Canadian National Committee for SCOR
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Scientific Committee on Oceanic Research

CANADIAN OCEAN SCIENCE NEWSLETTER
LE BULLETIN CANADIEN DES SCIENCES DE L'OCÉAN

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Graduate Scholarship Available; Microalgal Systematics/Polar Oceanography

Institut des Sciences de la Mer, Universite du Quebec a Rimouski

Application Deadline: Wednesday, 1 August 2007

The Institut des Sciences de la Mer (ISMER) of the Universite du Quebec a Rimouski (UQAR) announces the availability of a scholarship for graduate studies in microalgal systematics and polar oceanography in the context of the International Polar Year. The research program involves a Circumpolar Flaw Lead polynya study, primarily one identified west of Banks Island, to examine the impacts of climate change on the coastal Canadian Arctic. The microalgal community inhabiting the land-fast ice beside the flaw lead polynya will be studied throughout the growth season in winter and spring.

Graduate studies may lead to MSc or PhD degrees in oceanography. A BSc degree in biology or environmental sciences is required to enter these programs. Candidates may conduct research and write a thesis in French or English and it is possible for non-French speaking candidates to take all courses in English.

For further information, including application instructions, please contact: Michel Poulin, Canadian Museum of Nature mpoulin@mus-nature.ca, or contact:Michel Gosselin, Université du Québec à Rimouski**,** michel_gosselin@uqar.qc.ca

The Fourth IPCC Assessment Report on Climate Change (AR4): A View from the Inside

Ken Denman, Department of Fisheries and Oceans, Institute of Ocean Sciences, Sidney BC, and Canadian Centre for Climate Modelling and Analysis, c/o University of Victoria, ken.denman@ec.gc.ca

The UN Intergovernment Panel on Climate Change (IPCC) has produced four exhaustive assessments of climate change and numerous special reports since 1990. As background from the IPCC website [www.ipcc.ch], "… the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the IPCC in 1988. It is open to all members of the UN and WMO. The role of the IPCC is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation. The IPCC does not carry out research nor does it monitor climate related data or other relevant parameters. It bases its assessment mainly on peer reviewed and published scientific/technical literature." After 156 countries signed the UN Framework Convention on Climate Change, UNFCCC, in 1992, the role of the IPCC was clearly identified as one of scientific assessment, associated with but at arms' length from political activities of the UNFCCC. The conclusions of the IPCC Second Assessment Report (SAR), released in 1995, "… served as the basis for the decisions taken at the Third Conference of the Parties to the Convention in Kyoto in 1997".

The IPCC is comprised of three working groups: "Working Group 1 assesses the scientific aspects of the climate system and climate change; Working Group 2 assesses the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it; and Working Group 3 assesses options for limiting

greenhouse gas emissions and otherwise mitigating climate change." The Summary for Policymakers (SPM) of the Fourth Assessment Report (AR4) of WG 1 released in Paris on 2 February 2007, the SPM for WG2 in Brussels on 6 April, and the SPM for WG3 in Bangkok on 4 May.

I was a Coordinating Lead Author in the SAR WG1 of chapter 10 titled 'Marine biotic responses to environmental change and feedbacks to climate', and also in AR4 WG1 of chapter 7 titled 'Couplings between changes in the climate system and biogeochemistry'. I participated in the WG1 Plenary in Paris, where governments 'approve' the SPM, literally line by line over a 4-day period. I was at the press conference when the SPM was made public on 2 February 2007, where that day climate change was the biggest story on the planet.

What are some of the key issues relating to the oceans in AR4?

- the oceans are storing more than 90% of the heat associated with global warming, to depths of at least 3000m, indicating a long lifetime for the heating that has already taken place.
- for the mid-range A1B emissions scenario, the best estimate for warming (2090-2099 relative to 1980-1999) is 2.8°C (*likely*, or 66% probability range 1.7 – 4.4°C) and the model-based range for sea level rise is 0.21 – 0.48 m, compared with an increase of 0.17 m (0.12 – 0.22) during the last century. This expected sea level rise excludes a contribution from future rapid dynamical changes in ice flow from the Greenland and Antarctic ice sheets. This low estimate has attracted criticism that we have been too conservative in AR4. In the SPM, we do say however for the Greenland ice sheet: "*Current models suggest … that the surface mass balance becomes negative at a global average warming (relative to pre-industrial values) in excess of 1.9 to 4.6°C.*", and that "*The corresponding future temperatures in Greenland are comparable to those inferred for the last interglacial period 125,000 years ago, when paleoclimatic information suggests reductions of polar land ice extent and 4 to 6 m of sea level rise.*" which is hardly ignoring the possibility of a major longer term increase in sea level.
- in past IPCC assessments the lifetime of anthropogenic CO_2 in the atmosphere was given as 100 years. We now state that there are several different decay timescales associated with different sinks, but that possibly as much as 20% of anthropogenic CO_2 will remain in the climate system for millennia because of the tens of thousands of years required for transport to the deep ocean and neutralization by calcium carbonate in the deep ocean and sediments.
- the oceans are becoming more acidic because CO_2, as it enters the ocean from the atmosphere, combines with water to form bicarbonate and carbonate ions and more importantly H^+ ions. Surface ocean pH has decreased by 0.1 since preindustrial times and is projected to decrease by another 0.14 to 0.35 by the end of this century. Much of the North Pacific may be undersaturated with respect to calcium carbonate from top to bottom by 2100. That means that organisms with calcium carbonate structures, such as coccolithophorids (plankton that photosynthesize), pteropods (small molluscs or snails that provide food for salmon at certain periods of the salmon life cycle), and both warm and cold water corals, will have difficulties synthesizing and maintaining their structures which will be dissolving at the same time.
- there is a positive feedback between the carbon cycle and climate warming, as indicated by the results of an intercomparison of coupled carbon cycle – climate models, C4MIP. In the SMP we say "*For the A2 scenario, for example, the climate-carbon cycle feedback increases the corresponding global average warming at 2100 by more than 1°C.*" For all 8 models both

the land biosphere and the ocean took up less atmospheric CO_2 by 2100 when run in coupled mode than when there was no feedback between a changing climate and the carbon cycle. This feedback means that even greater reductions in emissions would be needed to achieve the same stabililization level of CO_2 in the atmosphere.

