaszyk and Gaździcki 1980, Gaździcki and Wrona 1982a, *see also* Szaniawski, Wrona and Gaździcki 1983), and entered the program of the Earth sciences studies supervised by Professor Krzysztof Birkenmajer within the Interdisciplinary Project MR.I.29 of the Polish Academy of Sciences (*see* Birkenmajer 1983).

Melville Peninsula. — Highly fossiliferous glaciomarine sediments were discovered here during the Vth Polish Antarctic Expedition in January 1981 (Birkenmajer 1982b, Birkenmajer, Gaździcki and Wrona 1983). The Moby Dick Group, established in that area by Birkenmajer (1982b, 1984), comprises

three formations: the lower, Sherrat Bay Formation — represented by basalt lavas, the middle, Destruction Bay Formation — represented by reworked basalts and tuffs with marine biota and the upper, glaciomarine Cape Melville Formation with very rich and predominantly invertebrate fauna (Gaździcki and Wrona 1982a, b; Birkenmajer, Gaździcki and Wrona 1983). The cliffs of the Melville Peninsula, almost 200 m high, excellently display the whole sequence, especially the strata of the Cape Melville Formation (Pl. 1, Fig. 1). Majority of fossils in the glaciomarine sediments of the Cape Melville Formation are Tertiary in age (Gaździcki and Wrona 1982a, b; Birkenmajer, Gaździcki and Wrona 1983). They are accompanied by recycled Cretaceous coccoliths (Dudziak 1984) and belemnites (Birkenmajer *et al.* 1987). The sequence is cut by numerous andesite dykes (Pl. 2, Fig. 1), dated by the K-Ar method at about 20 Ma (Birkenmajer *et al.* 1985). These datings and the biostratigraphic data (especially those based on the brachiopod record for the underlying strata of the Destruction Bay Formation) indicate the Lower Miocene age of the Cape Melville Formation (Biernat, Birkenmajer and Popiel-Barczyk 1985, Birkenmajer 1987).

The team of paleontologists assisted by Dr. Andrzej Tatur carried out field studies of the Melville Peninsula from February 2 to February 7, 1986. Attention was mainly focused on the lower part of the Cape Melville Formation exposed above the Bolek Cove and the Destruction Bay. This part of the sequence contains corals *Flabellum rariseptatum* (Pl. 3, Fig. 1), bryozoans, gastropods, bivalves, belemnites and crabs *Antarctidromia inflata* (Pl. 3, Fig. 2). Moreover, numerous samples for micropaleontological analyses were taken there. Planktonic foraminifers of the family Globigerinidae were found in the lower part of the sequence of the Cape Melville Formation, and representatives of the family Heterohelicidae — in the uppermost part exposed at the plateau. The sediments of the Cape Melville Formation are especially rich in diatoms, including representatives of the genera *Actinoptychus*, *Asteromphalus*, *Coscinodiscus*, *Triceratium*, *Trinacria* and possibly several others. Diatoms are accompanied by numerous foraminifers: *Cyclammina*, *Globobulimina*, *Haplophragmoides* and *Uvigerinella* (*cf.* Gaździcki and Wrona 1986), as well as spicules of siliceous sponges, radiolarians, ostracods of the family Cytheridae, jaws of polychaetes of the genera *Drilonereis*, *Glycera*, *Lumbrinereis* and *Ophryotrocha* (*cf.* Szaniawski and Wrona 1987, and a problematic microfossil *Bolboforma* (*cf.* Gaździcki and Wrona 1986). Up to the present, several groups of macrofauna common in the strata of the Cape Melville Formation, have been covered by paleontological studies. This is especially in the case of corals (Roniewicz and Morycowa 1985, 1987), gastropods (Karczewski 1987), belemnites (Birkenmajer *et al.* 1987), crabs (Förster, Gaździcki and Wrona 1985, 1987), and echinoids (Jesionek-Szymańska 1987).

