

Bohdan CZARNECKI<sup>1)</sup>, Danuta BIAŁASIEWICZ<sup>2)</sup>

<sup>1)</sup> Specialistic Health Service Unit  
95-040 Tuszyn, POLAND

<sup>2)</sup> Department of Biology and Medical Parasitology  
Medical Academy of Łódź  
Kościuszki 85, 90-436 Łódź, POLAND

## Fungi as a component of the aerosphere in the H. Arctowski Polar Station and its vicinity (King George Island, South Shetland Islands)

**ABSTRACT:** Mycological analyses of the air and food remnants in heated and non-heated rooms of the H. Arctowski Polar Station were carried out. In the material 23 fungi strains were found representing 10 species of the classes Ascomycetes, Zygomycetes and Deuteromycetes.

**Key words:** Antarctica, South Shetlands, fungi.

### 1. Introduction

The participants of successive polar expeditions to the King George Island pointed out to the occurrence of fungi on food products left by their predecessors from other expeditions. Consequently, it seemed important to determine which genera and species of fungi might develop at low temperatures.

### 2. Material and methods

Material was collected by the senior author in his wintering during the VII Antarctic Expedition to the H. Arctowski Station (King George Island). An attempt was made at assessing the degree to which the air is polluted with fungi in the rooms of the station, in the trapper's house

situated about 3 km from the station, the meteorological box situated on the glacier and a caravan situated at the Demay Point about 7 km from the station, and serving from time to time as a base for field research teams. Food remnants left in these places were also analysed; culture medium was also inoculated by the samples of sea water and fresh water from the station water intake. The temperature of heated rooms was as follows: in the dining-room it ranged from 12°C (at the floor) to 20°C, in the first-aid room from 8°C to 12°C, and in the fruit store, power station and the building of the water intake it was about 5°C. In the caravan, trapper's house and the meteorological box the temperatures were those of the surroundings, which in July had an average of -4.5°C, in August -2.1°C, and in September -3.7°C. In the above described rooms open Petri dishes containing the Sabouraud agar medium were exposed and colonies of microbes which had grown on them were inoculated on the Sabouraud agar slants. Food remnants and water samples were also placed on dishes with the Sabouraud medium and the Sabouraud agar slants were inoculated with colonies of microbes. The obtained cultures were transported at the temperature of 5°C to Poland where in the Department of Biology and Medical Parasitology of the Medical Academy of Łódź the isolation of pure fungi strains and their determination were carried out.

The colonies grown up on the Sabouraud and Czapek medium were microscopically observed and their colour, shape, surface structure, glitter, edges and relation between the colony surface area and that of the agar were noted. For microscopic investigations, microcultures were made on microscopic slides covered with a thin layer of Sabouraud and Czapek agar from each distinguished strain of fungi. The microcultures were placed in moist chambers for 2–20 days and monitored with a microscope at 48 h intervals. After preserving the microcultures in 75% ethanol permanent microscopic slides were made of them, coloured with acid fuchsin (Kurnatowska 1982). In determination procedure the characteristic features of the mycelium, the kind, size and situation of spores were taken into account (Fassatiová 1983).

### 3. Results

10 fungi species were recorded in the investigated material; they belonged to the classes of Ascomycetes and Deuteromycetes. From the air of the heated rooms and compartments of the station (dining-room, fruit store room, first aid room, power station) there were isolated 7 fungi strains belonging to the following species: *Aspergillus oryzae*