- with respect to the likelihood of abrupt climate change, we say in the SPM *"... It is very unlikely* [less than 10% likelihood] *that the MOC* [Meridional Overturning Circulation] *will undergo a large abrupt transition during the 21st century. ...* ". In terms of probability levels, we could have said 'There is up to a 10% chance that the MOC will undergo a large abrupt transition during the 21st century'.

I urge you to read all three SPMs: they are short and as environmental scientists, you should not be getting this information through the filtering of the mass media. All three SPMs are available at [www.ipcc.ch] and you can follow the link to the WG1 website where the complete WG1 report is now available. Of particular interest to oceanographers are chapter 4 on ice and snow, chapter 5 on ocean observations, chapter 6 on paleoclimate, and chapter 7 on the carbon cycle (and actually all seven other chapters!).

IMBER Update on Activities

Report by Jay T. Cullen, IMBER SSC and IMBER National Contact, jcullen@uvic.ca

The Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) is a decade-long international project, co-sponsored by the Scientific Committee for Oceanographic Research (SCOR) and the International Geosphere-Biosphere Program (IGBP). The vision of IMBER is to provide a comprehensive understanding of, and accurate predictive capacity for, ocean responses to accelerating global change and the consequent effects on the Earth System and human society. The goal is to investigate the sensitivity of marine biogeochemical cycles and ecosystems to global change, on time scales ranging from years to decades.

Since 2005 the IMBER International Project Office (IPO) has been operating out of the European Institute for Marine Studies in Brest, France. The IPO has been actively promoting the scientific goals of IMBER through the dissemination of information much of which is available on the IMBER website (www.imber.info). Although IMBER does not provide financial support for research, it will serve to help coordinate Canadian and joint Canadian-international IMBER research activities. International/regional research groups can submit their project for recognition by the IMBER SSC via the IMBER website. Canadian groups and individual Principle Investigators (PIs) should first work through their national IMBER representative, who in turn will present the application to the international SSC. Projects seeking recognition from multiple IGBP/SCOR projects are welcome, as the IMBER SSC recognizes that many national/regional activities will contain research objectives relevant to more than one project.

IMBER is actively pursuing its implementation plan through sponsorship through the organization and sponsorship of international meetings, scientific working groups and endorsement of IMBER themed research programs. Detailed information on each of these activities can be found by browsing www.imber.info.

The 4th IMBER SSC meeting will be held at the Dunsmuir Lodge in Victoria, BC June 12-14, 2007. A reception for local scientists in IMBER related fields is in the early planning stages so keep your calendars clear.

International Polar Year

Prepared by: Andries Blouw, Communications, DFO, blouwa@dfo-mpo.gc.ca

The Polar Regions are the most remote areas of the Earth. They have profound significance for the Earth's climate and ultimately environments, ecosystems and human society.

However, we still remain remarkably ignorant of many aspects of how polar climate operates and its interaction with polar environments, ecosystems and societies. Existing climate models do not work well in the Polar Regions and have for example failed to predict the dramatic break-up of ice shelves observed in recent years. To have any hope of understanding the current global climate and what might happen in future, the science community needs a better picture of conditions at the poles and how they interact with and influence the oceans, atmosphere and land masses. The three fastest warming regions on the planet in the last two decades have been Alaska, Siberia and parts of the Antarctic Peninsula, Thus the Polar Regions are highly sensitive to climate change and this raises real concern for the future of polar ecosystems and Arctic society.

Where did IPY come from?

On three occasions over the past 125 years scientists from around the world banded together to organize concentrated scientific and exploring programs in the Polar Regions.

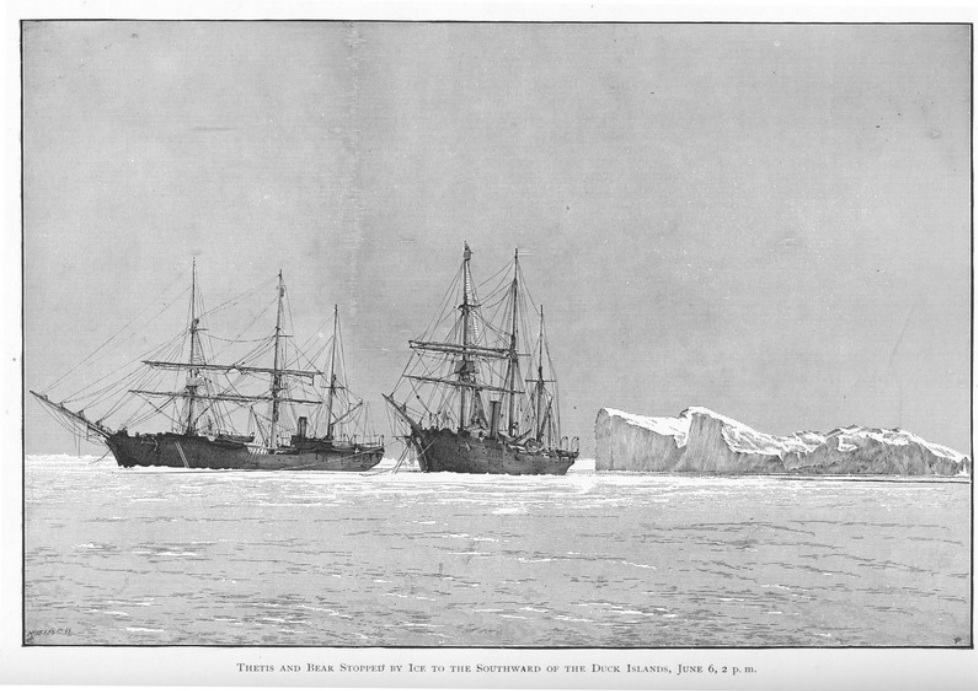
First International Polar Year (1882-1883): The idea of International Polar Years was the inspiration of the Austrian explorer and naval officer Lt. Karl Weyprecht. The key concept of the first IPY was that Polar research could not be surveyed by one nation alone; rather, an undertaking of this magnitude would require a coordinated international effort. A principal legacy of the First IPY was setting a precedent for international science cooperation.

