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Report on the expedition of Polish biologists to Bunger Hills, East Antarctica, 1988/89

On the 30th anniversary of the Polish ownership of the Antarctic „A. B. Dobrowolski" Station in Bunger Hills, Institute of Ecology of Polish Academy of Sciences organized a summer expedition to Bunger Hills in East Antarctica. The purpose of the voyage has been an extensive ecological reconnaissance and an estimate of future possible biological investigations in this part of Antarctica.

The participants of expedition — Krzysztof Filcek and Krzysztof Zieliński — left Warsaw for Leningrad on 24th October 1988, leaving this city on 31th October 1988 with the 34th Soviet Antarctic Expedition, on board of the r/s „Akademik Fedorov". After prolonged works at the Soviet bases of „Bellingshausen", „Družnaja 3", „Molodežnaja", „Progres" and „Mirnyj", Polish group arrived at the oasis on 4th February 1989. All the works at the „Dobrowolski" Station lasted 65 days, until 10th April 1989. It was the longest stay of Poles in the Bunger Hills oasis. Return to Leningrad took place on 28th May 1989, and on 1st June the Polish team was back in Warsaw.

The name of Bunger Hills commemorates its discoverer, David Bunger, American pilot, participant of the „High Jump" operation in 1947. Following preliminary exploration by the Americans, no works were carried out in the Bunger Hills oasis until 1956 when USSR set up the „Oasis" base which was transferred to Poland in 1959 and receiving new name „A. B. Dobrowolski". At that time a team of seven Polish scientists led by Professor W. Krzemiński stayed several days at the new station. In 1966 the team of Polish geophysicists led by M. Zalewski visited Bunger Hills. In the period 18 January — 21 February 1979 an expedition of the Institute of Geophysics of Polish Academy of Sciences worked at „Dobrowolski" base (Krzemiński and Wiśniewski 1985). Recently, there has been a growing scientific interest in the Bunger Hills oasis. In the years 1986 and 1987 Australian scientists worked in the newly set up „Edgeworth David" base, and in 1987 the Arctic and Antarctic Institute (AANII) in Leningrad has opened the „Oasis-2" base located only 300 m from the Polish station. Since then the Soviet scientists work there in every summer season.

Bunger Hills are situated in the Wilkes Land in East Antarctica. This Antarctic oasis is situated between 65°58' and 66°20'S, and 101°20' and 101°28'E (Wiśniewski 1981). It is separated from the Mawson Sea by

Shackleton Glacier and surrounded by Antarctic ice cap and the outflowing glaciers: Adisto, Apfel and Ramenhus (Fig. 1). The total icefree area covers 952 squ.km; of this the land takes 395 squ.km, marine bays 470 squ.km, lakes 36 squ.km and snow covered areas 51 squ.km (Simonov 1971). More detailed physiographical description of Bunger Hills is given by Wiśniewski (1981) and Battke (1985).

Admiral Richard Byrd, commander-in-chief of the „High Jump" operation described the Bunger Hills oasis as „the land of blue and green lakes and brown hills among limitless glacial space" (Byrd 1947). In reality the lakes covering 9% of the land surface give the Bunger Hills oasis a special character. The largest, Figurnoe Lake, crosses all the teritory of the oasis along the length of 25 km, and its surface area is 16 squ.km (Simonov 1971). Except for about some dozen large lakes small water reservoirs prevail in the oasis. There are only few permanent water streams. Almost all small and a greater part of larger lakes are without any outflow. With the dry and windy climate of the oasis such lakes, if not supplied by local snow-melting areas, show increased mineral salts concentrations. The highest recorded level of the salinity of $78^{\circ}/_{oo}$ in Salt Lake exceeds more than twice the salinity of oceanic waters (E. Kaup, pers. comm.). The occurrence of sequences of several lakes which are usually devoid of outflow is a characteristic phenomenon in the oasis. The Seven Lakes Valley and High Valley are such examples (Fig. 2). Investigations carried out in the 50-ties showed that the lakes in the Hills are inhabited by algae of the groups Cyanophyta, Chlorophyta and Bacillariophyta. There are also invertebrates belonging to Rotatoria, Nematoda and Copepoda (Simonov 1971). However, no detailed biological studies have even been carried out in the lakes of the Bunger Hills oasis.