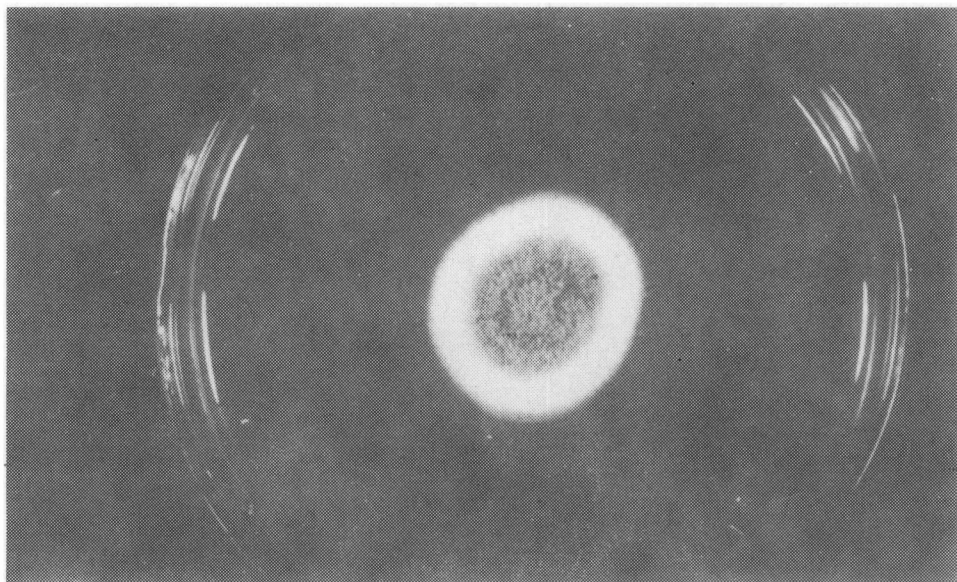


Fig. 1. *Penicillium notatum* -- colony on the Sabouraud agar medium

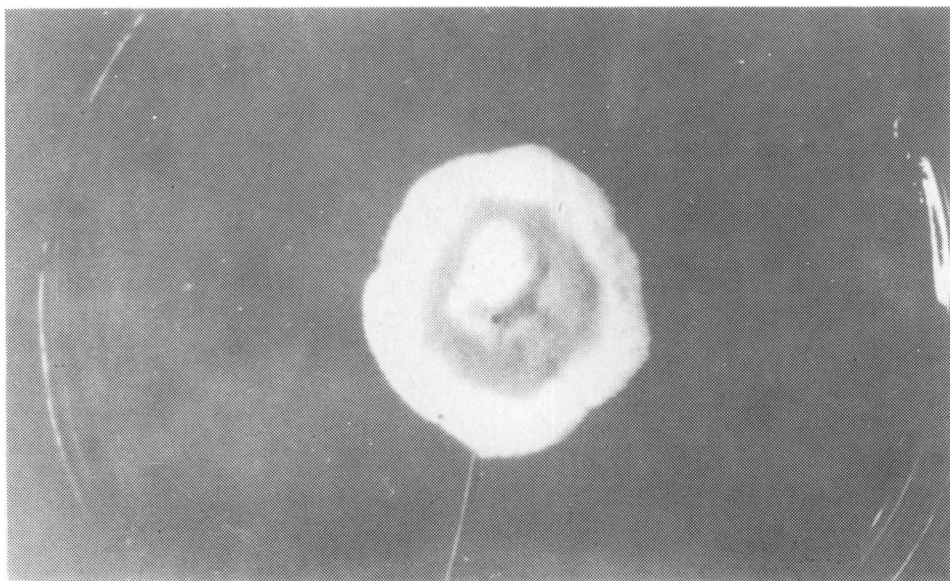


Fig. 2. *Chrysosporium pannorum* --- colony on the Sabouraud agar medium

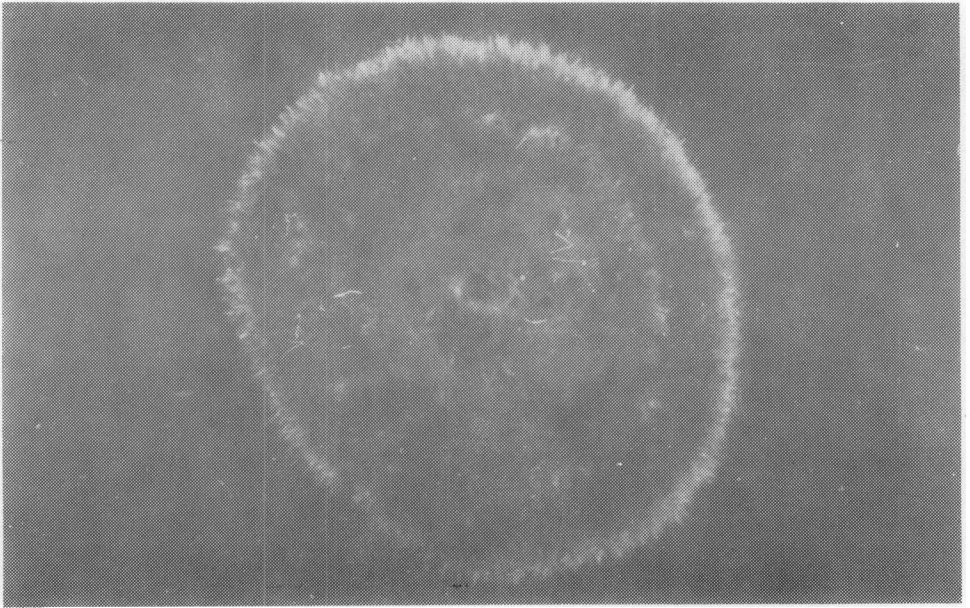


Fig. 3. *Fusarium aquaeductum* — colony on the Sabouraud agar medium

