



INSTITUTE OF POLAR SCIENCES

Overview

[Stefano Miserocchi](#)

The researchers who joined ISP (Bologna) in July 2019 have extensive polar research experience and most of them participated in Antarctic and Arctic expeditions and activities. Over the last 2 years, ISP-Bologna has tried to strengthen its presence in the polar areas with the implementation of new research projects (ENI Artico; progetti PRA: Betha-NYA, PAST HEAT; PNRA: BIOCOARSE, EDISTHO, RadiCA, BIOROSS, LASAGNE, COLLAPSE, CHIMERA; SIOS: MIST-CA). The research interests of ISP-Bologna range from paleoclimatology, to oceanography, physics and chemistry of the atmosphere, biology and ecology of Antarctic fish species, etc.

Despite the COVID pandemic, a new laboratory of organic geochemistry has been set up and the laboratory for the treatment of suspended sediment has been relocated and refurbished.

ISP-Bologna manages the Dirigibile Italia Arctic Station that supports the Italian and International scientific community working in the Arctic, providing access to laboratories, office space and observatories, including the CCT, Gruvebadet Laboratory and the Mooring Dirigibile Italia, which are used to monitor the ongoing climate change. A central part of the monitoring activities consists

in making the collected data publicly available through the PNRA and PRA repositories, which have been developed and are managed by ISP-Bologna.

ISP-Bologna also carries out extra-polar activities, like in the Southern Adriatic Sea by managing the MSA observation site, which has been recently included in the EMSO-ERIC consortium. Furthermore, it coordinates, through the branch office in Milan, a project studying the transport processes of climate-altering particles, their deposition and potential impact on the cryosphere in the Peruvian-Andes.

IN THIS ISSUE:

Overview

Top stories

Italy in the context of the Synoptic Arctic Survey (2020-22)

News from Dirigibile Italia

Research Highlights

Subfreezing corals

The Comment

1st Conference of the Institute of Polar Sciences

Postcards from the field ...

Polar chronicles

In brief

About us

Upcoming events

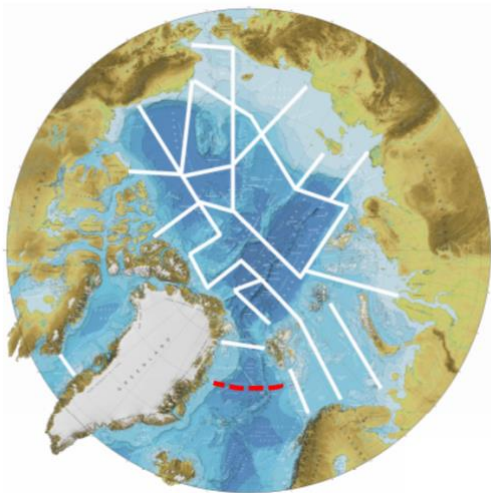


TOP STORIES

Italy in the context of the Synoptic Arctic Survey (2020-22)

[Maurizio Azzaro](#)

The Synoptic Arctic Survey (SAS) is a bottom-up, researcher driven, initiative coordinating and collecting oceanographic data from the Arctic Ocean in 2020-2022 using the research vessels – ice breakers of several Nations. The goal is to generate a comprehensive dataset that allows an improved characterization of the Arctic Ocean. This will be done by assessing the absorption of carbon and acidification of the oceans, the distribution of possible pollutants, and how the ecosystems function. The SAS aims to take a "picture" of the Arctic Ocean in the two-year period 2020-22 in as much detail as possible and to answer the main scientific question: what is the current state and what are the main changes taking place in the Arctic marine system due to climate change?



The dashed red line represents the studied transect

The Italian project CASSANDRA (*Advancing knowledge on the present Arctic Ocean by chemical-physical, biogeochemical and biological observations to predict the future changes*) is part of SAS, in the framework of the Arctic Research Program, which aims to quantify the current state of the physical, chemical, biological and biogeochemical systems of a historical subarctic transect at 75 ° N crossing a cyclonic vortex of the Greenland Sea.



Sampling from the *rosette* (Credits: Warren Cairns)

Along the transect studied there is one of the deep-water formation sites in the Arctic Ocean, which is one of the main ocean cold engines. In addition, the cyclonic vortex helps to regulate Arctic temperatures and therefore also Arctic Amplification

The proponents of the project (ISP-leader, OGS) chose the name CASSANDRA because the environmental message is getting through to more and more people on a social and political level. We hope to break the curse Apollo put on her and finally dispel her legend as an unheard Prophetess!



