

THE VIEW FROM THE SOUTH

The United States, Norway, the United Kingdom, and Australia – these are the other countries that, like Poland, are scientifically active in the Antarctic. What did we do to deserve to be among this group? Is Poland a polar power?

ROBERT BIALIK: From the perspective of investments in science, we obviously cannot compare to such giants as the United States and Norway, not to mention Australia, New Zealand, or the UK – which has the British Antarctic Survey, the largest organization that conducts research in the Antarctic, and the Scott Polar Research Institute in Cambridge. Those are powerful countries that have a huge infrastructure and employ thousands of people. However, we also maintain our own polar stations, both in the north and in the south, which gives us a major advantage, because we can conduct comparative research. So, what did we do to deserve the status? The Arctowski Station was established back in 1977. It is well-known what system of government Poland had back then; the Soviet Union was a powerful country that treated us as

a satellite state. In an attempt to expand their sphere of influence, the Russians handed over the Dobrowolski Station to Poland. It was not used actively on a yearly basis, but it was needed to maintain the right to access marine food resources.

“Harnessing krill to feed Poland?”

That essentially was the idea, through it turns out krill works best as a source of protein for farmed salmon. So in addition to conducting scientific research, the Arctowski Station was indeed supposed to provide logistic support for krill-fishing vessels. Personally, I believe that what was achieved back at the start was phenomenal. Building an entire village with its own infrastructure – a power station, fuel storage facilities, cooling chambers, and warehouses – took just two months. Two hangars were built that are still used as storage facilities. These days, whoever operates helicopters in the region of the South Shetland Islands has a great advantage, because they have the logistics. Poland was one of those countries during the 3rd and 4th Antarctic

Asst. Prof. Robert Bialik, head of the Department of Antarctic Biology at the PAS Institute of Biochemistry and Biophysics, talks about the Henryk Arctowski Polish Antarctic Station on King George Island.

Expedition, which means in the late 1970s and early 1980s. For the first years, we had pilots, mechanics, and maintenance. Back then, Poland was a powerful player in terms of logistic support for scientific research.

Then what happened?

The Polish system of government changed and the economy collapsed. The world started to wonder if the Antarctic marine resources were not being over-exploited. Consequently, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) was established in 1982, and it started to regulate the catches of the Antarctic krill and the Antarctic toothfish, living in the waters surrounding the Antarctic. At the same time, the Polish fleet, adjusted to the requirements set for the vessels in that region, became outdated, and there was no money for new vessels.

So the krill-harnessing dream came to an end, but the station remained in place.

Exactly, because scientifically speaking its location was the best that could be picked. When you visit the jungle, you can hear animals all around. Here, when you go outside, you can see several thousand animals: three penguin species nesting close to the station (the Adélie penguin, gentoo penguin, and chinstrap penguin), elephant seals, Weddell seals, leopard seals, and Antarctic fur seals. Moreover, there are other penguin species that visit the station area from time to time: the king penguin, emperor penguin, and macaroni penguin. Nesting colonies of penguins can be found in the Antarctic Specially Protected Areas (ASPAs) – these are places where you cannot just walk in and start research. You can't bring in equipment, say a drilling rig, and start making noise. Invasive activities are not allowed, as expeditions to the region are monitored. Poland manages two such areas, namely ASPA 128 and ASPA 151. Close to the station, there is an area called the Jasnorzewski Gardens, one of the largest marine wetlands in the whole of the Antarctic region. Some sources say it dates back around 5,000 years. You can't

even walk there, because every step leaves behind an impression that stays for years. Others envy us of such a location.

What scientific opportunities does it offer?

We are strong in terms of ecology, and have been from the very beginning. Those who worked there back in the 1980s, apart from the staff from the Department of Antarctic Biology, included a team from the University of Łódź, whose members included Prof. Krzysztof Jażdżewski and Prof. Jacek Siciński. The materials they collected back then are still nowadays being used for PhD and DSc (*habilitacja*) dissertations. We have no taxonomists nowadays, but we have still discovered many new species. For instance, Prof. Wojciech Majewski from the PAS Institute of Paleobiology has collected core samples and determined the age of new organisms. The work by Prof. Maria Olech's team was commended by the Scientific Committee on Antarctic Research (SCAR) in 2016. A lot of work has been done especially in the field of biology, due to the scientific profile that the station adopted as a result of the presence of numerous animals and a wide variety of mosses and lichens (even despite the barren Antarctic climate).