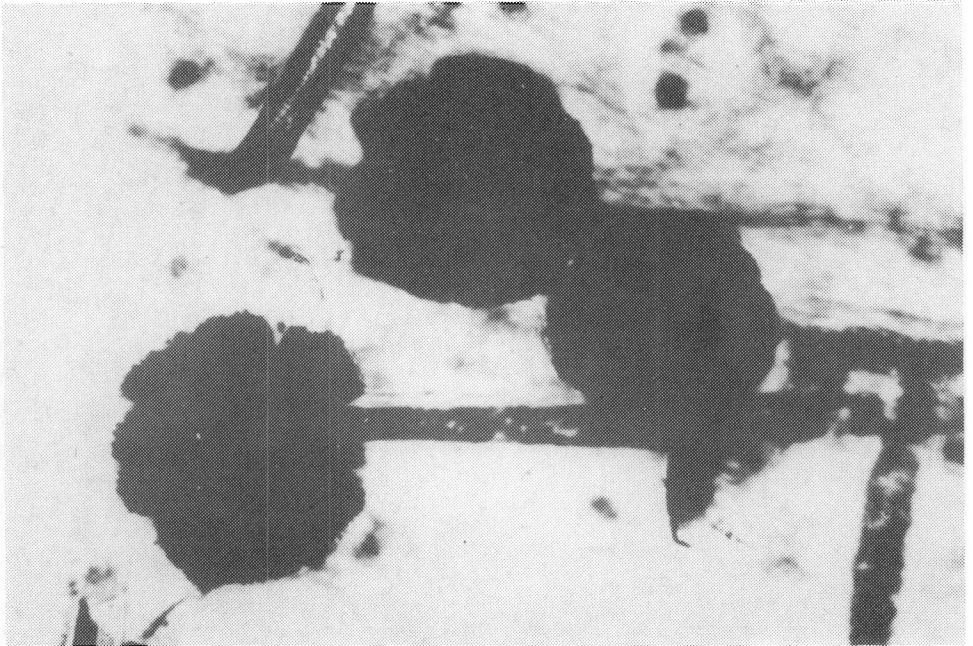


Fig. 4. *Aspergillus oryzae* — conidiophores; microcolony preserved with ethanol, stained with acid fuchsin

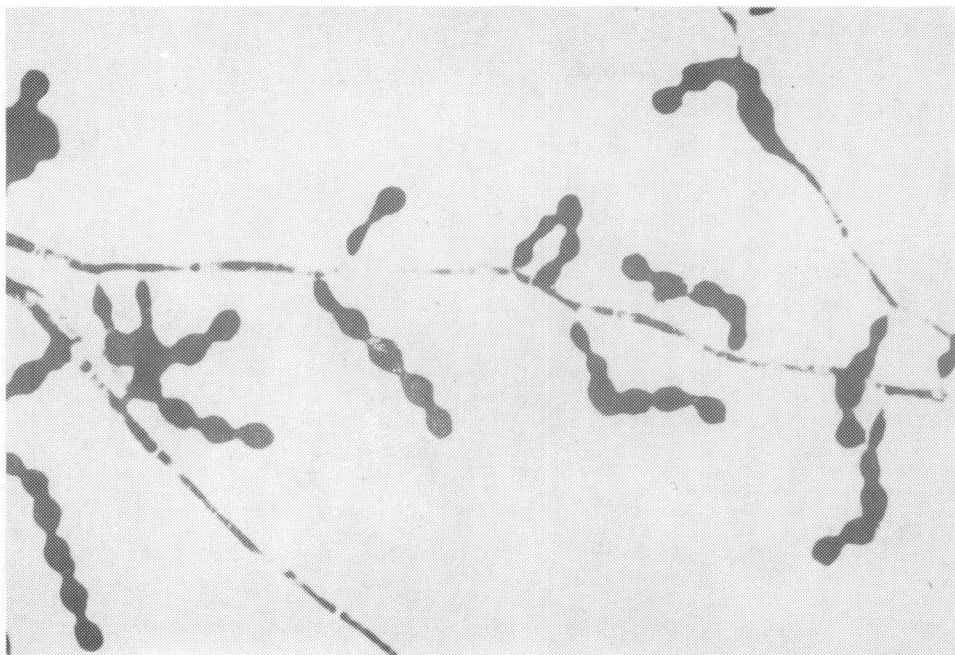


Fig. 5. *Scopulariopsis brevicaulis* — conidiophores; microcolony preserved with ethanol, stained with acid fuchsine