The strata of the Cape Melville Formation yield numerous erratics



Text-fig. 1. Map of localities (arrowed) on the King George Island covered by paleontological studies during the Xth Polish Antarctic Expedition (1985—1986). Scientific stations at the Fildes Peninsula: A — Artigas (Uruguay), B — Bellingshausen (USSR), PF — Presidente Frei and Teniente Marsh (Chile). GW — Great Wall (China)

(dropstones) (Pl. 2, Fig. 2), interpreted as brought by icebergs from the Antarctic continent during the Melville Glaciation (Birkenmajer 1982b, 1984, 1985, 1987). These boulders are randomly distributed throughout the sequence, being especially easy to collect at upper, erosional surface of the plateau. A special attention should be paid to erratics of black limestones, rich in fossils typical of the Lower Cambrian: archaeocyathids, sponges, brachiopods (*Lingulella*), monoplacophorans, gastropods (*Pelagiella*, *Anabarella* and *Helcionella*), hyoliths (?*Microcornus*), ostracods (*Hipponicharion* and ?*Indiana*) and problematic small shelly fossils such as *Chancelloria*, *Halkieria*, *Camenella*, *Lapworthella*, *Mongolitubulus* and *Hadimopanella* (cf. Gaździcki and Wrona 1986). Majority of these skeletal microfossils are known from the Lower Cambrian of various continents but this is their first record from rocks of the Antarctic provenance (Wrona 1987). It should be also noted that this record suggests Lower Cambrian (Atdabanian) age of the limestone erratics found on King George Island (Gaździcki and Wrona 1986, Wrona 1987).

Low Head. — On February 16—21, 1986, the paleontological team assisted by Eng. Andrzej Molek, M. Sc., carried out studies in the Low Head — Lions Rump area (Text-fig. 1), where 65 m sequence of glacial and glaciomarine strata of the Polonez Cove Formation (see Birkenmajer 1980, 1982a) is exposed (Pl. 1, Fig. 2). The formation is divided into four member: the Krakowiak Glacier Member, the Low Head Member, the

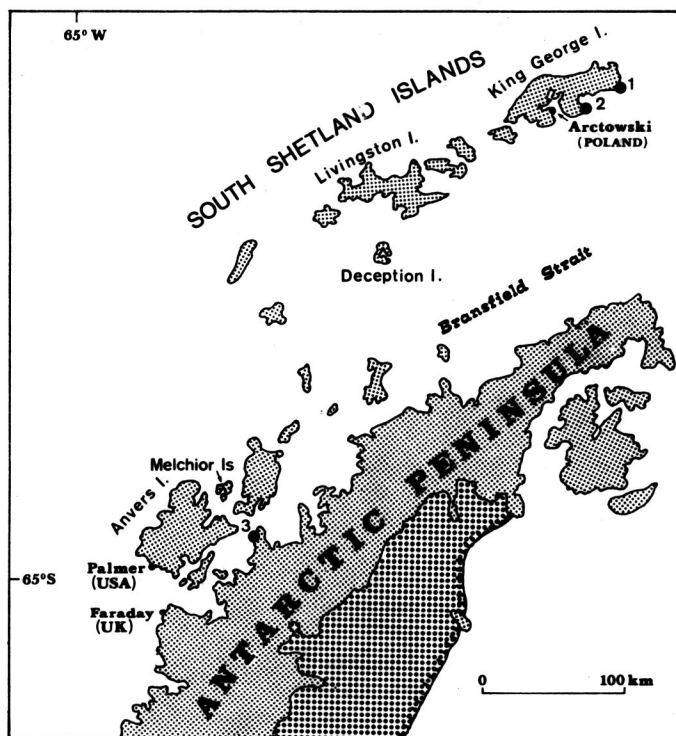
Siklawa Member, and the Oberek Cliff Member. Origin of this sedimentary sequence was related to the Polonez Glaciation (Birkenmajer 1980, 1982a, 1987, *see also* Gaździcki *et al.* 1982). The Low Head Member (= *Pecten* Conglomerate) is especially rich in fossils, including coccoliths (Pl. 3, Fig. 3), diatoms, benthic and planktonic foraminifers (Pl. 3, Fig. 6), ostracods (Pl. 3, Fig. 4), and echinoderms (*see* Błaszyk and Gaździcki 1980, Bitner and Pisera 1984, Gaździcki 1984, Gaździcki and Pugaczewska 1984, Jesionek-Szymańska 1984, Gaździcka and Gaździcki 1985a, b; Błaszyk 1987). The strata of the Polonez Cove Formation were previously assigned to the Pliocene or Plio-Pleistocene on the basis of the record of bivalves of the species *Chlamys anderssoni* (Pl. 3, Fig. 6), analogous to those previously described from the *Pecten* Conglomerate of the Cockburn Island (*cf.* Birkenmajer 1982, Gaździcki and Pugaczewska 1984, Smellie *et al.* 1984), whereas coccoliths found in the strata of the Low Head Member (Pl. 3, Fig. 3) appear indicative of the Oligocene (Gaździcka and Gaździcki 1985a, b). At the same time, K-Ar datings showed that lavas that rest directly on the strata of the Polonez Cove Formation are over 23 Ma old, *i.e.* Upper Oligocene in age (Kreuzer *in* Birkenmajer *at al.*, *in press*; *see also* Birkenmajer and Gaździcki 1986). This shows that the glaciomarine sediments of the Polonez Cove Formation are pre-Upper Oligocene in age and that the Polonez Glaciation had taken place before the Late Oligocene (*cf.* Birkenmajer 1987). This makes dating of the basal part of this formation so important and for this reason new samples of the strata directly underlying the formation were taken for radiometric datings. Moreover, samples for micropaleontological studies were taken from the neptunian dykes found in the Low Head Member (*cf.* Tokarski 1986).