Second International Polar Year (1932-1933): The International Meteorological Organization proposed and promoted the Second IPY as an effort to investigate the global implications of the newly discovered "Jet Stream." Forty nations participated in the Second IPY, and it made possible advances in meteorology, magnetism and atmospheric science. Forty permanent observation stations were established in the Arctic, creating a step-function expansion in ongoing scientific Arctic research

The International Geophysical Year (1957-58): The IGY was conceived by a number of post-WWII eminent physicists at an informal gathering in Washington, DC in 1950. The IGY's research, discoveries, and vast array of observations revised or "rewrote" many notions about the Earth's geophysics. One long disputed theory, continental drift, was confirmed. A U.S. satellite discovered the Van Allen Radiation Belt encircling the Earth. Geophysical traverses over the Antarctic icecap yielded the first accurate estimates of the total size of Antarctica's ice mass.

IPY in 2007-2008 affords an opportunity to engage the upcoming generation of young scientists and to get the public to realize just how much the cold ends of the sphere we all live on really do influence us. To ensure that researchers get the opportunity to work in both Polar Regions or work summer and winter if they wish, the Polar Year will actually run from March 2007-March 2009.

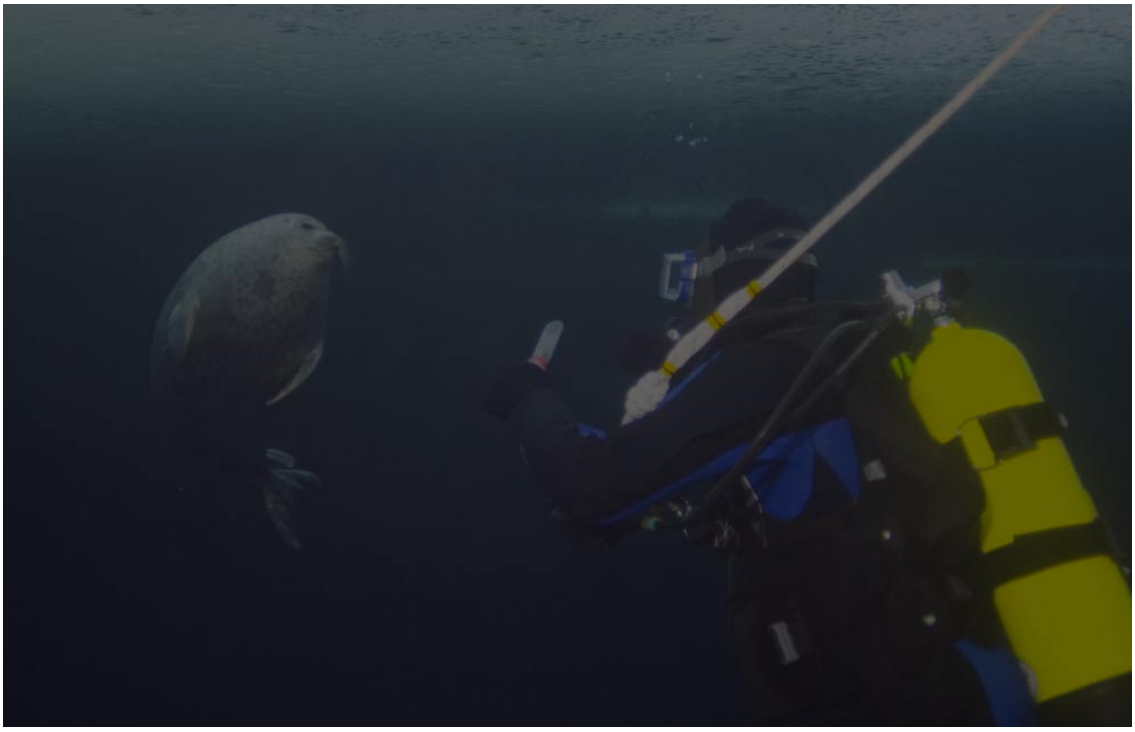
In each major thrust, or "year," scientific knowledge and geographical exploration were advanced, thereby extending understanding of many geophysical phenomena that influence nature's global systems. IPY 2007-2008 will expand upon this legacy of scientific achievement and societal benefits.



THETIS AND BEAR STOPPED BY ICE TO THE SOUTHWARD OF THE DUCK ISLANDS, JUNE 6, 2 P. M.

Caption: *Thetis* and *Bear* stopped by ice to the Southward of the Duck Islands. Image: NOAA Archives.

IPY has a rich naval marine history which is continued today. The “CASES” project included the Canadian Coast Guard as a vital element. Shown here is CCGS AMUNDSEN frozen into landfast ice in Amundsen Gulf, December 2003. Photo: Owen Owens, Centre for Earth Observation Systems, (CEOS) at UofM.



This underwater shows a curious seal approaching diver Wayne Smith at the “CASES” research site. Photo: Jeremy Stewart, DFO Winnipeg.

Pascal Collin's face shows the rigours of doing Arctic research. Scientists work in extreme conditions when measuring and sampling outdoors; work which continues in the total darkness of the Arctic winter. Photo: Thomas Juul-Pedersen, CEOS – UofM.