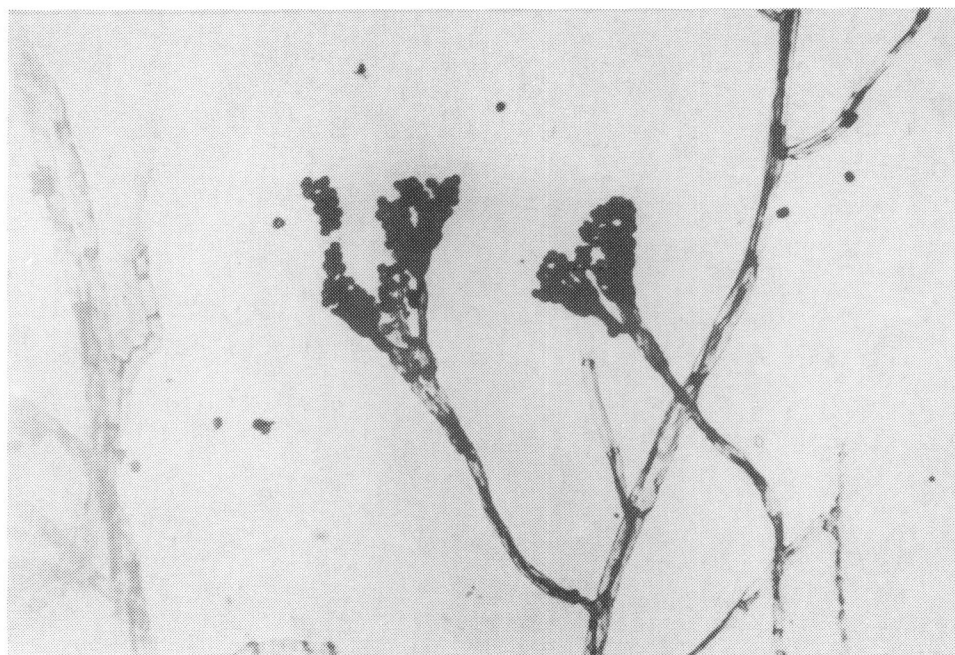


Fig. 6. *Penicillium notatum* — conidiophores; microcolony preserved with ethanol, stained with acid fuchsine

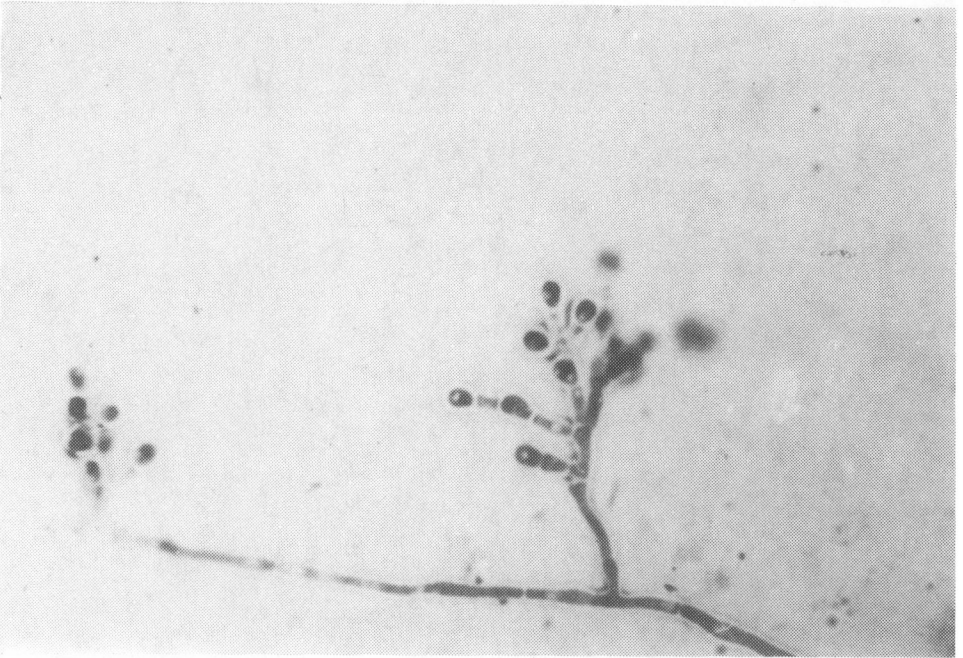


Fig. 7. *Chrysosporium pannorum* — conidiophores with aleuroconidia; microculture preserved with ethanol, stained with acid fuchsine