Fixing the samples (Credits: Warren Cairns)



HERE DIRIGIBILE ITALIA



Mauro Mazzola

December 2021

We parted in September with the conclusion of the "summer" activities, such as the installation of new hydrophones in the fjord by Giusi Buscaino (CNR-IAS) for listening to the sounds emitted by the aquatic fauna, but also by the movement of the glaciers that end up in the sea.

By October activity at the Italy Dirigibile Arctic Station returned to a "monitoring" mode. Almost. The base was occupied by Federico Scoto, a CNR-ISAC research fellow, and Ivan Sartorato, researcher at ISP Venice "acting station leader". They were joined by Sara Giansiracusa and Agnese Petteni, both PhD students in polar sciences at Ca' Foscari. During the first half of the winter season a lot of work was done. For example, the housings were prepared for the installation of 4 piezometers into the soil for the *Ice2Flux* project, which will start in 2022; monitoring of black carbon in the atmosphere was started and a webcam to observe the northern lights managed by Stefano Massetti (INAF) was reinstalled as every winter. Since the beginning of November, "command" passed to Raffaello Nardin, a doctoral student from the University of Florence and a veteran in Ny-Ålesund, flanked by the doctoral student Stefano Frassati, also from Ca' Foscari. There was also time for a visit by two INGV colleagues (Vincenzo Romano and Emanuele Pica) for maintenance and upgrade of their ionospheric scintillation detectors.

In November our colleagues in the base took part in the "Futuro Remoto" outreach event organised by the "Citta della Scienza" of Naples. We also saw the start of renovations to our base by Kings Bay. The building that houses us was built in 1996 and has remained more or less the same ever since. The works will consist of the renovation of the bathrooms, the floors of the common areas, and complete renovation of the living room/kitchen area and its furniture. We will therefore be ready to celebrate the 25th anniversary of the Arctic Station Dirigibile Italia at Ny-Ålesund, that was officially opened on May 15, 1997. To honor this anniversary, we hope to have the president of the CNR, Maria Chiara Carrozza, as our guest.



Dirigibile Italia (Credits: Mauro Mazzola)

We also take this opportunity to wish a Merry Christmas and Happy New Year to all readers and in particular to the staff who will spend the holidays at the station!



RESEARCH HIGHLIGHTS

Subfreezing corals

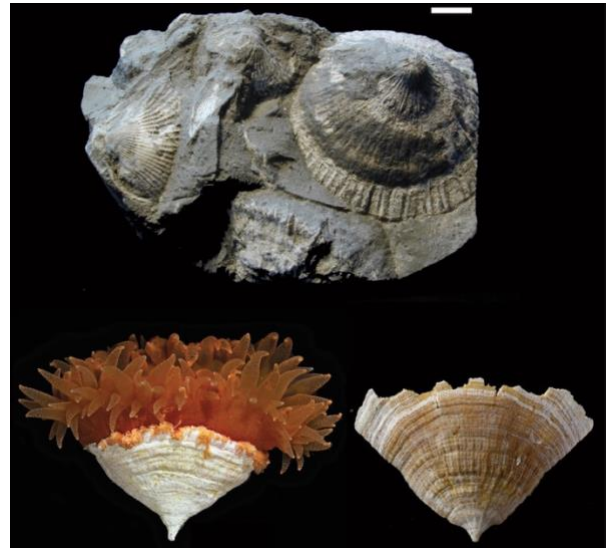
[Paolo Montagna e Marco Taviani](#)

As shown by rare fossil occurrences on mainland and islands, modern type corals inhabit Antarctic waters since the early Tertiary when seawater temperature was milder than today. Their presence extends up to present times posing a physiological problem to deal with highly demanding sub-zero temperatures. Although mostly represented by soft cnidarians deprived of mineralized exoskeletons, recent Antarctica is also home to some colonial and solitary calcified species, which also include taxa secreting aragonite, a metastable form of calcium carbonate. A case in point is the cosmopolitan cup coral *Flabellum*, which is represented in Antarctic and subantarctic habitats by a bunch of species thriving at depths between ca. 300 and 600 m.