The International Polar Year; Circumpolar Flaw Lead (CFL) System Study

Report by Dr. D. Barber, U of Manitoba, lead, dbarber@cc.umanitoba.ca, Dr. G. Stern, Fisheries and Oceans Canada, co-lead, Dr. J. Deming, U of Washington, co-lead, And over 200 collaborators from 15 countries

Introduction: The World expects confirmation of global warming first and strongest in the polar regions of our planet (IPCC 2004, ACIA 2005). Technologically and scientifically advanced nations have a unique responsibility to understand the nature and impacts of these changes. Observations indicate that the Arctic Ocean and its peripheral seas are presently warming. The extent of Arctic sea ice has shrunk at an average annual rate of 34,000 km^2 per year since 1979 (Parkinson et al. 1999). Five of the minimum extent years have occurred since 1998 (Serreze et al. 2000), with 2005 being **the** minimum on instrumental record. The thickness of the multiyear ice has also decreased by about 40% over the past 30 years (Lui et al. 2004). Recent studies have also documented variations in the Northern Annular Mode and associated surface atmospheric pressure fields (Thompson and Wallace 1998). The resulting strengthening of westerly winds has increased the influx of warm Atlantic water into the Arctic basin (e.g., Polyakov et al. 2005), deflected eastward the freshwater plumes of the several large rivers (e.g., Carmack et al. 2005), and increased the export of sea ice through the transpolar drift (e.g., Kwok et al. 2001). The freshwater on the continental shelves normally forms a shield between the ice and the underlying warm Atlantic water. The eastward advection of this shield has allowed contact between the ice and the invading Atlantic waters enhancing sea-ice melt (Dmitrenko et al. 2003). In the Canada Basin the Beaufort Sea Gyre is also thought to be a significant element in the reduction of sea ice and formation of the circumpolar flaw lead (CFL). Recent results (Lukovich and Barber 2005) show that the reversal of the Beaufort Gyre, triggered by increased

cyclogenesis over the Canada Basin (Zhang et al. 2003), has increased in frequency since 1990, thereby affecting both sea ice dynamic and thermodynamic processes in the region. The need to understand the complexities of sea-ice response to changing oceanic and atmospheric forcing, and the subsequent response of the marine ecosystem to this change, provides a key motivating principle for the International Polar Year (IPY) and for the CFL system study.

The circumpolar flaw lead (CFL) is a perennial characteristic of the central Arctic (Fig 1). The CFL system is formed when the central pack (which is mobile) moves away from coastal fast ice, opening a flaw lead which occurs throughout the winter season, forming first in the fall and continuing as thin ice areas in the winter season. The flaw lead is circumpolar, with recurrent and interconnected polynyas occurring in the Norwegian, Icelandic, North American and Siberian sectors (Fig. 1) of the circumpolar arctic (Barber and Massom 2006). Due to a reduced ice cover these regions are exceedingly sensitive to physical forcing from both the atmosphere and ocean and provide a unique laboratory from which we can gain insights into the changing polar marine ecosystem.

Oceanographically the high ice production in the flaw lead system contributes significantly to brine fluxes from the continental shelves into the deep basins (Martin et al. 1993). These fluxes in turn drive biogeochemical fluxes on and off the continental shelves and control many aspects of gas and mass fluxes across the ocean/sea-ice/atmosphere (OSA) interface (MacDonald et al. 1991). Meteorologically we expect that the flaw lead system plays a central role in the steering of cyclones within the Arctic and that the connection to the central pack likely portends a large scale teleconnection to hemispheric scale pressure patterns such as the Arctic Oscillation (e.g., Barber and Hanesiak 2004, Dmitrenko et al. 2003). Biologically the CFL preconditions the shelves to become the most productive portions of the Arctic marine ecosystem, with the early availability of light and increased availability of nutrients through advection and upwelling at the shelf break. Early use of the CFL by apex predators such as birds, beluga, bowhead and polar bears, and traditional use by Inuit and northern aboriginals around the world, attest to this elevated production. We expect ecosystem-wide enhancements to productivity in these areas, sustained for longer periods through the annual cycle. Biogeochemically the CFL is productive due to rapid ice growth in the winter. This growth enhances surface (and basal) fluxes of salts within the young sea ice and plays a significant role in carbon exchange across the OSA interface.

Study Area and Sampling Strategy. Although the CFL is hemispheric, we propose to focus on the Canadian component near Banks Island, NT (Fig. 2). The study area is typified by the recurrent thin ice/open water in the flaw lead and adjacent formation of fast ice > 150 cm in winter thickness. We discovered an ideal location for the CFL study while conducting the CASES program. A detailed summary of the setting is provided in the 'additional pages' of the full CFL proposal. Ice thickness (flaw lead) in the mid-winter ranges from open water to < 30 cm, making this an ideal location to study physical-biological coupling. The field study would require the over-wintering of the *Amundsen* beginning in October 2007 and continuing to August 2008. Surveys of the flaw lead would be conducted as ice forms from the northern limit of the pack ice and from the landfast ice in the south. Details of the typical growth cycle are well known and have been published elsewhere (Barber and Hanesiak 2004). The size of the study area would decrease as the ice encroaches on the flaw lead until January when the ship would enter into the landfast ice located immediately adjacent to the flaw lead, south of Banks Island (Fig. 2). An ice camp would be established using the infrastructure of parcols, snow machines,

snowcat, and related essentials from the *Amundsen* pool of equipment. Temporal measurements will be emphasized at the ice camp while spatial measurements will be emphasized during the flaw lead sampling via the *Amundsen*. On weekly intervals we propose to take the *Amundsen* from her 'landfast harbour' and conduct a 1-2 day survey of the evolving flaw lead system. The extent of the survey would be determined by the extent of the flaw lead but is expected to range between 10,000 km^2 (January) and 80,000 km^2 (June). A corridor between the ice camp and the flaw lead would be maintained by the icebreaker; since no 'stamuki' form in this region the ship navigation would be relatively simple. A fuel barge would be moored near the fast-ice camp for refuelling of the *Amundsen*. Once melt ponds form (likely in mid-June), the ice camp would be disassembled and the study would proceed with continuous sampling from the *Amundsen* through the end of July 2008.

