# Programma Nazionale di Ricerche in Antartide (PNRA)

## Final project report

<table>
<thead>
<tr>
<th>Project ID</th>
<th>2004/1.01</th>
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<tbody>
<tr>
<td>Title</td>
<td>Responses of Antarctic terrestrial and freshwater ecosystems to variations of climatic and environmental conditions.</td>
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<tr>
<td>Principal investigator</td>
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<td>Duration</td>
<td>3 years</td>
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<tr>
<td>Assigned funding</td>
<td>300.000,00 Euro</td>
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## Activities and results

Trough the development of coordinated and integrated studies on the phylogeny of cryptogamic organisms and invertebrates and their adaptation mechanisms to the Antarctic environment, the project aimed at achieving a better understanding of the distribution and composition of the main biotic communities and the functioning of terrestrial and freshwater ecosystems in deglaciated areas of Victoria Land. Studies on interactions of Antarctic organisms with their environment, taxonomic revision, the creation of database, together with studies on genetic variability and differentiations of micro-invertebrates, cryptogams and cyanobacteria aimed at detecting/predicting the possible effects of climate and environmental change on Antarctic ecosystems. The project drew on the expertise of six Italian research groups (Prof. R. Bargagli, Dept. Environmental Sciences, Univ. of Siena; Prof. F. Frati, Dept. Evolutionary Biology, Univ. of Siena; Prof. C. Andreoli, Dept. Biology, Univ. of Padoa; Prof. G. Carchini, Dept. Biology, Univ. of Rome Tor Vergata; Prof. B. Fumanti, Dept. Plant Biology, Univ. of Rome “La Sapienza”; Prof. P.L. Nimis, Dept. Biology, Univ. of Trieste), acquired in over a decade of research within the international context of Antarctic biology and ecology. Several research activities were also performed in collaboration with some foreign Antarctic biologists and ecologists such as P.A. Broady, I.D. Hogg, A. Mc Gaughran, M.I. Stevens, M. Skotnicki, D.H. Wall and P. Convey. The results of the research activity have been reported in several scientific publications and communications at international workshops and symposia (see the section products); thanks to samples stored in our laboratories and some culture of Antarctic algae and cyanobacteria some research activities are still going on. Among the most important results:

- new record and genetic characterization of thermophilic bacteria and the moss *Pohlia nutans* from geothermal grounds of Mt. Rittmann and the northwest slope of Mt. Melbourne.
- The biogeochemical cycle of Hg throughout the Victoria Land, the finding of an enhanced deposition in the Nansen Ice Sheet region with Hg accumulation on mosses, lichens and lacustrine sediments. We found that the coastal polynya at Terra Nova Bay is a source of marine aerosols and during the austral spring the photochemically driven Hg$^0$ oxidation by reactive halogens determines "Hg depletion events" like those previously reported in some Arctic coastal ecosystems. These results raises concern about the possible environmental effects of changes in regional climate and sea ice coverage, and on the possible role of Antarctica as a sink in the global Hg cycle.
- The development of algae, moss and lichen communities is affected by spatio-temporal variations in the availability of water and nutrients, which mostly arise from the marine environment.
- ANTADATA: a database on biogeography of non-marine algae in continental Antarctica; new records of Antarctic algae, molecular phylogeny and ecophysiology of *Koliella antarctica*.
- Differently from most cryptogamic organisms, the terrestrial microarthropods have limited dispersal capability, highly aggregated distribution and their diversity and genetic variability seem affected mainly by local factors (i.e. the geological and glaciological history) rather than latitudinal or altitudinal gradients.
- VICTORIA: a database of Antarctic lichens and on-line identification key of all taxa recorded in the northern Victoria Land.
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Products

A – papers in scientific magazines (with IF)

2004

2005

2006

2007
Programma Nazionale di Ricerche in Antartide (PNRA)


2008


2009


2010


B – books and book chapters


C - proceedings of international conferences


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"Evolution and Biodiversity in Antarctica", Curitiba, Brazil, 25-29 July 2005, 3.


D – proceedings of national meetings and conferences


E – thematic maps

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F – patents, prototypes and data bases
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G – exhibits, organization of conferences, editing and similar
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H - formation (PhD thesis, research fellowships, etc.)
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Research units

R. Bargagli – Dept. Environmental Sciences, University of Siena (biogeochemistry and ecosystem functioning, Coordination of research activities)
C. Andreoli – Dept. Biology, University of Padova (molecular biology and ecophysiology cyanobacteria and algae)
G. Carchini – Dept. Biology, University of Rome Tor Vergata (phylogeny of Antarctic Chironomidae)
F. Frati – Dept. Evolutionary Biology, University of Siena (phylogeny and genetic variability of Antarctic collembola)
B. Fumanti – Dept. Plant Biology, University of Rome “La Sapienza” (Taxonomy and biogeography Antarctic algae)
P.L. Nimis – Dept. Biology, University of Trieste (taxonomy and biodiversity of Antarctic lichens)

Date: April 14, 2010

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