Between the land part of the oasis and the Shackleton Ice Shelf there are situated marine bays: Adisto, Kakapon, Rybij Chvost and Transkripcii. They are dotted with many islands (Figs. 1, 2). Our works were concentrated in the bays Rybij Chvost and Transkripcii which are located closer to the station. They are of different character. The Transkripcii Bay is isolated from other bays by a glaciers; its never melting ice cover has a thickness of about 4 m and its upper water layer is of fresh water. For this reason this bay had been included into lakes by Simonov (1971). However, it shows tidal activity and its tides are synchronized with the oceanic tides. A similar phenomenon has been observed in Poljanskij Lake boundering with the Apfel Glacier (G. Kadačigov, pers. comm.). The Rybij Chvost Bay melts in summer and its water is of typical oceanic salinity. The presence of typical marine macroalgae species like *Phycodrys antarctica* was recorded there as well as marine fish species like *Trematomus newnesi, T. londbergii* and *Pagothenia bernacchi*.This bay which is connected with the bays Kakapon and Adisto gives a food base for Weddell seals which occur there. In the season 1989 two individuals of these mammals were regularly seen in the southern part of the bay. There must have been more

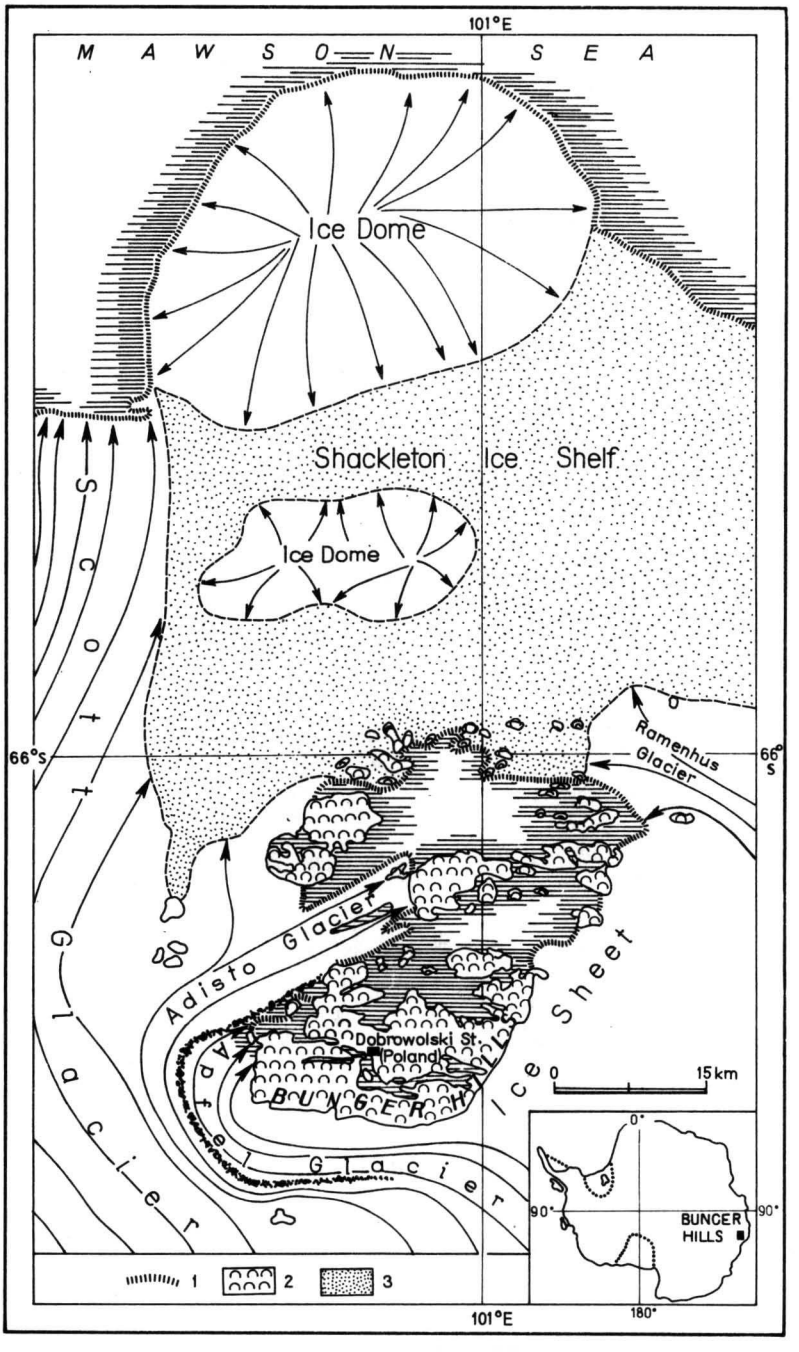

Fig. 1. Geographical situation of Bunger Hills (from Wiśniewski 1981): 1 — ice cliffs, 2 — hills, 3 — ice-shelf.