Science Objectives: We propose a study with three integrated components: a) A field program, b) An Observatory, and c) A modelling effort. This triumvirate will integrate a series of testable hypotheses designed to examine the importance of climate processes in changing the nature of the flaw lead system in the northern hemisphere and the effect of these changes on the marine ecosystem, contaminant transport, carbon fluxes, and the exchange of greenhouses gases across the OSA interface. We are particularly interested in the effects that changes in the flaw lead system may have on physical-biological coupling at the local to hemispheric scale and consequently how these processes affect the transport and fate of contaminants in the Arctic. The CFL project will contrast and compare the early opening (late closing) of the flaw lead, against that of the adjacent fast ice. This effort will focus on the oceanic and atmospheric forcing of the ice cover in these two regions and describe how these physical processes moderate biological function within the Arctic marine ecosystem. The science teams will collaborate on addressing a pair of interconnected hypotheses:

1) Climate variability affects the timing and extent of the flaw lead system through predictable oceanic and atmospheric controls: as climate changes (warms), these forcings will result in increased ecosystem productivity and carbon cycling.

2) Climate variability affects the adjacent fast-ice ecosystem by controlling the timing of snow precipitation and formation/decay of sea ice which in turn dictates the contributions of epontic versus pelagic production to carbon cycling: as climate changes (warms), this balance will shift to pelagic processes.

We will develop a unique dataset of the physical controls on marine ecosystem productivity in the circumpolar flaw lead system, use these data to improve physically based models of atmospheric, sea-ice and oceanic processes, and then develop improved modelling approaches that couple biological and physical processes to predict ecosystem response in a changing Arctic. The legacy of this IPY project will include environmental 'observatories' that will be maintained in this region through ArcticNet. We will also archive the data from this project in the Canadian Cryospheric Information Network (CCIN) and other national data bases, according to international involvement.

We structure our work into the following interdisciplinary science teams:1) Physical oceanography; 2) Ocean/sea-ice/atmosphere processes; 3) Light, nutrients and primary productivity; 4) Pelagic and benthic foodwebs; 5) Marine mammals and sea birds; 6) Gas fluxes; 7) Carbon fluxes; 8) Contaminants and paleoclimate reconstructions; 9) Physical - biological modelling; and 10) Engaging Communities. We are planning for 10 principal investigators

within each of the 10 research teams. Of these, half are expected to be Canadian and half from 11 different countries (Denmark, France, Germany, Japan, Norway, Poland, Russia, Spain, Sweden, UK and USA) collaborating in the study. We are also proposing to fund 40 graduate students from Canada and 10 graduate students from Russia, with other countries supporting another 50 students, funded by our international partners. The project is coordinated through the Pan-Arctic Marine Ecosystem (PAN-AME) cluster at the international level of IPY. It is also linked with Democles and iAOOS clusters of IPY. Funding for this project is being sought through NSERC and the federal IPY program in Canada. Foreign collaborators will bring existing funds to the project.

Involvement of Inuit: Based on our previous experiences, it is clear that our local Inuit partners have significant knowledge, energy and motivation to contribute to a study such as the IPY–CFL. Member of the Hunters and Trappers Committees (HTCs) will be engaged early in the planning process of CFL through public meetings to be held in the communities of Sachs Harbour, Hollman Island, Paulatuk and Tuktoyuktuk. These communities are already involved with collaborative work through a Community Based Monitoring (CBM) Program which is funded separately and has been running annually since 2004. A social sciences team (within CFL) will engage communities through the CBM program to engage Inuit through traditional and contemporary knowledge of the CFL region. A principal focus of this work will be to examine both climate change impacts and adaptation specific to this region of the Canadian Arctic. In collaboration with the Inuit Circumpolar Conference (ICC) and Fisheries and Oceans Canada, we also plan to hold a Circumarctic Climate Change Impacts and Adaptation Conference (C^3IAC) aboard the *Amundsen* in March 2008. At this workshop we will engage western science and Inuit perspectives of the challenges facing Inuit peoples due to climate change and explore ways in which northern peoples can begin to adapt to these challenges.

Outreach and Communications. The International Schools on Board program will develop and deliver an intensive exploration of the science being conducted aboard the *Amundsen* both for schools and for individuals lucky enough to be selected to participate in the field program. Students from the 11 partnering countries (including northerners) will be selected by school divisions to participate in the field activities of the CFL and their schools will follow a select few as they integrate themselves into the science of the CFL. The concept has been tested (during CASES) and is now operating as a national program as part of ArcticNet. The concept of the 'International' Schools on Board (iS/B) is to expand this model from a national program to one that engages the international community in outreach to highlight our northern peoples, northern science and our emerging leadership role in circumarctic affairs. Our team has extensive experience in how to encourage and engage the media in polar science. We have extensive contacts in printed, radio and television and will engage with these media outlets to communicate the science of the CFL. We intend to set aside two berths on the *Amundsen* for media on each leg and will solicit national and international media outlets to take advantage of these births. We will also focus specific media attention around the Circumarctic Climate Change Impacts and Adaptation Conference (C^3IAC) and the International Schools on Board elements of the CFL proposal. We have also partnered with the World Federation of Science Journalists to host an IPY media symposium aboard the Amundsen where 14 journalists from around the world will be invited to spend 5 days immersed in the science of the CFL system study with a particular emphasis on how traditional knowledge and western science integrate to examine aspects of Arctic climate change and adaptation.