Specimen of *Flabellum* living at 553 m water depth along the south-western Australian margin (Credits: Schmidt Ocean Institute)

Furthermore, these corals are well established in distant waters of the southern hemisphere, such as Australia and New Zealand bathed by Antarctic water masses. This combination makes *Flabellum* an ideal candidate for geochemically-based paleoclimatic studies. As for their tropical counterparts, the aragonite skeleton of *Flabellum* preserves specific geochemical signals that can be decoded and converted into environmental parameters using empirical calibration equations. In particular, the concentration of some trace



Fossil (Oligocene) and modern corals belonging to the genus *Flabellum* from the Ross Sea. Scale bars = 5 mm (Credits: Stolarski and Taviani, 2001; Greg Rouse, Paolo Montagna)

elements, including lithium, magnesium and strontium, is strongly related to the ambient seawater temperature, whereas phosphorus and boron in the skeleton vary as a function of the nutrient content and carbonate ion concentration, respectively. The analysis of boron and neodymium isotopes enables reconstructing past variations of the pH and the dynamics of the water masses bathing the corals. We thus have a unique climate archive that can provide valuable information to study the long-term climate evolution in the polar regions, increasing our understanding of the recent anthropogenically driven global warming and ocean acidification.



Remotely Operated Vehicle SuBastian used for deep sea exploration and sampling of *Flabellum* specimens from the Southern Ocean (Credits: Schmidt Ocean Institute)



THE COMMENT

1st Conference of the Institute of Polar Sciences

Internal Advisory Board

Two years after the birth of ISP, the first conference of the Institute was held from 22 to 24 September 2021 at the CNR headquarters in Rome (Photo of the director on stage).

The first day was dedicated to the national framework of research at the poles in the international context, with an introductory speech by the director of ISP. The importance of the establishment of the Institute of Polar Sciences and the appreciation of the work done so far have been evidenced by the interventions of the President of the CNR, Prof.ssa Maria Chiara Carrozza and the Director of DSSTA Dr. Fabio Trincardi. In the following session polar research carried out by the main European institutions were remotely presented by the directors Jane Francis – BAS (UK), Yan Robert-Coudert - IPEV (France), Ole Arve Misund - NPI (Norway) and Antje Boetius - AWI (Germany). A further session presented the two national research programs in Antarctica (PNRA) and the Arctic (PRA). Contribution were given by Benedetto Della Vedova, Delegated for Polar Activities from the

medium- term prospects for Italian polar research in relation to funding, priorities and infrastructural investment.

MAECI, Silvano Onofri, President of CSNA and Carmine Robustelli, Special Envoy for the Arctic. The first day then ended with a discussion on the The second day was dedicated to presentation by ISP researchers in 5 sessions. 53 presentations were given with a large participation both in presence and remotely. The day was a fruitful opportunity to summarize the main research currently conducted in ISP and to strengthen collaborations between the Institute's researchers. The conference created synergies between the different sections of the Institute and strengthened our sense of belonging.

The last day was dedicated to the presentation of the summary document of the activities related to the latest AR6 IPCC. The working groups currently active in the ISP presented their objectives, the results achieved so far and the opportunities they offer to all ISP researchers. There is still a lot of work to do to grow our Institute but the results achieved so far, both in terms of planning and scientific articles, are a good sign that we are going in the right direction.

All the documents presented are available [online](#).



The first day: a photographic summary



POSTCARDS FROM THE FIELD

POSTCARD

In the framework of the SED-POPs, PRIMA and FIKO projects, the maintenance and implementation of the 3 marine observatory sites managed by CNR-ISP in the Kongsfjorden-Krossfjorden system (KKS) were carried out. Seawater, suspended particulate and sediment samples were also collected. These activities contribute to improve the knowledge of the main physico-chemical changes, linked to climate warming and anthropogenic pressure, occurring in the KKS.

Jasmin Rauseo

Stefano Misericocchi

Sara Giansiracusa

Francesca Spataro Federico Giglio





Credits: Sara Giansiracusa, Stefano Misericocchi, Jasmin Rauseo

In the frame of PNRA project "Multidisciplinary Investigations on mount Melbourne volcano and its fumarolic ice Caves - MIMIC" the sampling activities of different caves of Mt. Melbourne volcano have just been completed.

The MIMIC investigations aim to reconstruct the eruptive histories of the volcanoes, as well as to characterise their actual states, and the conditions and trace of life forms presence inside the fumarolic ice caves. The main objective was thus, for the first time, to perform an accurate sampling of soil close to gas emissions collected from different ice caves of Mt. Melbourne in order to obtain the reliable and statistically significant molecular survey on microbial diversity.