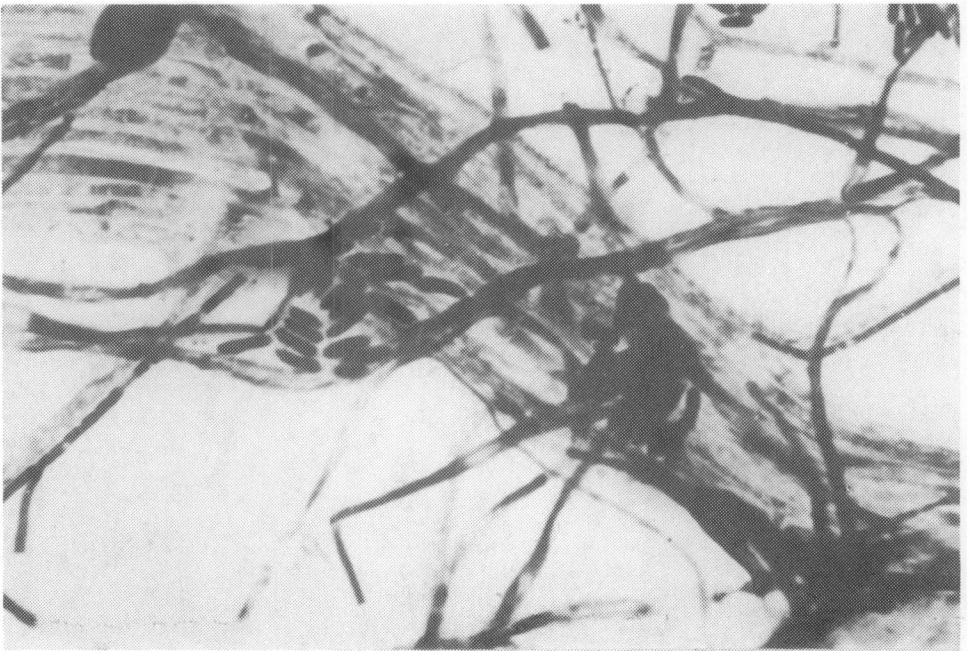


Fig. 8. *Fusarium aquaeductum* — macroconidia; microculture preserved with ethanol, stained with acid fuchsine

Table 1

Species of fungi isolated from heated rooms and compartments of the H. Arctowski Station

Place of isolation	Species
Dining room (air)	<i>Botrytis cinerea</i> Persoon ex Fries <i>Penicillium chrysogenum</i> Thom <i>Aspergillus oryzae</i> (Ahlburg) Cohn
First aid room (air)	<i>Scopulariopsis brevicaulis</i> Brumpt et Langeron <i>Penicillium chrysogenum</i> Thom
First aid room (fruit)	<i>Rhizopus nigricans</i> Ehrenberg
First aid room (water)	<i>Penicillium notatum</i> Westling
Fruit store (air)	<i>Penicillium chrysogenum</i> Thom
Fruit store (fruit)	<i>Penicillium chrysogenum</i> Thom
Power station (air)	<i>Penicillium notatum</i> Westling
Power station (compote)	<i>Penicillium notatum</i> Westling
Water intake (water)	<i>Fusarium aquaeductum</i> Lagerheim

Table 2

Species of fungi isolated from the non-heated rooms and compartments of the H. Arctowski Station

Place of isolation	Species
Caravan (air)	<i>Penicillium notatum</i> Westling
Caravan (food products)	<i>Penicillium notatum</i> Westling <i>Penicillium camemberti</i> Thom <i>Penicillium chrysogenum</i> Thom
Trapper's house (air)	<i>Penicillium notatum</i> Westling (4 strains) <i>Chrysosporium pannorum</i> (Link) Hughes <i>Botrytis cinerea</i> Persoon ex Fries (2 strains)
Meteorological box (air)	No fungi