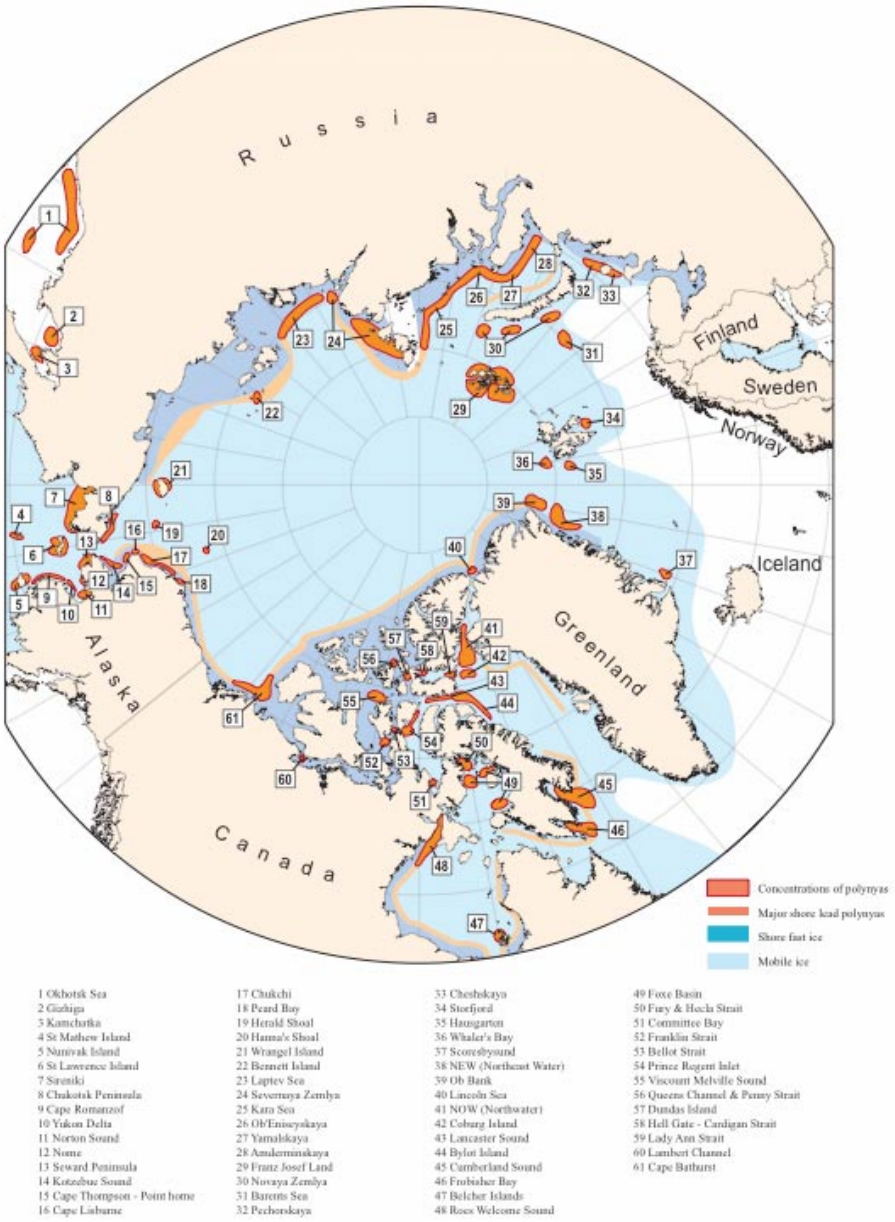


Figure 1. Collection of flaw leads comprising the Circumpolar Flaw Lead (CFL) system (light orange, major shore-lead polynyas). Also shown are all other known polynyas in the northern hemisphere (adapted from Barber and Massom 2006).