M/S *Koral* cruise to the Antarctic Peninsula

On February 9–16, 1986 a cruise was organized on M/S *Koral* to carry out additional research program in biology and paleontology. The program comprised fishing of krill by biologists and field studies in selected parts of the South Shetlands Archipelago and the Antarctic Peninsula by paleontologists (Text—fig. 2). Two attempts were done to land on the Livingston Island (Byers Peninsula) to study the Upper Jurassic–Lower Cretaceous marine sequence but failed because of disadvantageous weather conditions and difficulties in navigation. On February 10, 1986, the ship entered the Port Foster (Deception Island), which made possible to gather a collection of volcanic rocks and samples of modern beach sediments for comparative purposes. The teams subsequently landed on the Melchior Islands and the Arctowski Peninsula. The later stop was done to commemorate the famous Polish scientist Professor Henryk Arctowski in honour of which

the Polish Antarctic Station in King George Island has been named. Henryk Arctowski carried out his pioneer geological studies of that region in the course of the Belgian Expedition to West Antarctica in the years 1897—1899 on the ship *S/Y Belgica*.

The participants of the IXth and Xth Antarctic Expeditions of the Polish Academy of Sciences and *M/S Koral* crew mounted a commemorative plate at the foot of the Spiegot Peak (Pl. 4, Fig. 2).



Text-fig. 2. Map of the South Shetlands Archipelago and the Antarctic Peninsula (1 — Melville Peninsula, 2 — Low Head — Lions Rump, 3 — Arctowski Peninsula)

During the next days members of the expedition visited the American Palmer Station on Anvers Island (Text—fig. 2) and the British Faraday Station on Galindez Island in Argentine Islands Archipelago (Pl. 4, Fig. 1) to get acquainted with laboratory equipment and work and life conditions. Coming back to King George Island, the groups landed in the Paradise Cove close to the Argentinian Almirante Brown Station and repeated attempt to land on Byers Peninsula (Livingston Island). On February 16, *M/S Koral* reached the Marian Cove (King George Island) to board the geological team studying the Barton Peninsula (*cf.* Tokarski 1986).

Final remarks

The collections of fossils (mostly of plants and invertebrates) gathered in the course of the Polish Antarctic Expeditions have been studied by Polish and foreign paleontologists. The results obtained so far were presented in over 25 papers (a part of which are listed in the References). The results of the studies, especially the stratigraphic ones define the age of continental glaciations of the West Antarctica, the earliest of which affected the South Shetlands Archipelago as early as Late Paleogene (Birkenmajer 1987, *see also* Birkenmajer and Gaździcki 1986). Therefore, they appear to be of a wider importance, supplying new data for paleobiogeographic reconstructions of circum-Antarctic regions.

