Full Proposals for International Polar Year 2007-2008 Activities

Proposed IPY Activity Details

1.0 PROPOSER INFORMATION

(Activity ID No: 71)

1.1 Title of Activity
Polar Aquatic Microbial Ecology

1.2 Short Form Title of Proposed Activity
PAME

1.3 Activity Leader Details
Gunnar Bratbak
University of Bergen
Norway

1.4 Lead International Organisation(s) (if applicable)
NULL
NULL
NULL
NULL

1.5 Other Countries involved in the activity
Canada
Italy
Russia
NULL
Denmark
The Netherlands
Sweden
NULL
France
Norway
UK
NULL
Germany
Spain
USA
NULL

1.6 Expression of Intent ID #'s brought together in this proposed activity
565,115,257,460,635,778,962,963

1.7 Location of Field Activities
Bipolar

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

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

2.0 SUMMARY OF THE ACTIVITY

Microbial communities, including phytoplankton, protozoa, bacteria, archaea, fungi and virus, are by far the most abundant and the most taxonomic and genetically diverse group of organisms in marine pelagic ecosystems. Biological activity, biomass, production and remineralization in these systems are essentially microbial while higher trophic levels (crustaceans, fish, and mammals) play a minor role in quantitative terms. Microorganisms are the main drivers of biogeochemical cycles and the major producers and consumers of green-house gases, and they are therefore significant players in regulating the ecosphere. In addition, they can be important sentinels of environmental change, as alterations in the structure and biomass of microbial communities can herald changes not only in pathways of nutrient and energy transfer in foodwebs, but also in biogeochemical cycles. Despite their abundance and likely importance in polar ecosystems, very little is known about the composition of polar microbial communities, their interactions and geochemical roles, or their response to environmental changes.
The PAME program will focus on polar marine microorganisms and their activities; the processes that relate to these organisms and the significance of these organisms and their activity with respect to climate and global environmental change. The projects participating in PAME will target different aspects of microbial ecology in different polar areas. Projects may also encompass studies undertaken in warmer latitudes where these compliment and inform polar research. Field campaigns, logistics and research will be coordinated through PAME, and the projects will share and exchange data, samples, field opportunities, infrastructure, human and intellectual resources in order to obtain better and more complete datasets from field surveys and experimental studies than otherwise would be possible.
Understanding microbial food web structure and function involves major research tasks related to community composition, population dynamics and flux of energy and matter. PAME will assess microbial biodiversity and community composition employing a full range of approaches from classical taxonomic studies to metagenomics of community DNA. The work will include development and application of state-of-the-art molecular methods to detect, enumerate and monitor sentinel ('indicator') microbial genes, functions and taxa, and to determine the molecular biodiversity of key microbial groups. Population dynamics, trophic interactions and flow of energy and matter between different microbial compartments and biogeochemical pools will be investigated both during field campaigns and in experimental ecosystem models (mesocosms). Experimental approaches to climate and environmental change, as well as mathematical modelling, will be integral parts of this work. The overriding aim is to understand how external and internal driving forces and control mechanisms regulate microbial processes and how they affect community structure and biogeochemical cycles.

2.1 What is the evidence of inter-disciplinarity in this activity?
As a field of research, marine microbial ecology is approached from different perspectives such as biodiversity, food web, nutrient flow, population dynamics etc. and engages scientists from a wide range of disciplines including microbiology, chemistry, molecular biology, phycology, virology etc. Most research projects and groups are unable to address more than a few specific subjects and questions related to marine microbial ecology. A more comprehensive understanding of marine microbes and their ecological significance calls for extensive collaboration both between individual researchers and between research groups. To understand their significance at ecosystem level and in a wider (global) context requires interdisciplinary and cross cutting collaboration. The main role of the present proposal is to provide a network and point of

reference for both disciplinary and interdisciplinary collaboration.

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 research will improve our knowledge of polar marine microorganisms and their ecological significance, and our understanding of microbial population dynamics and ecosystem structure and function. It will contribute to a better understanding of the biological and environmental processes that shape polar microbial communities and the factors that are likely to be important in the context of future climate and environmental change.Investigating the composition of microbial communities will document the microbial richness of polar communities and provide information required to help us understand if they are changing. Understanding of the structure and function of microbial food webs in polar waters will in addition aid prediction of future consequences of climate and global environmental change. Coupling of these studies to existing long term data series and active participation in interdisciplinary studies on climate and environmental change will enhance the value of the work.
In an applied perspective, the research will be indispensable for a knowledge based management of natural recourses and pollution issues in polar waters and for assessing the potential of microbial bioremediation. Moreover, the knowledge will also provide a basis for bio-exploitation of polar microorganisms and biomolecules of use to mankind.

