Full Proposals for International Polar Year 2007-2008 Activities

Proposed IPY Activity Details

1.0 PROPOSER INFORMATION

(Activity ID No: 53)

1.1 Title of Activity
A Census of Antarctic Marine Life

1.2 Short Form Title of Proposed Activity
CAML - A Census of Antarctic Marine Life

1.3 Activity Leader Details
Michael Stoddart
Administrator, CAML
Australia

1.4 Lead International Organisation(s) (if applicable)
SCAR
COMNAP
CCAMLR
NULL

1.5 Other Countries involved in the activity
Germany
Belgium
USA
France
Russia
Poland
Argentina
Malaysia
Italy
Ukraine
India
UK
New Zealand
Brazil
Norway
Korea and more
Japan

1.6 Expression of Intent ID #'s brought together in this proposed activity
83,109,111,148,153,189,192,205,219,236,330,379,817,818, 863,949,953,271,417,713,109, 290, 683

1.7 Location of Field Activities

Antarctic

1.8 Which IPY themes are addressed
1. Current state of the environment
2. Change in the polar regions
4. Exploring new frontiers
5. The polar regions as vantage points

1.9 What is the main IPY target addressed by this activity
1. Natural or social science

2.0 SUMMARY OF THE ACTIVITY

Polar regions experience greater rates of climate change than elsewhere on the planet. The fauna of these regions is uniquely adapted to the extreme environments in which they exist, and may be vulnerable to shifts in climate. There is an urgent need to establish the state of these communities, and in particular their diversity, if we are to understand the impact of climate change. Current knowledge of Antarctica's marine biodiversity is patchy. For the most part almost nothing is known about the mesopelagic, bathy/abysso-pelagic and benthic fauna of the slopes and deep-sea abyssal plains. Practically nothing is known about the tiny organisms (bacteria, archaea, eukaryl protists, viruses, nanoplankton) in the sea wherever they occur and in whatever habitats, or about the faunas associated with hydrothermal vents, cold seeps, and seamounts.
The CAML is a five year project that will focus the attention of the public on the ice-bound oceans of Antarctica, reaching its peak of activity during the International Polar Year (IPY) in 2007/08. It will be conducted under the auspices of the Census of Marine Life (www.coml.org). CAML's objective is to study the evolution of life in Antarctic waters to determine how this has influenced the diversity of the present biota, and to use these observations to predict how it might respond to future change. The project will integrate knowledge across all regions, biomes, habitats and fields of study to strengthen our knowledge of ecosystem dynamics in this high latitude, ocean system, and only through a multi-scale level of investigation will a better understanding of the diversity and status of Antarctica's marine life be obtained.
While planning for the specific science projects within CAML is as yet incomplete, the census will investigate: 1. The use of powerful new genetic and molecular tools to determine the extent to which the circum-Antarctic marine fauna and flora is homogeneous or differentiated. This will enable regional predictions to be made of the consequences of future climate change. 2. The future adaptability of a flora and fauna which evolved in an environment free from the pressures of current global warming. This will inform predictions of species survival to the observed rate of change. 3. The likely effects of environmental change on the provision of ecosystem services. This will be estimated from comparison of data collected in the 2007/08 field season with data published from previous expeditions, such as the Challenger and Discovery voyages, and from taxonomic analysis of existing museum collections. 4. The environmental consequences of ice-shelf collapse, enabling predictions to be made of the impact of further dissolution of this uniquely polar habitat to ecosystem services. 5. The importance of the Southern Ocean as a source of marine speciation. If, as has been suggested, Antarctic waters are a launching pad for speciation, change in circulation and physical characteristics of Antarctic waters will have far-reaching effects.
The CAML will leave legacy sites for future comparability studies. It will employ modern genomic scientific techniques and contribute to the Barcode of Life project, as well as integrating with other Census of Marine Life projects. In particular, the CAML will interact very strongly with the Arctic Ocean Diversity project ArcOD, EoI 64 and the Canadian ArcOD, EoI 713, drawing comparisons between differences in ecological structure and dynamics between the Arctic and Southern Oceans.
The various EoIs, listed under 1.6, contribute to the overall CAML proposal by elucidating various facets of the above five objectives. Together they are the building blocks of an integrated, coherent and Antarctic-wide snapshot of the status of biodiversity in Antarctica and its surrounding oceans. CAML will provide a baseline against which the effects of future

environmental change can be measured.