Further results of the Polish paleontological studies in Antarctica will be presented in a new special series of *Palaeontologia Polonica* — *Palaeontological Results of the Polish Antarctic Expeditions*. The first volume of that series is in press at the moment to appear in 1987.

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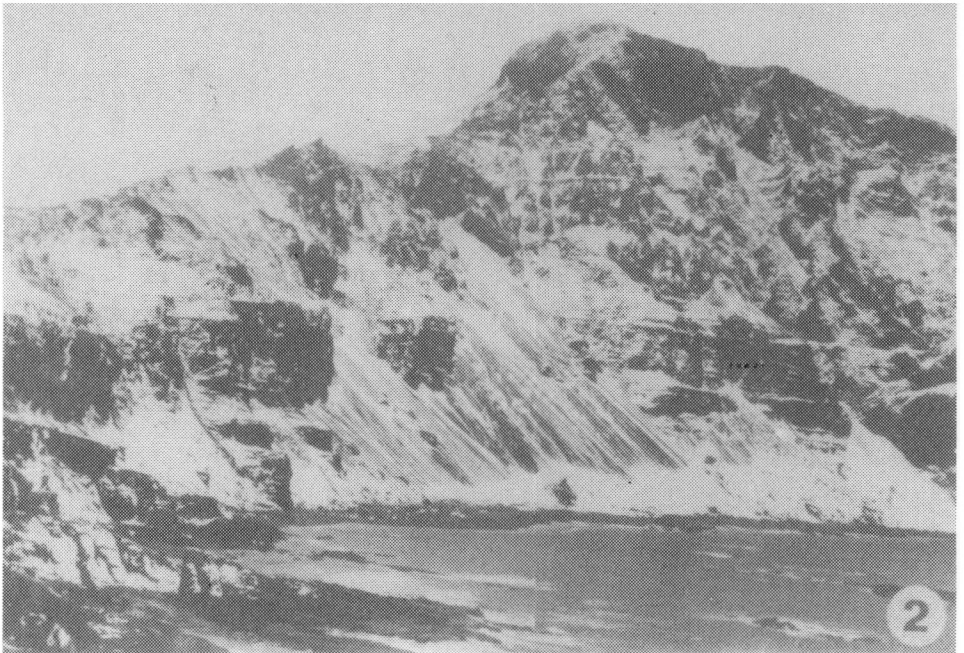
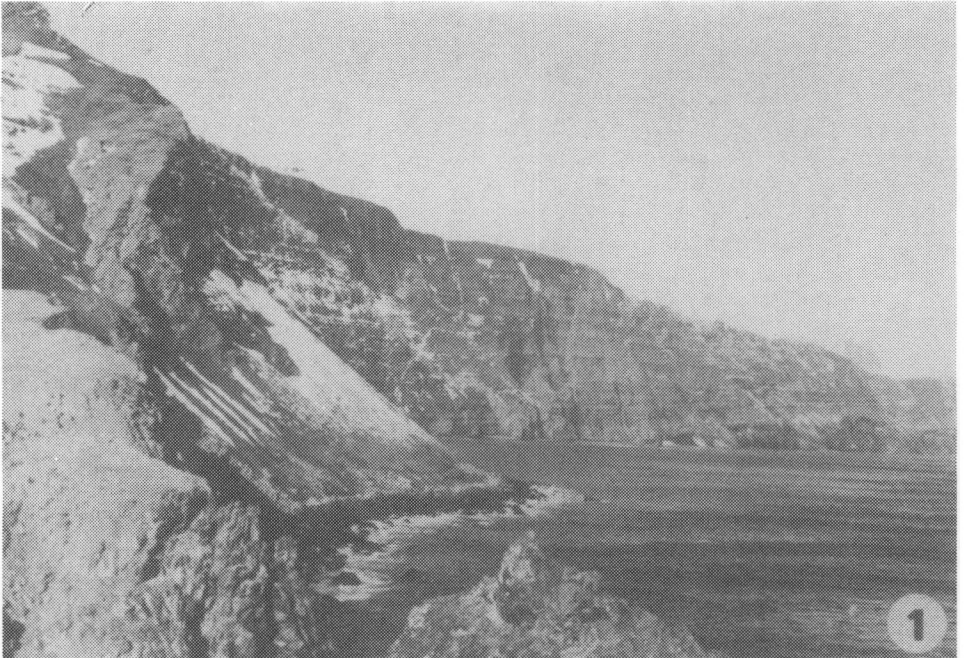
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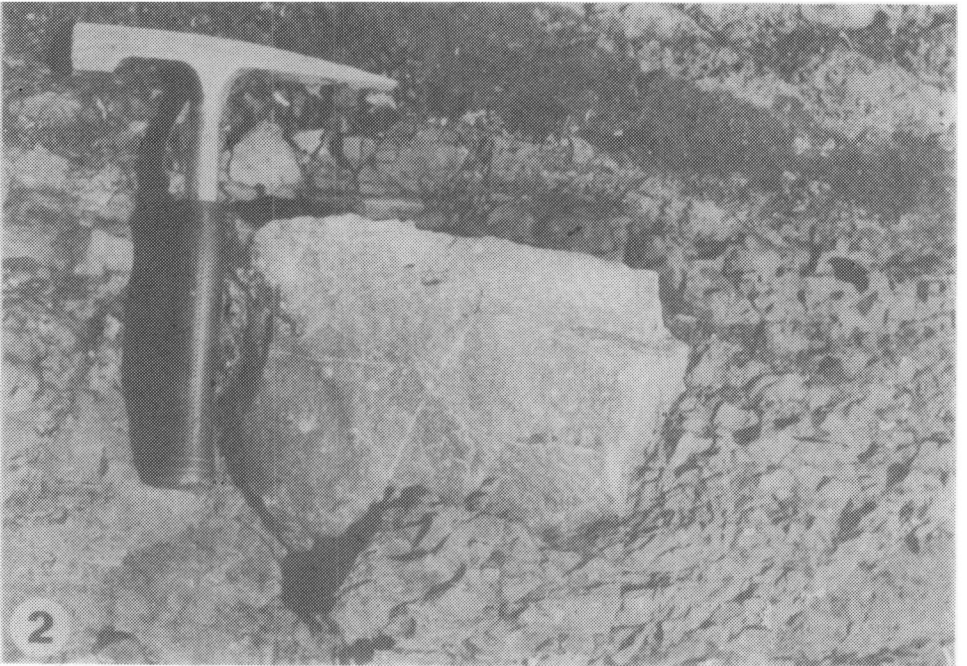
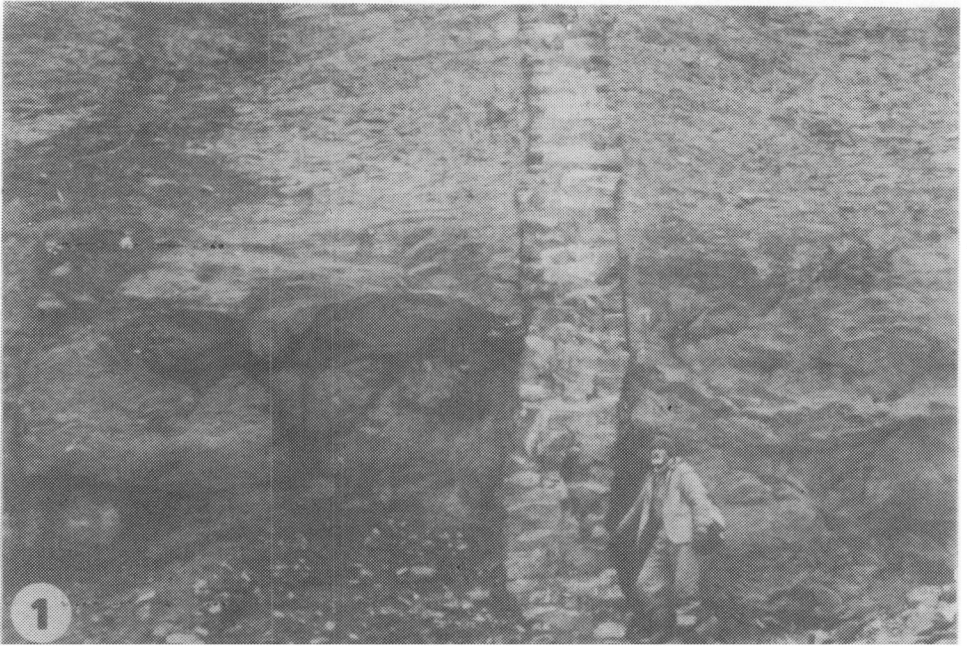
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Andrzej GAŹDZICKI