From the outset, the station has maintained observations of "indicator species," including penguins. The task of implementing the monitoring program, which continues to the present day, was entrusted to Dr. Małgorzata Korczak-Abshire. As a result of her work, the database on species counts and animal populations (on pinnipeds, penguins, and other bird species) became so extensive that it attracted the interest of the international community. We started to conduct observations of krill-dependent indicator species, including the Adélie penguin. When the Americans decided, in the wake of the economic crisis in the United States, to limit their observations in the region of the Copacabana Station located in the vicinity of the Arctowski Station, we began to continue those studies. For 14 years, we have also monitored indicator species at Lions Rump, King George Bay. Six years ago, a Polish-Norwegian consortium led by the PAS Institute of Biochemistry and Biophysics in collaboration with the Warsaw University of Technology, the Northern Research Institute in Tromsø, and other institutions, was awarded the Project MONICA ("A novel approach to monitoring the impact of climate change on Antarctic ecosystems"), whose purpose was to use new technologies such as unmanned aerial vehicles (UAVs) to conduct monitoring. Photographs taken by the aircraft allowed us to estimate the size of the population of penguins and pinnipeds as well as to map plant communities. This was a pioneering project; at present we use drones to perform regular monitoring observations, thanks to which the reliability of the data collected has significantly improved.

Is that enough to ensure the station's maintenance?

No, so when I was appointed head of the Department of Antarctic Biology five years ago, I decided that we needed to expand our research activity to stretch into other disciplines as well. For example, we have launched projects in glaciology, hydrology, and climate science. The glaciers in the Antarctic are like those on Spitsbergen, or even larger, and the climate is very similar, so it is natural for us to conduct comparative research.

Domestic funding is a very important element in the development of the Arctowski Antarctic Station, including from the National Science Centre (NCN), which covers the ongoing research activity. In previous years we hosted some outstanding ornithologists at the Station: the team of Prof. Dariusz Jakubas from the University of Gdańsk, with an NCN project to study two species of small birds from the family Oceanitidae. One type of research that is directly useful to us has analyzed the speed of coastline changes, performed scientists from the University of Wrocław. The most important problem we face is that back when the main building of the station first was erected, it was more than 10 meters away from the coastline, but now the distance is just 1.5 meters. Since July 2018, a National Science Centre project has been underway with the use of the Station's infrastructure, entitled "Quantitative assessment of sediment transport from glaciers of the South Shetland Islands on the basis of selected remote sensing methods." Aside from NCN funded projects, we are continuing our years of collaboration with Prof. Żaneta Polkowska from the Gdańsk University of Technology on the hydrochemical study of watercourses. We are monitoring glacial meltwater to see how it shapes the moraines. In 2018, we also launched sea monitoring, with the aim of validating water turbidity values against values from spectral reflection in various channels registered by optical satellites and keeping track of changes in the physicochemical parameters of the water column in the close vicinity of glaciers.

Are any new technologies being used in these studies?

Under a targeted grant from the Polish Ministry of Science and Higher Education in 2018, a set of equipment was purchased (with the acronym HYDRANT) for comprehensively studying the hydrosphere in the Antarctic. This has enabled us to further develop the environmental monitoring programs underway at the Station, which currently stand out among those being performed on King George Island. Among the things this grant was used to purchase is a rigid-hull inflatable boat equipped with CTD EXO2 and LISST 200X sensors and two ADCP current meters taking readings on different frequencies. The investment enabled continuous meteorological measurements to

be reinstated, in the form of a system of automatic stations. At present, measurements are being taken at three stations, whereas plans call for a system of 6 meteorological stations.

And what about the coastline? You mentioned that the buildings of the station are in danger.

Because the Station has come under threat and immediate action needed to be taken, from 2015 the PAS Institute of Biochemistry and Biophysics sought funding to cover the costs of a new main building at the Station. We secured a positive decision in 2018 and the investment process then began. The first stage involves conceptual and design work, and we can expect to see the new building constructed in 2024. Through that time, we will continue to use the current infrastructure.