2.1 What is the evidence of inter-disciplinarity in this activity?
Investigation of the evolutionary biogeography of Antarctica requires close interdisciplinary links with geologists, environmental and physical oceanographers and glaciologists, in order to compare the faunal distribution and abundance with the environmental features. New technologies embraced in CAML include molecular biology and “crittercams” and other visualisation techniques – these are at the forefront of innovative, interdisciplinary approaches in marine science which will assist conventional technologies to move forward in understanding the interactions between organisms and their habitats. Development of standard sampling protocols for CAML will link disciplines, within acceptable levels of statistical resolution.

2.2 What will be the significant advances/developments from this activity? What will be the major deliverables? What are the outputs for your peers?
The CAML is a strong collaborative core project, that will make significant advances to the IPY research themes. Theme 1: The CAML will provide rich data on the state of diversity of marine life around Antarctica. Attention will be paid to those marine habitats under-represented in the literature. Theme 2: CAML will provide a benchmark for tracking future change in the Antarctic marine environment. With reference to earlier “Discovery” voyages some assessment can be made of faunal changes occurring over the past 60–70 years. Legacy sampling sites can be revisited in the future for further comparisons. Theme 3: CAML will address basic ecological and evolutionary questions concerning speciation in Antarctic waters, and the interactions between species distribution and ocean currents. Theme 4: CAML can confidently be expected to reveal many species new to science. It will establish a network of comprehensive Antarctic marine biodiversity databases (within SCAR-MarBIN see EoI 817), fully interoperable with the OBIS network.
By querying databases and reference to voucher specimens (museum samples, DNA barcode sequences) CAML will unhinge a vast array of information for current and future scientists, in the international cooperative spirit of IPY. Publications in international refereed journals are ensured by the calibre of researchers involved in CAML. In addition, freely available materials will be provided by the education and outreach program. For example, within a week of the CAML workshop in Brussels 27-30 May 2005, presentations were available on the new website www.caml.aq which has since received almost 600 visits.

2.3 Outline the geographical location(s) for the proposed field work (approximate coordinates will be helpful if possible)

Locations	Coordindates
Antarctic Peninsula	
Weddell Sea	
Haakon VII Sea	
Eastern Antarctic region	
Ross Sea	
Bellingshausen Sea	
Amundsen Sea	

2.4 Define the approximate timeframe(s) for proposed field activities?

Arctic Fieldwork time frame(s)	Antarctic Fieldwork time frame(s)
	09/07 - 04/08

2.5 What major logistic support/facilities will be required for this project?
Icebreaker
Ice strengthened research ship
Autonomous Underwater Vehicle
Submarines

Further details – CAML is happy to share logistics with other ocean-based projects – in particular, CASO (EoI 109), ANDEEP-SYSTCO (EoI 111), CCAMLR (EoI 148) and ICED (EoI 417).

2.6 How will the required logistics be supplied? Have operators been approached?

Source of logistic support	Likely potential sources	Support agreed
Consortium of national polar operators	Y	
Own national polar operator	Y	Y
Another national polar operator	Y	Y
National agency	Y	Y
Military support		
Commercial operator	Y	
Own support	Y	Y
Other	Y	Y

2.7 If working in the Arctic regions, has there been contact with local indigenous groups or relevant authorities regarding access?