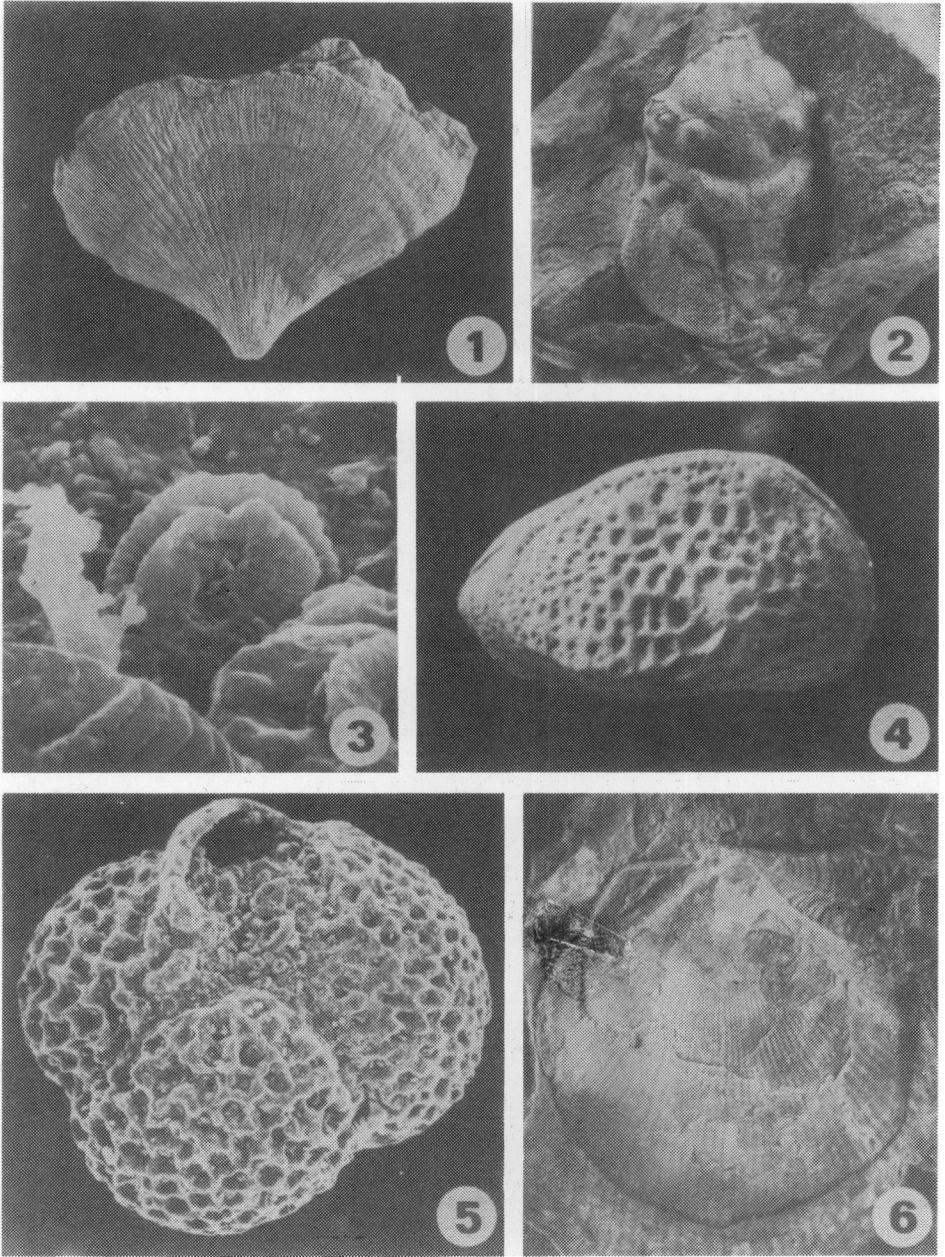
Institute of Paleobiology
Polish Academy of Sciences
Al. Żwirki i Wigury 93
02-089 Warszawa, POLAND