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

Locations	Coordindates
Barents Sea - Arctic Ocean Transect	30E, 75 - 85N/ice edge
White Sea	66°N, 37°E
Canadian Arctic	
Greenland and Norwegian Seas.	
Environments around and in Greenland	
Kongsfjorden / Ny-Ålesund Svalbard	78° 55' N, 11° 56' E
Antarctic Convergence – Ice edge Transect	0W, 50-70S
The Ross Sea	76°42’N, 169°04’E -74°00’N, 175°04’E

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

Arctic Fieldwork time frame(s)	Antarctic Fieldwork time frame(s)
03/07 -12/07	01/07 - 03/07
01/08 - 12/08	11/07 - 03/08

2.5 What major logistic support/facilities will be required for this project?
Icebreaker
Ice strengthened research ship
Existing field stations
Helicopters

Further details – Ice strengthened research ship (e.g. RRV James Clark Ross, CCGS Amundsen, R/V Italica, R/V Paamiut, R/V Adolf Jensen) Existing field stations; Svalbard: Ny-Alesund, Koldewey lab / Sverdrupstasjonen; Greenland: Arctic Station on Disko. Helicopters: East Greenland Satellite communication access for transmission of data. Two moorings (A, B) in the Ross Sea.

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		

Own national polar operator	Y	
Another national polar operator	Y	
National agency	Y	
Military support		
Commercial operator		
Own support	Y	
Other		

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 activity is the start of a new programme that will outlive IPY

3.2 How will the activity be organised and managed? Describe the proposed management structure and means for coordinating across the cluster
The consortium consists of a number of individual projects and project groups with established collaborative links. The projects are independent, responsible for their own funding, and will answer to their own organizations and funding bodies. Each project may also participate in, or be associated with, other IPY consortia as they see fit. The main role of the consortium is to provide a network and point of reference for both disciplinary and interdisciplinary collaboration.
A self established interim Consortium Coordinating Committee (CCC) of IPY EoI PIs will be managed collectively by electronic communication and open “reply-to-all” discussions. Each PIs will communicate with their respective project partners. The interim committee will be replaced by a CCC of PIs from funded IPY projects in due time. The CCC will meet as necessary and be responsible for initiating further collaboration between participating projects and for coordinating issues related to logistics, fieldwork, sampling, methodology, infrastructure access, data handling, outreach, web pages etc. Open and restricted access web pages / web boards will be used for communication and discussion.

ID No: 115 Buma
ID No: 257 Leakey
ID No: 460 Vincent
ID No: 565 Bratbak
ID No: 635 Catalano
ID No: 778 Stougaard
ID No: 962 (Canada #222) Suttle
ID No: 963 (Canada #222) Suttle

3.3 Will the activity leave a legacy of infrastructure and if so in what form?
Experimental ice laboratory Equipment for polar mesocosm studies.Two running moorings, and their continuous 10 years time series.A global data base on the topic will be improved.Network of monitoring in specific Arctic habitats (Ikait columns and homeothermic springs).Molecular tools for long term monitoring of the polar marine environment.Microbial DNA library from a wide range of polar marine environments.

3.4 Will the activity involve nations other than traditional polar nations? How will this be addressed?
No.

3.5 Will this activity be linked with other IPY core activities? If yes please specify
Yes. Life in polar regions: patterns, evolution and adaptation

Life under natural and anthropogenic changes: stress, responses and adaptations
Terrestrial and limnetic biodiversity and environments
Ecosystem response to change and variability in the physical environment
Biogeochemistry and ecosystems
PAME will communicate with other IPY projects and consortia during the 2005-06 planning period for possible collaboration and sharing of logistics. The proposed IPY MERGE project, which will focus on microorganisms in terrestrial, lacustrine and supraglacial habitats, is of special relevance to PAME and some research groups may contribute to both activities. However, with a strong focus on marine systems, and with logistic requirements that are very different from MERGE, we maintain PAME as a separate activity that will collaborate with MERGE and other activities whenever this is fruitful rather than pursue further integration.

3.6 How will the activity manage its data? Is there a viable plan and which data management organisations/structures will be involved?
All data will be collected, processed, validated and managed by the respective partners.

Data management will be in accordance with the operating data management systems of the participating institutes, and with national and international bodies (e.g. British Oceanographic Data Centre, P.N.R.A., ICES etc) with which the institutes have entered into agreement. The data will be made available to IPY and other databases as required.
Qualitative data (images, descriptions) will be stored electronically, listed in a www-searchable database and made available on request. Biological material will be deposited in genbanks, biobanks, clone libraries, and culture collections as required.

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.?
PAME will offer master and PhD students from a wide range of disciplines the possibility to specialize in polar research.

The outreach activities will aim at increasing public interest in polar research and stimulate recruitment of future scientists to this important and exciting field.

