



CHRONICLE

The Polish-Italian Bilateral Conference on “Biology of the Antarctic”

The Fourth International Polar Year (2007–2008) was an outstanding opportunity to focus the attention of the general public and politicians on the polar regions. These last unspoiled frontiers on Earth are of immense climatic, naturalistic, historical, scientific and social importance. Polar regions – and in particular the Antarctic – are an extraordinary source of inspiration to our young scholars.

The polar idea which unites scientists from all over the world pushed us to organize the Bilateral Conference “Biology of the Antarctic” joining the Polish and Italian researchers.

This conference was held on 23rd of June 2008 at a hospitable and architectonically beautiful Szlenkier Palace where the Italian Embassy is located in Warsaw (Poland). The one-day Polish-Italian conference brought together leading scientists and a number of participants interested in the Antarctic problems. Different aspects of the Antarctic biology were presented and the discussion focused on the effects of contaminants on the ecology of the Antarctic continent and the King George Island, both in marine and terrestrial habitats.



The lecture by Professor Piero Luporini from the University of Camerino.
Photograph by Francesco Frati

The Conference was opened by Anna Blefari Melazzi, the Italian Ambassador in Poland, and Jakub T. Wolski, Titular Ambassador of the Ministry of Foreign Affairs, Department of Legal and Treaty Issues. They welcomed the audience and wished fruitful discussion.

Prof. Massimo Mazzini, the Scientific Attaché of Italian Embassy, after a short introduction asked the first speaker, Prof. Andrzej Tatur (Department of Antarctic Biology of the Polish Academy of Sciences), to present the history of the Polish Antarctic research. He illustrated the thirty year-history of the Polish scientific activity and logistic support in the *Arctowski* Station. The most important Polish achievements in the field of natural sciences (glaciology, oceanography, ecology, biology) were discussed. At present, the Department of Antarctic Biology PAS is involved in several projects, related to the program of the International Polar Year, such as CLICOPEN, AMES, ALIENS, ACE and POLARCAT.

The second speaker was Prof. Stanisław Rakusa-Suszczewski (Department of Antarctic Biology PAS), initiator of the Polish *Arctowski* Station on King George Island. He presented the long-term changes in the West Antarctic ecosystem. Due to the round year functioning of the Station, it was possible to recognize a considerable temporal variability of geoecosystems in relation to physical, chemical and biological processes. It is expressed in daily, seasonal, annual and multi-annual cycles reflecting climatic changes in the South Shetlands Archipelago. Prof. Suszczewski pointed out that the rapid increase of the number of tourists in the region will most likely favor an uncontrolled introduction of alien species into that ecosystem.

Prof. Piero Luporini (University of Camerino) presented the results of studies on the Antarctic microorganisms. Unlike the continent, that is very poor in resident animal species, Antarctic waters are rich in animals and microscopic Protozoa that play a fundamental role in every ecosystem and trophic chain. Some marine species of free-swimming ciliates were studied for the cold-adapted structures of the hormone-like (signal) molecules they synthesize and secrete to control their mating and reproduction.

Prof. Krzysztof Jażdżewski (Łódź University) presented a lecture entitled "Exceptional diversity and endemism of Antarctic peracarid Crustacea". On the background of world species richness of Crustacea the present state of knowledge of this animal group in the Southern Ocean was presented. The lecture focused on the peracarid crustaceans, mainly the richest groups – Amphipoda and Isopoda. The recent enormous increase in our knowledge of these crustaceans inhabiting Antarctic seas we owe mainly to three successive ANDEEP-expeditions (2002–2005) on r/v *Polarstern* bringing hundreds of species new for science. The Polish contribution to the knowledge of the Antarctic Amphipoda has been briefly mentioned.

As it was presented by Prof. Roberto Bargagli (University of Siena) although the remote continent of Antarctica is perceived as the symbol of the last great wilderness, human presence in the region began in the early 1900s for hunting, fishing and exploration, and many invasive plant and animal species were introduced since then in sub-Antarctic islands. Over the last 50 years, the development of research and tourism have locally affected terrestrial and marine coastal ecosystems through fuel combustion, accidental oil spills, waste incineration and sewage. Available data on the occurrence of heavy metals, pesticides and other persistent pollutants in Antarctic ecosystems show that their concentrations are lower than those in other remote regions, except for the natural accumulation of Cd and Hg in several marine organisms, particularly albatrosses and petrels. Most contaminants in the Antarctic environment are transported from other continents in the Southern Hemisphere. Concentrations of some organic pollutants in the eggs of top predators such as the south polar skua are close to those that may cause adverse health effects. Although the Protocol on Environmental Protection to the Antarctic Treaty provides strict guidelines for the protection of the Antarctic environment and establishes obligations for all human activity, the global warming, population growth and industrial development in countries of the Southern Hemisphere will likely increase the impact of anthropogenic contaminants on Antarctic ecosystems.

Dr Katarzyna Chwedorzewska (Department of Antarctic Biology PAS) presented the results of studies upon *Poa annua* carried out together with Prof. Maria Olech (Jagiellonian University). In the vicinity of the *Arctowski* Station (King George Island) the population of this antropophyte spreads and inhabits areas strongly altered by human activities. The species was initially recorded in the 1985/86 austral summer. In the summer 2006/2007, number of individuals in the natural communities, as well as the total number of its localities, increased drastically. The *Arctowski* Station appears to be the most frequently visited research station in the Antarctic. The number of visits has increased during the last few years and in 2007/2008 the number of tourist vessels reached 31 and the number of tourists – 6036. Authors tried to find the possible source for introduction of the species by comparing its populations from the *Arctowski* Station, Ushuaia (Argentina) and Poland, based on DNA fingerprints. The study showed that all the three analysed populations differed significantly from each other. Moreover, the population from *Arctowski* showed an astonishingly high variability resulting from increased human activity at the *Arctowski* oasis. Thus, genetic monitoring of a population combined with microclimate observations over several growing seasons can facilitate the assessment of the genetic diversity and explain the processes of colonisation of the *Arctowski* oasis by *P. annua*.