Mikhail Iakimov

Violetta La Cono








Greetings from
Mario Zucchelli Station
Antarctica

Credits: ©PNRA



POLAR CHRONICLES

Carlo Barbante

All is set up at Little Dome C in what we hope will be the start to a great season. The logistics team has already been in the field since early November 2021, working hard to start up the caravans and tractors that are necessary for the Camp. They've been there a couple of times so far and they'll stay there to finish setting up the drilling site.



The setup of the LDC camp (Credits: Patoir@PNRA/IPEV)

We are there within the framework of the European Union project [BeyondEPICA - Oldest Ice Core: 1.5 Myr of greenhouse gas - climate feedback](#). In this project experts from 12 institutions in ten European countries are coordinated by the Institute of Polar Sciences of the National Research Council of Italy (ISP-CNR) in Venice and we are about to start ice core drilling operations. The drill site is located at Little Dome C (LDC), an area of about 10 km², 40 km away from Concordia Station at Dome C, the Italian-French base on the high Antarctic Plateau. Dome C is 1000 km from the coast, at an altitude of 3233 m above sea level, and is run by IPEV and the PNRA, the French and Italian polar agencies.



Aerial view of the LDC camp (Credits: Barbante@PNRA/IPEV)

BeyondEPICA aims to drill for and recover ice from up to 1.5 Million years ago in Antarctica. It will take about four seasons in the field to retrieve the deepest ice, which should hold the secrets of climate dating back to 1.5 Million years ago. The previous EPICA project recovered

800,000 years of ice. We want to go BEYOND that. We hope that this core will give us information on the Antarctic climate and the greenhouse gases present during the Middle Pleistocene Transition (MPT), which occurred between 900,000 and 1.2 Million years ago. During this period the climatic periodicity transitioned from 41,000 to 100,000 years between ice ages. Why this change happened is the mystery we want to resolve. With this goal in mind, the LDC area was selected after an initial period of coordinated actions, including more than 4,000 km of airborne and ground-based Radar Echo Sounding (RES) survey and basal temperature assessment based on vertical velocity and temperature measurements. All measurements were interpreted within a temperature and age modelling framework. A group of experts precisely selected the exact site for drilling operations during the 2020-21 field season and after the COVID-19 break we are about to start drilling. It is the first time that a site for deep drilling has been selected with such high precision and effort, and we hope that the drilling technologies available will allow us to reach our goal on time. A team of about twelve scientists, drillers and logistical staff will work hard for the first LDC drilling season.



First firn core recovered at LDC (Credits: Poutou@PNRA/IPEV)



IN BRIEF

- The first Italian Workshop on air pollution by particulate matter at high altitudes entitled "AEROSOLS IN MOUNTAIN SITES" was held in Falcade (BL) on 9 September. The workshop was organised by the Italian Aerosol Society, in collaboration with the ISTITUTO DI SCIENZE POLARI-CNR, ISAC-CNR, Ca' Foscari University of Venice, University of Perugia, ARPA Valle d'Aosta and the Municipality of Falcade.

ABOUT US

In "Radar Magazine" Alfonso Lucifredi, naturalist and scientific journalist, talks about the Ice Memory project that involves ISP researchers in the collection of ice-cores, cold archives of the climate of the past. <https://www.radarmagazine.net/ice-memory-proteggere-la-memoria-del-ghiaccio/>

- In BBC news, science correspondent Jonathan Amos talks about the Beyond EPICA project, which involves researchers from ISP and other European research institutes with the aim of recovering an ice core that will allow them to study the climate of the past going back more than 1.5 million years. <https://www.bbc.com/news/science-environment-59475410>

UPCOMING EVENTS

- The fourth edition of SIOS Polar Night Week (PNW) will take place in Longyearbyen from 24th to 28th January 2022. Due to COVID pandemic, only remote participation will be available, but registration is still required. <https://sios-svalbard.org/PolarNightWeek>
- A new call SIOS to contribute to the state of environmental science in Svalbard (SESS) has been issued. SIOS seeks proposals for new and update chapters that highlight and contribute to the development of the Earth Observing System in and around Svalbard. The [call](#) was opened on the 1st of December and will close on 10th January 2022.
- The call for research activities at the Italian Dirigible Station is now open. Deadline for submission of the proposals is 22 January 2022. More information in the [reserved area of IADC](#).

The "Outreach and Communication" working group wishes everyone

Merry Christmas and Happy New Year!!!

STAY IN TOUCH:



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