3.0 STRUCTURE OF THE ACTIVITY

3.1 Origin of the activity
This is a new activity developed for the IPY period

3.2 How will the activity be organised and managed? Describe the proposed management structure and means for coordinating across the cluster
The CAML is managed by a self-funded and self-organised Scientific Steering Committee (SSC), established by SCAR under the Evolution and Biodiversity in Antarctica (EBA) program. The Alfred P Sloan Foundation is contributing US$1.4 million to SCAR over 5 years for scientific coordination activities, including a full-time Project Coordinator. The Chief Scientist of Australian Antarctic program is the Project Administrator.
Since startup in early 2005, CAML has established a viable management plan and organisational structure, as a basis for strong scientific collaboration. Following a SSC planning meeting in Brussels in May 2005, five working groups have been established to plan detailed studies in CAML. Timelines have been agreed for commitments to the project and for logistic support. Calls for participation in CAML are being made during SCAR's July 2005 Biology Symposium, at the Dynamic Planet conference in August 2005, and on the websites of SCAR and CAML. Calls will be made for scientists to participate in field studies and laboratory studies. Having corresponded and discussed issues with the proposers of all Marine Biodiversity EoIs, as shown on the IPY website, the CAML SSC is in active engagement across the cluster and intends to incorporate as many EoIs as it can.
The SSC will meet again in November 2005 to review progress in integration of all projects by the working groups. By this time it is hoped that the amount of ship time will be known, enabling the SSC to refine its scientific plans and objectives.

The CAML is providing funds to SCAR-MarBIN to enable it to become the Antarctic node of the Ocean Biodiversity information System (OBIS).

3.3 Will the activity leave a legacy of infrastructure and if so in what form?
No, but CAML will leave some legacy sampling sites (identifiable by GPS) that can be re-sampled at intervals in the future in order to track changes in marine biodiversity. It will leave collections of marine specimens that will be used for biological research for many years to come.

Although no direct legacy will be left by CAML, some of the data arising from the project will be made available through the SCAR-Marine Biodiversity Information Network (SCAR-MarBIN) portal, which will be designed to exceed the timeframe of IPY. In this respect, it will leave a legacy in the form of a valuable data recovery tool.

3.4 Will the activity involve nations other than traditional polar nations? How will this be addressed?
The CAML is inclusive, already making links with researchers in Malaysia, Indonesia, Ukraine, India, China and Korea, as well as with traditional polar nations. In association with meetings such as the Census of Marine Life "All Programs" meeting in Frankfurt in November 2005, and Dynamic Planet in Cairns in August, productive international collaboration will be actively encouraged. Through the CAML SSC and website, many requests for involvement have been taken up by the CAML Administration.

3.5 Will this activity be linked with other IPY core activities? If yes please specify
In line with its objectives and logistic requirements, the CAML will naturally link with other core IPY activities. Of course, this will include the other lead EoIs in the Marine Biodiversity cluster, namely ANDEEP-SYSTCO EoI 111 and SCAR-MarBIN EoI 817. For example, collaboration with physical oceanographers using the RV Polarstern is actively underway and has been endorsed through the German IPY Committee, particularly in connection with ANDEEP-SYSTCO EoI 111 and CCAMLR EoI 148, as well as core activities in other clusters (eg. CASO EoI 109). CAML has received endorsement through the Australian IPY Committee. The U.S. GEOTRACES EoI 271 provides a welcome link with chemical oceanographers, to coordinate the availability of nutrients with marine ecosystems. Further links with other IPY core activities will be forged through COMNAP, interactions with ship providers, and funding agencies. These links are supported by CAML but will also be driven in achieving cost-effective use of high capital sampling platforms.

3.6 How will the activity manage its data? Is there a viable plan and which data management organisations/structures will be involved?
The CAML has a well-developed data management structure, with dedicated funding and staff already in place. SCAR has adopted the development of SCAR-MarBIN; a marine biodiversity information network, based in Brussels. The Belgian Government intends to commit two-person-years to the development of an interoperable network of Antarctic marine biodiversity databases. This will provide data to the Ocean Biodiversity Information System (OBIS), as required by the Census of Marine Life. The companion EoI 817 "SCAR-MarBIN: the information dimension of Antarctic marine Biodiversity" outlines the data management and informatics structures that will develop with CAML. The CAML is providing funds for SCAR-MarBIN to become the Antarctic node of OBIS.

3.7 Data Policy Agreement
Will this activity sign up to the IPY draft Data Policy (see website)
Yes

3.8 How will the activity contribute to developing the next generation of polar scientists, logisticians, etc.?
The CAML 's position at the forefront of new technologies for the study of biodiversity provides ideal opportunities to foster the new generation of polar scientists. A strong emphasis is placed on the participation of young scientists and students in the program; coordination funds are earmarked for this purpose. By establishing legacy sites and standard sampling protocols, CAML will provide a framework for the next generation of scientists to continue the Census work. A particular objective is the involvement of young scientists in the program.