At this point the station is fragmented?

There is a main research building, which also has a dining room, kitchen, and rooms for the 14-member over-winter group. There is also a “Meteo” building where weather observations were previously performed, which now customarily serves as the quarters for the head of the Department of Antarctic Biology when at the station. Scientists live in three houses with two-, three-, and four-person rooms without any conveniences, only beds and electricity, situated about 200 m from the station, but sufficing for normal life and work. Everyone comes to the main building for meals. That arrangement is problematic, at the very least because of the wind. Such weather is only possible in Antarctica: sunshine, a blue sky, and winds of 100 km per hour, lasting for instance for a week. One can barely open the door, walking 100 m takes some 15 minutes, and there are large-sized pebbles flying around at the level of your knees.

Despite everything, I myself, and probably also my colleagues, will miss the main building of the station. Perhaps it can be preserved at least in part, as a museum. The part that serves as a unique mess hall can be separated, because the building is composed of containers.

How much does the station cost to maintain per year?

Our annual subsidy amounts to 7.5 million zlotys, and that suffices to maintain ongoing operations. However, logistics are really expensive. Just hiring a ship entails huge expenses, and travelling from the port in Gdynia in Poland to our island takes around 40 days each way. The increase in the subsidy from 6 to 7.5 million zlotys has secured the functioning of the station, but it also enabled it to be adapted to facilitate top-notch research. In my opinion, harnessing the full potential of the Station, including both ensuring the right number of technical staff and further developing research, requires around 10 million zlotys a year.



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What does the station give back to Poland, to justify spending such sums of money?

Firstly, keeping up our presence on the continent, and our ability to have a hand in decisions there, should be seen as being in Poland's state interests, and maintaining the Arctowski Station enables this to happen. Aside from that, we truly are a kind of Polish embassy in the Antarctic. We are visited by guests from various countries and we try to greet them with the highest honors, we have the national flags of all the countries working in the Antarctic, to hang on the mast outside the entranceway to the main building. This is scientific diplomacy. Secondly, polar research raises Poland's prestige in the international arena. Especially the studies that attract a lot of publicity.

For instance?

With the ability to conduct direct observations, supported by registered metrological data, we can identify climate changes occurring over years as well as the occurrence of weather anomalies. There is a discussion starting, one in which we can say “we have additional information” and our voice is starting to be important. A discussion about whether what is happening at the poles may perhaps be a question not of climate, but certain other factors. And about the consequences. Being here, we can monitor the status of animal populations on the Island on an ongoing basis. If certain disturbing events are noted, we can raise the alarm overnight. Our monitoring work is valuable in and of itself, because it has been underway for 40 years now. Few countries possess such long-term data.

What interests you personally the most in the Antarctic?

Hydrology, of course.



KURYLOWICZ & ASSOCIATES

Fig. 1
Design for
a new Arctowski Station

Fig. 2
Dr. Michał Pętliski doing
glacier-scanning work

Fig. 3
Dr. Mateusz Strzelecki
hard at work at
the Arctowski Station



LESZEK KRZEMIEN



PROF. GRZEGORZ RACHLEWICZ

But there are no big rivers there.

No, but the small streams that flow out of the glaciers can be even more intriguing. If I notice that a stream has appeared where there was none a year ago, I can work out how such things must have occurred elsewhere in the past and might occur in the future. For example, the transport of river debris. In Poland we have the Vistula River, which transports so much material that it is immeasurable – so much that we can only estimate the quantity. And so various models get posited, but it is only in the Antarctic, on this small scale, that we can actually verify them. Of course someone might say: why don't you verify them in the Tatra Mountains in Poland? Because postglacial streams and washed-out moraines have already formed there. We also have floods in Poland. When the water recedes, a lot of debris remains. But again: we don't know how much. In Antarctica, we can measure it. In other words, without intervening in nature, we can observe things and draw conclusions that be naturally adapted to the environmental landscape back here in Poland. There are many such topics.

In other words, Antarctica is a kind of world in miniature?

Yes, a natural laboratory. A wealth of potential topics to study, and a major brand of its own.

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