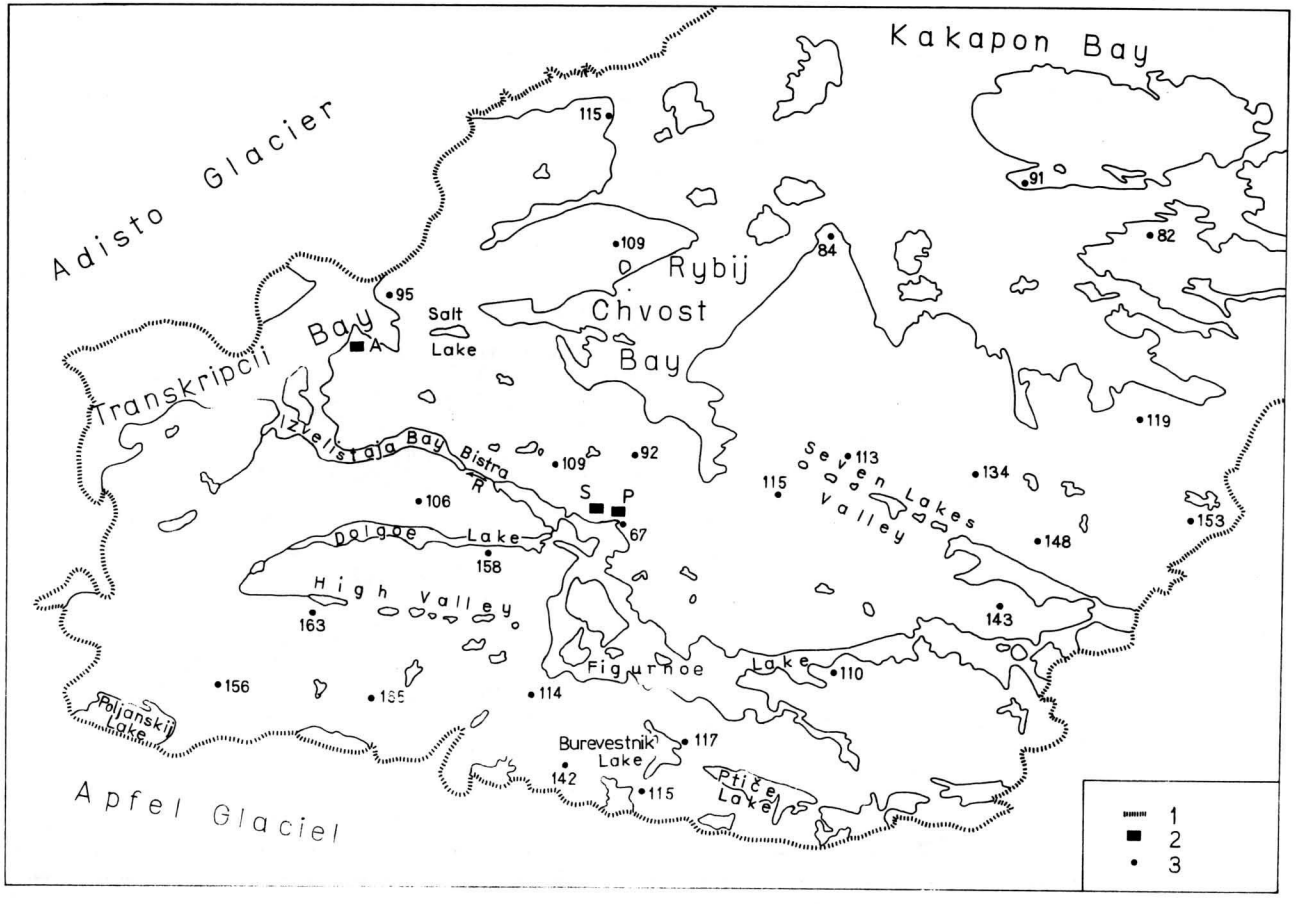

Fig. 2. Southern part of Bunger Hills: 1 — boundaries of glaciers, 2 — polar bases (A — „Edgeworth Davis" /Australia/, S — „Oasis" /Soviet Union/, P — „Dobrowolski" /Poland/), 3 — elevation points.

of them in the past since one encounters many mummified corpses of the seals along the shores of the bay.

In the land part of the oasis some species of lichens occur. In more humid places mosses are also found. The occurrence of lichens is limited to certain parts of the oasis. They are never observed in large stretches of areas, such as the south-west shore of Rybij Chvost Bay or the plateau between Izvelistaja Bay and Dolgoe Lake. On the other hand, in the places of their occurrence in favourable conditions, they may cover 75% of the surface area of the rocks.