(Ahlburg) Cohn, *Penicillium chrysogenum* Thom, *Penicillium notatum* Westling, *Botrytis cinerea* Persoon ex Fries and *Scopulariopsis brevicaulis* Brumpt et Langeron; 3 fungi strains were isolated from food products found in these compartments; they were *Penicillium notatum* Westling (in compote) and *Penicillium chrysogenum* Thom and *Rhizopus nigricans* Ehrenberg (on fruits). The strain of *Fusarium aquaeductum* Lagerheim was isolated from a water sample taken from the water intake (Table 1). *Penicillium notatum* was recorded in the air of the non-heated caravan, while *Penicillium camemberti* Thom, *P. notatum* Westling and *P. chrysogenum* Thom were recorded on food products left in the caravan. 7 strains of fungi were isolated from a colony developed from the air of the trapper's house and they belonged to the following species: *Penicillium notatum* Westling,

*Chrysosporium pannorum* (Link) Hughes and *Botrytis cinerea* Persoon ex Fries (Table 2). No colonies were obtained from inoculations on dishes with the Sabouraud agar medium placed in the meteorological box. Photographs 1–3 show the characteristic colonies of fungi of the genera *Penicillium*, *Chrysosporium* and *Fusarium*. The hyphae and spores of fungi of the genera *Aspergillus*, *Scopularopsis*, *Penicillium*, *Chrysosporium* and *Fusarium* are presented in photographs 4, 5, 6, 7 and 8.

#### 4. Discussion

It should be pointed out that the same fungi species: *P. chrysogenum*, *P. notatum* and *B. cinerea*, grew both in the heated and in the non-heated rooms and compartments (the caravan trapper's house). Stakes (1968), Fennema et al. (1973) and Nickerson and Sinskey (1972) state that the main sources of psychrophilic organisms are soil and water. They constitute 40–70% of the total of microflora which were isolated from various water habitats: fresh water, sea water, streams, snow and ice. While investigating the vegetation of the Antarctica Rudolph (1970) isolated from the air and soil at the Cape Hallet Station in the Victoria Land and from the air at the Mary Byrd Land various fungi, more than half of them constituted the species of the genus *Penicillium* (*P. charlesi*, *P. chrysogenum*, *P. frequentans*, *P. meleagrianum*, *P. notatum*) and the other ones belonged to the genera *Cladosporium*, *Mucor*, *Neurospora*, *Saccharomyces* and *Rhodotripora*. Other authors (Hael et al. 1967, Baker 1970, Cort and Daglio 1964, Sun et al. 1978, Llano 1965, di Menna 1960), while describing the air and soil of various regions of the Antarctic, mentioned the following genera of fungi: *Penicillium*, *Aspergillus*, *Acremonium*, *Chrysosporium*, *Mucor*, *Phialophora*, *Trichodeuma*. Comparing the above presented results with data obtained by Zabawski and Piasecki (1981), who investigated the soil microflora of King George Island in 1979 we can see much similarity of the results; these last authors observed in this area the occurrence of the majority of fungi recorded by the present authors (*Penicillium*, *Aspergillus*, *Chrysosporium*, *Botrytis*).

Species of fungi which were found by the present authors of food products in the compartments of the station and in the caravan are considered as common contamination of cold stored food.

From frozen food products Gunderson (1962) isolated 113 psychrophilic fungi species. Most frequent of them were *Aureobasidium pullulans*, *Botrytis cinerea* and *Geotrichum candidum*. According to Frank's (1968) data, out of 247 *Penicillium* strains isolated from food products 87% belonged to psychrophiles.



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Received April 28, 1986

Revised and accepted November 5, 1986

## 6. Streszczenie

W trakcie pobytu na Stacji im. H. Arctowskiego na wyspie King George (VII Wypława Antarktyczna) dokonano oceny mikologicznej powietrza pomieszczeń ogrzewanych i nieogrzewanych Stacji oraz resztek produktów spożywczych, które się tam znajdowały. Wyhodowane kolonie drobnoustrojów na podłożu Sabourauda przywieziono do kraju, gdzie izolowano bezbakteryjne szczepy grzybów. Stosując rutynowe metody diagnostyczne w badanym materiale

stwierdzono obecność 23 szczepów grzybów, które zaliczono do 10 gatunków klasy: Ascomycetes, Zygomycetes i Deuteromycetes (tabela 1 i 2). Zarówno w budynkach ogrzewanych jak i nieogrzewanych Stacji często występowały te same gatunki grzybów.