3.9 How will this activity address education, outreach and communication issues outlined in the Framework document?
In alliance with The Cousteau Society, an education and outreach program has been drafted for the CAML, under the direction of the SSC. As part of the program, the CAML website www.caml.aq was launched in June 2005. Brochures, posters and information presentations at

five conferences in 2005 are underway. The use of underwater video and “crittercams” will provide a rich stream of pictorial material. A TV production company will be approached with a view to making a comprehensive before-during-and after documentary of CAML, following the success of this genre in other Census of Marine Life field projects.

3.10 What are the proposed sources of funding for this activity?
The CAML will be a very expensive project. Informally, we are aware of many nations that might offer ship time to the CAML. Work during 2005 with the Council of Managers of National Antarctic Programs (COMNAP) will identify the amount of ship time and the areas in which those ships will operate during the field-work phase of CAML. The major cost of CAML is ship time. Apart from the coordination/planning costs, which are being met by the Alfred P Sloan Foundation, the remaining costs will be for scientist support. A science plan for CAML, currently in draft form, will be completed by October 2005 and will be used by researchers as the basis of their applications to research funding bodies.

3.11 Additional Comments
We know more about the surface of the moon than we do about the surface of the Earth, because so much of our planet is covered by water. The CAML will focus attention of the public on the ice-bound oceans around Antarctica, to determine the present state of its biodiversity. This will be used to predict how the oceans might respond to future climate change. It will integrate knowledge across all regions, biomes, habitats and fields of study to strengthen our knowledge of ocean biodiversity and ecosystem dynamics. The coincidence of the IPY and the international Census of Marine Life makes CAML possible - a once-in-a-lifetime opportunity to conduct a comprehensive study of the evolution and biology of this vast and fascinating region of the Earth.To assist the National Committees to locate their nation’s proposed activities, listed below are the EoIs for potential collaboration, that are being considered in development of the CAML science plan.

Marine Biodiversity Cluster EoIs:
1. Role of Antarctica and the Southern Ocean in Past, Present and Future Climate: A strategy for the International Polar Year 2007-2008 (CASO CClimate in Antarctica and the Southern Ocean)), EoI #109 led by Dr Steve Rintoul, Australia.
2. ANDEEP-SYSTCO (ANtarctic benthic DEEP-sea biodiversity: colonisation history and recent community patterns - SYSTem COupling) (ANDEEP-SYSTCO), EoI #111 led by Prof Angelika Brandt, Germany.
3. International CCAMLR 2008 synoptic survey of krill , pelagic fish and plankton biomass and biodiversity in the South Atlantic (Area 48) (CCAMLR - 2008 Survey), EoI #148 led by Dr Volker Siegel, Germany.
4. Cenozoic bryozoans in West Antarctica - taxonomy, biogeography and evolution (Cenozoic bryozoans), EoI #153 led by Dr Urszula Hara, Poland.
5. Internationally coordinated studies on Antarctic environmental status, biodiversity and ecosystems. (Environmental, Biological, and Ecological Studies in Antarctica (EBESA)), EoI #189 led by Prof Roberto Bargagli, Italy.
6. Seasonality of the Drake Passage pelagic ecosystem: Biodiversity, food webs, environmental change and human impact. Present and Past (DRAKE BIOSEAS), EoI #192 led by Dr Viviana Andrea Alder, Argentina.
7. Biological and functional diversity of microbial communities in ecologically distinct polar environments (Biological and functional diversity of microbial communities in ecologically distinct polar environments), EoI #205 led by Dr Irene Kit-Ping Tan, Malaysia.
8. Effects Of Isolation On The Genetic Biodiversity Of Shallow Coastal Benthic Communities In Antarctica (Effects Of Isolation On The Genetic Biodiversity Of Shallow Coastal Benthic Communities In Antarctica), EoI #219 led by Prof Zulfigar Yasin, Malaysia.
9. Antarctic Marine Mammal Ecology using Passive Acoustic Monitoring (Marine Mammal Passive Acoustic Monitoring (MMPAM)), EoI #236 led by Dr John Hildebrand, USA.
10. Winter algal communities: year-round phytoplankton studies at Palmer Station (Pal-Flow), EoI #330 Maria Vernet, USA.
11. Comparative Studies Of Gentoo Populations (GOSGEN), EoI #379 led by Dr Volodymyr Bezrukov, Ukraine.