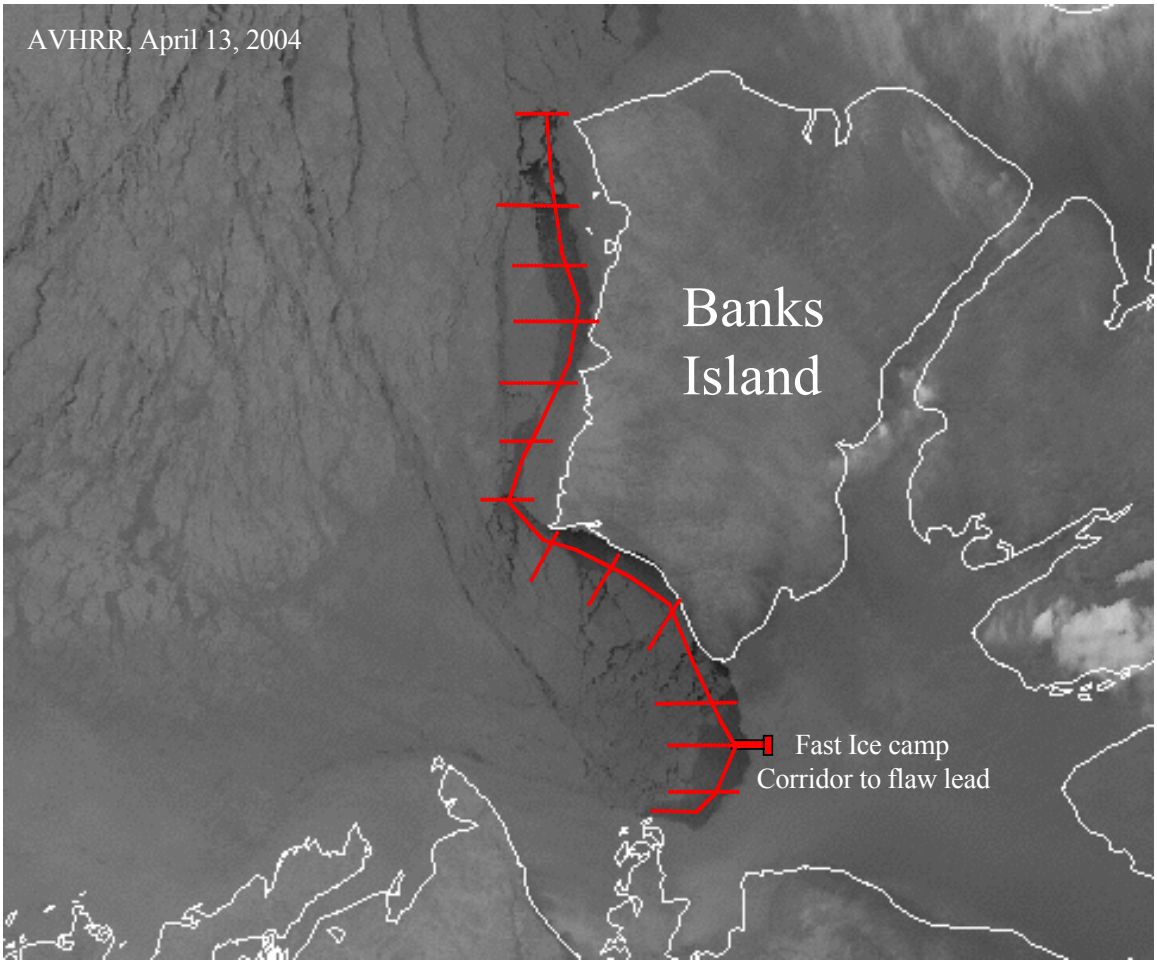


Figure 2. CFL project area in the western Canadian High Arctic, showing the location of the fast-ice and flaw-lead sampling areas. Extent of the transects will be ice-dependent. Helicopter flights, satellite download to the *Amundsen* and weather maps are used for flaw lead sample planning. The CFL study is planned to run from April 2006 to March 2010. The field program will be conducted between 01 November 2007 and 01 August 2008, with the fast-ice camp from 01 January 2007 to 15 June 2008.

New "Ice Graph" tool to visualize Ice Cover variability

A new tool to visualize ice cover variability in Canadian waters is now available on Environment Canada's Canadian Ice Service web site. The **Ice Graph** tool allows users to quickly generate ice cover graphs for a number of pre-defined areas in Canadian waters including the Northwest Passage. The tool uses summarized ice cover data (by ice type for each of the predefined areas) produced from the CIS Regional Charts from 1968 to present. The output product is a series of bar graphs depicting ice cover variability and trends based on user input. The **Ice Graph** can be accessed from the CIS Ice Archive web page or directly from the direct link below.
http://www.ice.ec.gc.ca/IceGraph/IceGraph-GraphdesGlaces.jsf?id=11874&Lang=eng

Nouvel outil “Graphe des Glaces” pour visualiser la variabilité du couvert de glaces

Un nouvel outil pour visualiser la variabilité du couvert de glaces dans les eaux canadiennes est maintenant disponible sur le site web du Service canadien des glaces d’Environnement Canada. L’outil **Graphe des Glaces** permet à l’usager de produire rapidement des graphes de couvert de glaces pour plusieurs secteurs prédéfinies dans les eaux canadiennes incluant le Passage du Nord-ouest. L’outil utilise un sommaire de données de couvert de glaces (par type de glace pour chacune des régions prédéfinies) produit à partir des cartes Régionales du SCG de 1968 à nos jours. Le produit de sortie est une série de diagrammes de barres illustrant la variabilité et les tendances du couvert de glaces basées sur les entrées de l'utilisateur. Le **Graphe des Glaces** est accessible depuis la page web Archives des glaces du SCG ou directement à partir du lien ci-dessous.
http://www.ice.ec.gc.ca/IceGraph/IceGraph-GraphdesGlaces.jsf?id=11874&lang=fre

George L. Pickard

George Pickard died recently after a short illness; he was 94. He directed the Institute of Oceanography at UBC for many years and was a major player in the development of ocean sciences in western Canada. Many who took his courses, went to sea with him or studied under his direction will remember him as a kind, no-nonsense, supremely organized and dedicated scientist, with a taste for exotic exploration.

George Lawson Pickard was born on July 5, 1913 in Cardiff, Wales. Following studies in Physics at Oxford (D.Phil.,1937), he joined the Royal Aircraft Establishment as a researcher and, later in the war, was posted to the Operational Research Section of the RAF Coastal Command. He worked on the development of improved bombsights and designed the two-spotlight technique that enabled low flying aircraft to place depth charges behind German hydroelectric dams (as shown in the movie "Dam Busters"); he was awarded the MBE for his war-time contributions. After the war, George and his family moved to Canada, joining the UBC Physics Department in 1947, where he hoped to continue his research in low-temperature physics, interrupted by the war. "We don't do that here - that's for Toronto", said Gordon Shrum, then head of UBC Physics, as he steered George towards oceanography. Following a year learning the rudiments of this new discipline at Scripps, he returned to UBC and joined the newly created Institute of Oceanography, launching a systematic study of BC's coastal fjords and building up the academic infrastructure which would eventually mature into a first rate interdisciplinary institution.

Pickard's books on Descriptive Physical Oceanography and (with Steve Pond) on Introductory Dynamic Oceanography were a great success and introduced a whole generation of students to the physics of the oceans. His detailed surveys of the waters of BC fjords provide an essential base line for assessing the progress of climate change. In later years, George extended his interests to the South Seas, surveying the fjords of Chile and New Zealand, making major contributions to the oceanography of the Great Barrier Reef and the Coral Sea.

George Pickard was a Fellow of the Royal Society of Canada and a recipient of CMOS's Tully Medal. His wife Lilian -- they met and married while students at Oxford -- predeceased him (in 1994); he leaves a son, Andrew, and a daughter Ann.