Dr Małgorzata Korczak (Department of Antarctic Biology PAS) presented the results of her studies upon changes in penguins population. Climate change significantly influences penguins' colonization. Populations of *Pygoscelis antarctica* from King George Island and Penguin Island were studied using the AFLP approach, in order to answer the question if the observed significant decrease of population size and changes of nesting areas might also influence the genetic structure of individual populations, the level of polymorphism, genetic variability and relatedness.

As it was shown by Prof. Francesco Frati (University of Siena) life in the soil is regulated by the availability of liquid water, which, in turn, depends on ice melting. When local environmental conditions are suitable, with provided soil moisture, vegetation (mosses, lichens, unicellular algae) and protection from winds (offered by rocks), communities of soil invertebrates, including the microarthropod collembolans and mites, may prosper. Nevertheless, biodiversity is always very limited, and only few, well adapted, species occur. Collembola represent the largest strictly terrestrial animals in continental Antarctica. The species distribution (most of them endemic) is shaped by major geographic features (mountain ranges and glaciers). In addition, the individuals have a very limited dispersal capabilities and populations are highly isolated, providing ideal conditions for the emergence of genetic differentiation, which may eventually lead to speciation. The study of various genetic markers may shed light on the influence of environmental conditions upon the population genetic structure, and help to infer the origin of the Antarctic Collembola. Genetic markers (allozymes, mitochondrial DNA haplotypes, and complete mitochondrial genomes) were applied in the study of 4 species of the Antarctic Collembola: *Gressittacantha terranova*, *Desoria klovtadi*, *Cryptopygus antarcticus* and *Friesea grisea*. In all instances, populations possess a remarkable degree of interpopulation differentiation, even at short geographic distances. Differentiation in *G. terranova* populations was related to the presence of geographic barriers, but in other species it did not appear to be congruent with geographic distances. This pattern, coupled with the evidence of remarkable genetic divergence, suggests that the Antarctic Collembola are not recent immigrants, but rather the descendants of taxa which were present in Antarctica before the cooling of the continent.

Prof. Piotr Węgleński (Warsaw University) presented the results of genetic investigation on Antarctic fishes. After comparison of partial mitochondrial 12S and 16S rDNA sequences of representatives of notothenioids from the Antarctic and their sister species from the Southern Ocean it was found that the divergence took place much later (1.7 and 6.6 million years ago) than the formation of the Antarctic Polar Front (20–25million years ago). That indicates the diversification was linked with substantial changes of environmental conditions – for instance,

episodes of climate change. It is known that such events took place in the history of the Antarctic, e.g. deglaciation of shallow Antarctic waters in Mid-Pliocene (2.5–4.8 million years ago). Based on the analysis of newly obtained rDNA sequences from 21 notothenioid species, and of 104 sequences known before, the systematics of notothenioids has been revised. Prof. Węgleński presented shortly also some new results of studies on the microbial abundance and diversity in soil samples from various ecological niches in the vicinity of the *Arctowski* Station on King George Island.

Prof. Giuseppe Scapigliati (University of Tuscia) presented the results of studies on the Antarctic fish which are extraordinary animals, since they are cold-blooded vertebrates permanently living at water temperatures below the freezing point. They developed peculiar strategies, like the production of antifreeze proteins, slow motion and slower metabolism. The most interesting species are the icefishes, that have lost hemoglobin and red blood cells in the adaptation to the cold environment. The main scope of studies on the Antarctic fish is to investigate immune defence mechanisms at low temperatures, as compared to those in warm water species, and then to use the results obtained for biotechnological applications. In addition, these studies may help to understand how the function of a gene can be modified to adapt to cold.

Prof. Wiesław Bogdanowicz (Museum and Institute of Zoology PAS) presented the results of genetics studies on elephant seal, *Mirounga leonina* – the largest representative of pinnipeds (body mass of males up to 4 tons) from the South Shetlands Archipelago. In this species, only a small portion (2–3%) of males have “breeding rights” to the large number of females. Three groups of animals were analyzed, from the Falkland Islands (Islas Malvinas), Elephant, and King George islands. Analyses of mtDNA and microsatellites revealed high levels of intra-population variation and low differentiation ($F_{st} < 0.002$) among the three groups studied despite the large distance (> 1000 km) between the Falkland Islands and the two other island groups.

The Polish-Italian Bilateral Conference was a big success. We hope that the exchange expertise between the two parties will serve to promote their future collaboration. Interesting presentations and the possibility of listening to inspiring talks led us to the conclusion that such meetings should be repeated in the future.

At the same day in the evening, the exhibition “Arctic and Antarctic – Italian researches on both polar regions” was opened at Italian Cultural Institute in Warsaw. The National Antarctic Museum “Felice Ippolito” of Genoa (Museo Nazionale dell’Antartide) and the Consortium for the implementation of the National Program for Research in Antarctica the Polarnet National Research Council and the S. Zavatti Polar Geographic Institute were its organizers (curator: Carlo Ossola; layout and graphic design: Cristina Fiordimela). This travelling exhibition, within the context of activities for the diffusion of science under the patrimony of MIUR (Ministry of Education, University and Research), aims to describe the polar regions as a whole and to inform the public about the Italian research undertaken in these extreme environments.

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