3.9 How will this activity address education, outreach and communication issues outlined in the Framework document?
Master, PhD and post-doctoral training will be integral components of the participating projects and joint specialised Master and PhD courses in Polar Ecology will be organized. A Polar Ecology Research School will be established by (at least) one of the PAME projects and serve as a platform for genuine multi-disciplinary studies. PAME will provide a network for coordination of educational issues among the partners at all educational levels. Outreach and communication activities will be coordinated through organizations like the International Polar Foundation (IPF) and the NCE network ArcticNet.
Material addressing high school and university students as well as the general public will be disseminated through public media and web pages.
Formalized links with Inuit organisations (e.g Inuit Tapiriit Kanatami and the Inuit Circumpolar Conference) will be pursued.

3.10 What are the proposed sources of funding for this activity?
The individual project partners are responsible for funding their own sub-projects via national and/or international funds as well as from private sources. The partners will/have apply(ied) as follows:
Project ID - Funding Agency (application deadline / status)
115: National Polar Program (Dutch National Science Foundation, NWO
257: National funding bodies and host institute core research funding.
460: Genome Canada, NSERC.

565: The Research Council of Norway (Dec. 1. 2005)
635: co-funded by P.N.R.A.
778: Danish Research Council, Other national funds, private funds (partly funded)
962: (Canada # 222): Special Research Opportunity, NSERC Canada
963: (Canada # 223): Special Research Opportunity, NSERC Canada
LTMS-B Microbiology at British Antarctic Survey (funded)

Partners not listed above are expected to submit proposals to US NSF Arctic Science Section, NERC and other national funding agencies. Joint international proposals to European Science Foundation, EU and other international funding agencies will be considered when relevant research funding programs are announced.

Each participating project will be responsible for contributing to costs of joint activities in the consortium (e.g. participation in CCC meetings, web pages, outreach, data management etc.) and will incorporate this in their applications.

3.11 Additional Comments

The PAME activity is based on the eight original IPY Expression of Intents listed in 1.6, but has evolved to include several additional research groups. The partners and projects in this proposal now represent 50 scientists from 32 different institutions in 12 countries. Collaboration is expected to take place on all levels and along all axes (individual, project, consortium, national, international, bilateral, multilateral, science, education, outreach, logistics, infrastructure). We are nevertheless open for collaboration with individuals and teams participating in other IPY projects/consortia. Detailed commitment to research, logistic and administrative tasks can not be planned before funding for each partner is secured.The project period will extend the IPY period in order to cover the following activities: Pre IPY: Planning and preparation for Antarctic fieldwork 2006/7, training of PhD-students, coordination of activities and logistics.
Post IPY: Data management, publication, dissertations, follow-up field activities, workshops, etc.

We foresee that the PAME collaboration and consortium will outlive IPY and form the basis for future research projects.

4.0 CONSORTIUM INFORMATION

4.1 Contact Details

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4.2 Other significant consortium members and their affiliation

Name	Organisation	Country
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Suttle, Curtis A.	University of British Columbia	Canada
Jacobsen, Carsten Suhr	Geological Survey of Denmark and Greenland	Denmark
Nielsen, Torkel Gissel	National Environmental Research Institute	Denmark
Stougaard, Peter	The Royal Veterinary and Agriculture University	Denmark
Kühl, Michael	University of Copenhagen	Denmark
Middelboe, Mathias	University of Copenhagen	Denmark
Priemé, Anders	University of Copenhagen	Denmark
Bouvier, Thierry	CNRS UMR 5119 University Montpellier 2	France
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Wiencke, Christian	AWI Bremerhaven	Germany
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Azzaro, Maurizio	CNR – I.A.M.C. Messina	Italy
La Ferla, Rosabruna	CNR – I.A.M.C. Messina	Italy
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Hegseth, Else	Norwegian Fishery College	Norway
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Heldal, Mikal	The University of Bergen	Norway
Thingstad, T. Frede	The University of Bergen	Norway
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Pedros-Alio, Carlos	Institut de Ciències del Mar	Spain
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Wängberg, Sten-Åke	University of Gotebørg	Sweden
Brussaard, Corina	Royal Netherlands Institute of Oceanography	The Netherlands
Herndl, Gerhard	Royal Netherlands Institute of Oceanography	The Netherlands
Bolhuis, Henk	University of Groningen	The Netherlands
Buma, Anita	University of Groningen	The Netherlands
van de Poll, Willem	University of Groningen	The Netherlands
Pearce, David A.	British Antarctic Survey	UK
Wilson, Willie	Plymouth Marine Laboratory	UK
Davidson, Keith	Scottish Association for Marine Science	UK

Green, David	Scottish Association for Marine Science	UK
Hatton, Angela	Scottish Association for Marine Science	UK
DiTullio, Giacomo (Jack)	Grice Marine labs / College of Charleston	USA
Sherr, Evelyn & Barry	Oregon State University	USA
Kirchman, David	University of Delaware	USA
Wilhelm, Steven W.	University of Tennessee	USA
Jeffrey, Wade. H.	University of West Florida	USA