Fred G. Barber

Frederick George Barber (1921-2007) died peacefully in hospital on April 27, 2007. Survived by his wife of 63 years Dorothy (Davies); son, Fred (Brenda); daughters, Eleanor (Hal) Harris, Beverly (Ray) Fortier; 12 grandchildren; 7 great-grandchildren, sister, Eleanor (Harry) Hinkelman and numerous nieces and nephews. Predeceased by his sister, Betty Bryant. Fred's early research efforts were with the Pacific Oceanographic Group in the mid 1950's. He moved east and joined the fledgling Marine Sciences Branch in what was then known as the Department of Mines and Technical Surveys, now Natural Resources Canada, when it launched its marine sciences program in the Gulf of St. Lawrence. Fred demonstrated his interest in oceanographic data archives and transferred and became a member of the Canadian Oceanographic Data Centre and later with DFO's Marine Environmental Data Service (MEDS) in Ottawa. Fred's research interests included physical oceanography and ship surveys in Hecate Strait and the Amundsen Gulf in the western Arctic, research on salmon/coastal waters interactions, studies of the heat budget of the Hudson Bay, and tracing environmental damage connected with the sinking on the east coast of the Irving Whale in 1970.

Ransom Myers

One of Dalhousie's brightest lights, Dr. Ransom Myers (1952-2007) passed away in Halifax on March 27, at the age of 54. Dr. Myers received his B.Sc. in Physics from Rice University, and his M.Sc. in Mathematics and Ph.D. in Biology from Dalhousie University. As Dalhousie's inaugural Killam Chair in Ocean Studies he was widely respected around the globe as a leading world-class ocean researcher. He published more than 100 refereed scientific publications in diverse fields of aquatic ecology. Ram, as he was known, captured the world's attention time and time again with breakthrough research on declining fish populations. He focused much of his attention on models of extinction, which is a growing concern in the marine environment. His influential work on the causes for the collapse of fish stocks, particularly cod in Eastern Canada, has been well documented. The Dalhousie community is enriched for having known and worked with him. Dr. Myers' achievements will long be recognized by his colleagues and his many friends, the world over.

DFO ADM Science Lecture Series

Fisheries Management and Science: The Promise of an Ecosystem Approach: Lessons from the Past – Hopes for the Future and Traditional Relationships in a Complex, Changing and Uncertain Environment; May 18th, 11:30 a.m., Peter Mitchell Room, 15th Floor, 200 Kent Street

Summary of Wendy Watson-Wright's lecture (Assistant Deputy Minister, DFO Science)*:*

A.G Huntsman's science mission was to improve the lot of the ordinary fisherman by doing more to understand the marine environment. His environment-based view was actually more in line with the present than the single species approach. When the management of the fishery became single species based – the single species population dictated the relevant scale for

research and management. And of course such an approach was doomed to failure since ecosystem relationships are played out and applied in space. Looking forward to the implementation of a modern Ecosystem Approach (EA) to management of the fisheries resource, Dr. Watson-Wright notes that, in principle at least, today's resource users endorse the concepts inherent in EA and Integrated Management. But do they have the same understanding of what these policy concepts mean for them or even apply to them? There are different agendas at work – agendas that are often at odds with each other. Going forward, science has a key role in two principal tasks – helping put EA and IM into practice, and communicating how to do that to all affected parties – two very challenging tasks.

Summary of Kevin Stringer's lecture (Director General, Resource Management Directorate*:*

The relationship between fisheries management and science has become more complex as we move from a fisheries stock focused approach with the objective of maximum sustainable yield to an approach with multiple objectives based on the Precautionary Approach, Ecosystem based management, and industry economic viability. Science is now being asked to provide advice, information and analysis on stock interactions and predation, on spawning practices, on sensitive areas and the effect of various gear technologies on benthic communities, on the effect of the increasing number of invasive species in the ecosystem, and on changing ocean conditions and their potential effect on stock dynamics now and in the future. The growing complexity and challenges for fisheries management, for science and for the fishing industry as a whole, has significantly stretched static resources but has been addressed by unique responses, depending on the circumstances, and the development of new partnerships and working arrangements between fisheries managers, scientists and the fishing industry.

Future ADM Lecture Series:
June 8, 1:30 p.m. - Jackie King, DFO Pacific Biological Station, topic to be announced.
June 21 - World Hydrography Day, Speaker to be announced.
July 6 – R. Quentin Grafton, Research Director and Director EDGES, International and Development Economics, Crawford School of Economics and Government (Australia)

SCOR Newsletter No. 8 March 2007

The latest international SCOR newsletter may be found (under publications from the SCOR Secretariat) at: http://www.scor-int.org/Publications.htm Topics include: the new Location for SCOR Web site; Second SCOR Summit of International Marine Research Projects (participants included representatives from virtually all international marine research projects and programmes CLIVAR1, CoML, GEBCO, GEOHAB, GEOTRACES, GLOBEC, iAnZone, InterRidge, IMBER, InterMARGINS, OceanSITES, and SOLAS, chairs of the GOOS panels and representatives from IGBP and SCAR); SCOR capacity-building activities; status of new Working Groups; status of SCOR sponsored Large-Scale Ocean Research Projects; planning for the Second Symposium on the Ocean in a High-CO_2 World met in Monte; Carlo, Monaco; information on SCOR Publications; and information on SCOR related Meetings.

CANADIAN OCEAN SCIENCE NEWSLETTER
LE BULLETIN CANADIEN DES SCIENCES DE L'OCÉAN

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Newsletter #30 will be distributed on June 28, 2007. Please send contributions to dick.stoddart@sympatico.ca
Bulletin #30 sera distribué le 28 juin 2007. Veuillez faire parvenir vos contributions à dick.stoddart@sympatico.ca

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