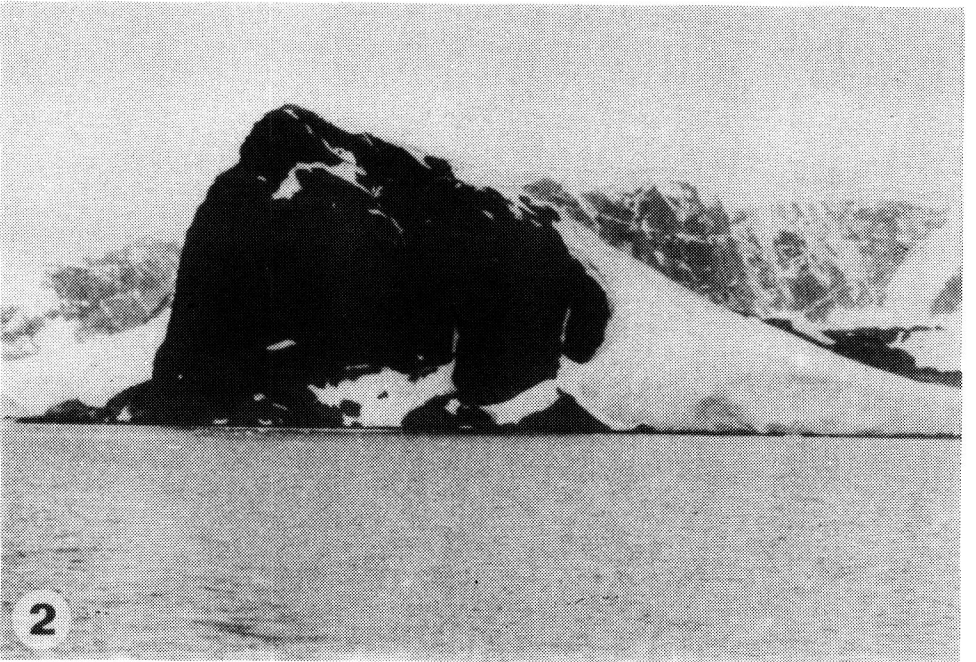
1. Fossiliferous glaciomarine sequence of the Cape Melville Formation (Lower Miocene) in cliff slopes of the Melville Peninsula.
 2. Outcrops of glaciomarine sediments of the Polonez Cove Formation (Oligocene) in a steep sea-cliff near Low Head.
- Photos by A. Gaździcki, 1986



1. Andesite dyke cutting glaciomarine sediments of the Cape Melville Formation. The Melville Peninsula.
2. Dropstone in sediments of the Cape Melville Formation exposed in the lowermost part of the Melville Peninsula cliff.
Photos by A. Gaździcki, 1986



Selected fossils from the Cape Melville Formation (Lower Miocene). 1 — coral *Flabellum rariseptatum* Roniewicz et Morycowa, nat. size. 2 — crab *Antarctidromia inflata* Förster, nat. size; and from the Low Head Member of the Polonez Cove Formation (Oligocene) 3 — coccolith *Reticulofenestra bisecta* (Hay, Mohler et Wade), SEM $\times 4700$. 4 — ostracode *Oculocyteropteron rakusai* Błaszyk, SEM $\times 110$. 5 — foraminifer *Globigerina* sp., SEM $\times 370$. 6 — bivalve *Chlamys anderssoni* Hennig, nat. size
King George Island, West Antarctica



1. The British Antarctic Survey's geophysical observatory, Faraday Station at the Argentine Islands off the west coast of the Antarctic Peninsula.
 2. The Spigot Peak at the Arctowski Peninsula. The Antarctic Peninsula (Danco Coast)
- Photos by A. Gaździcki, 1986