Three bird species are nesting on the territory of Bunger Hills: Wilson storm petrel (*Oceanites oceanicus*), south polar skua (*Catharracta maccormicki*) and snow petrel (*Pterodroma nivalis*). Wilson storm petrels live very dispersed, they make solitary nests in the crevices of rocky rubble covering the slopes of the hills. Nests of south polar skua are also very dispersed, however the birds gathered at the station or, after freezing of lakes on the patch of open water at the outflow of Bystra Stream from the Figurnoe Lake. Up to ten individuals were counted at that time. The most abundant species inhabiting the oasis is snow petrel. Its number is estimated at about two thousand pairs (V. Bulavincev, pers. comm.). *P. nivalis* builds nests in rock slits or crevices, or in rocky rubble. They occur most often solitarily, rarely in larger aggregations. The largest colony located close to the station contained, in the season of 1989, about 50 nests. They were continously observed. At the beginning of observations (5 February 1989) the chicks were fed once a day or once every two days at dusk (about 16.oo UMT). During day, only three to five adult birds stayed in the colony. When the time of their fledging was getting near, the frequency of feeding diminished, and finally the parents had entirely stopped coming into the colony. Young birds had finally fledged at that time, started to venture out from nests and exercise their wings before oncoming departure. Leaving took place at night. This process was observed in the first decade of March and the last bird left the colony on 11th March 1989. However, in the area of the Bunger Hills oasis a significant range in the time of departure flights of young snow petrel was recorded. On 7th April 1989, in Dolgoj Peninsula, a solitary nest with fully fledged young bird ready for flight was discovered (V. Bulavincev, pers. comm.). Last Wilson storm petrel in the oasis was observed on 2nd March 1989, while last skuas were seen on 5th April 1989.

Climatic conditions were favourable comparing with previous years (G. Kadačigov, pers. comm.). Maximal temperature of $+7{,}9°C$ was noted on 10th February 1989, while minimal temperature of $-31{,}9°C$ was reported on 26th March 1989. There were only two days with a minimal temperature above $0°C$, but six days with a maximal temperature lower than $-10°C$. During 35 days wind velocity did not exceed 10 m s^{-1}, and only in 12 days it was higher than 20 m s^{-1}. Strongest winds blew from the East. Maximal wind velocity of 43 m s^{-1} was noted on 24th February 1989. Daily temperature amplitudes rarely exceeded $10°C$ which was usually observed on frosty, sunny and windless

days. Heavy snow fell several times in March; maximal snow cover reached 40 cm on 19th March 1989. However, a few windy days at the end of this month were enough to blow out nearly the whole snow.

At the prevailing low temperatures and weak winds, small water reservoirs were frozen already at the turn of second and third decade of February. At the end of February and beginning of March large lakes started freezing and this process was completed during ten days. Then, in the second decade of March, Rybij Chvost Bay and Salt Lake began freezing. This way all the water reservoirs of Bunger Hills were frozen within a month. Only the Bystra Stream remained not frozen until the beginning of April, when it was also covered with ice.

During 65 days of work in the Bunger Hills oasis the Polish team collected materials and samples for future analyses in Poland by various specialists. And thus lake phytoplankton and zooplankton samples were given to K. Janiec of the Institute of Ecology, PAS; marine zooplankton samples to M. I. Żmijewska of the University of Gdańsk; marine phytoplankton collections to S. Rakusa-Suszczewski of the Institute of Ecology, PAS; lichen samples to M. Olech of the Jagiellonian University in Cracow; and the collection of lake bottom deposits were given for analyses to A. Tatur of the Institute of Ecology, PAS.

It was found that the area of Bunger Hills is interesting for biological investigations. The question of the degree of autonomy of the oasis ecosystem remains open. Whether or not, and to what degree the vertebrate animals inhabiting the oasis are dependent on the open ocean? What amounts of energy and matter are transferred by them onto the territory of the oasis? Special biological investigations are needed for Transkripcii Bay where water layers of different salinity remind the rich in life estuaries of large rivers. The population studies of plants and animals should be carried on. However, lack of laboratory space and energy supply in both the Polish „Dobrowolski" and the Soviet „Oasis-2" bases are serious obstacles in the continuation of detailed research. An early commencement of works in the season, in December or in the beginning of January, would be also advisable for any future investigations.

We would like to transmit our thanks to the participants of the 34 SAE expedition to the Bunger Hills oasis, for their hospitality, help in the field work and many useful informations. Special thanks are due to B. Viktorov for providing us with data on meteorological observations.

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