12. SCAR-MarBIN: the information dimension of Antarctic Marine Biodiversity (SCAR-MarBIN), EoI #817 led by Dr Bruno Danis, Belgium.
13. Study of Antarctic Sea Ice Ecosystems (SASIE), EoI #818 led by Academician Igor Melnikov, Russia.
14. The coastal and shelf ecosystem of Maritime Antarctica (Admiralty Bay, King George Island) (CSEMA), EoI #863 led by Prof Rakusa-Suszczewski Stanislaw, Poland.
15. A study, using Autosub, of the influence of sea ice and sea-ice algae on the winter distribution and abundance of Antarctic krill off East Antarctica (Antarctic krill and sea ice), EoI #949 led by Dr Andrew Brierley, UK.
16. Polar Microbial Observatories in Antarctic and Sub-Antarctic coastal zones (POLMICROBS), EoI #953 led by Dr Jean-Francois Ghiglione, France

Other linked EoIs:
1. U.S. GEOTRACES: Biogeochemical cycles of trace elements in the SW Pacific Sector of the Southern Ocean (U.S. GEOTRACES in the Southern Ocean), EoI #271 led by Dr Robert Anderson, USA.
2. Integrated Analyses of Circumpolar Climate Interactions and Ecosystem Dynamics in the Southern Ocean -IPY (ICCED –IPY), EoI #417 led by Dr Eugene Murphy, UK.
3. CANADA #59: Canadian Census of Marine Life Arctic Ocean Biodiversity Program (Canadian Arctic Census of Marine Life), EoI #713 led by Mr Paul Snelgrove, Canada.

4.0 CONSORTIUM INFORMATION

4.1 Contact Details

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4.2 Other significant consortium members and their affiliation

Name	Organisation	Country
Professor Angelika Brandt	University of Hamburg	Germany
Dr Claude De Broyer	Royal Belgian Institute of Natural Sciences	Belgium
Professor Alison Murray	University of Nevada, Desert Research Inst	USA

Professor Paul Rodhouse	British Antarctic Survey	UK
Dr Diego Rodriguez	Universidad Nacional de Mar del Plata	Argentina
Dr Lúcia de S Campos	Universidade Federal do Rio de Janeiro	Brazil
Dr Russell Hopcroft	University of Alaska Fairbanks	USA
Dr Julian Gutt	AWI Bremerhaven	Germany
Professor Antonio Solé Cava	Universidade Federal do Rio de Janeiro	Brazil
Dr Catherine Ozouf	CNRS	France
Professor Daniel Costa	University of California, Santa Cruz	USA
Dr Dean Peterson	Antarctica New Zealand, Christchurch	New Zealand
Dr Graham Hosie	Australian Antarctic Division	Australia
Professor Evgeny Pakhomov	University of British Columbia Vancouver	Canada
Dr Igor Smirnov	Zoological Insititute of the Russian Academy of Sciences, St Petersburg	Russia
Dr Jesse Ausubel	Census of Marine Life	USA
Dr Jose Torres	University of South Florida	USA
Dr Krzyzstof Jazdzewski	University of Lodz	Poland
Dr Phil Trathan	British Antarctic Survey	UK
Dr Philip O'Brien	Geosciences Australia	Australia
Dr Philippe Koubbi	University Littoral	France
Dr Polly Penhale	National Science Foundation	USA
Dr Randall Davis	Texas A&M University	USA
Dr Stefano Schiaparelli	Università di Genova	Italy
Dr Tarik Chekchak	The Cousteau Society	France
Dr Jon Watkins	British Antarctic Survey	UK
Dr Bruno Danis	Royal Belgian Institute of Natural Sciences	Belgium
Professor Zulfigar Yasin	Universiti Sains, Penang	Malaysia
Professor Riccardo Cattaneo Vietti	Universita degli studi di Genova	Italy
Daniel Rodary		France