

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

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Electronic Atlas of Ichthyoplankton on the Scotian Shelf of North America (EAISSNA)

Report by Robert M. Branton, brantonb@mar.dfo-mpo.gc.ca

The EAISSNA database contains information on location and time of spawning, abundance and distribution of eggs and larvae of marine fish on the Scotian Shelf of North America. Close to 200 scientific publications from 1919 to 2001 were reviewed and original analysis was conducted on archived data sets from DFO's Scotian Shelf Ichthyoplankton Program and Fisheries Ecology Program, which ran from 1976 to 1982. These sources provided information on 107 species of fish and invertebrates. The database is intended for use in environmental assessment of offshore hydrocarbon exploration and development, as well as other ocean management activities. Development of the atlas was sponsored by the Environmental Studies Research Funds (ESRF) and will be appearing as part of their report series. It will also be published as a DFO technical report. The report can now be viewed on the Centre for Marine Biodiversity web site at: <http://gmbis.marinebiodiversity.ca>

A related hands-on workshop for interested industry and science staff was held on January 16, 2004. Thirteen participants from DFO, the Canada-Nova Scotia Offshore Petroleum Board, the World Wildlife Fund and numerous consulting companies met at the Bedford Institute of Oceanography to gain a more detailed appreciation for the structure and content of the EAISSNA database, better understand its limits and possibilities, and discuss future directions.

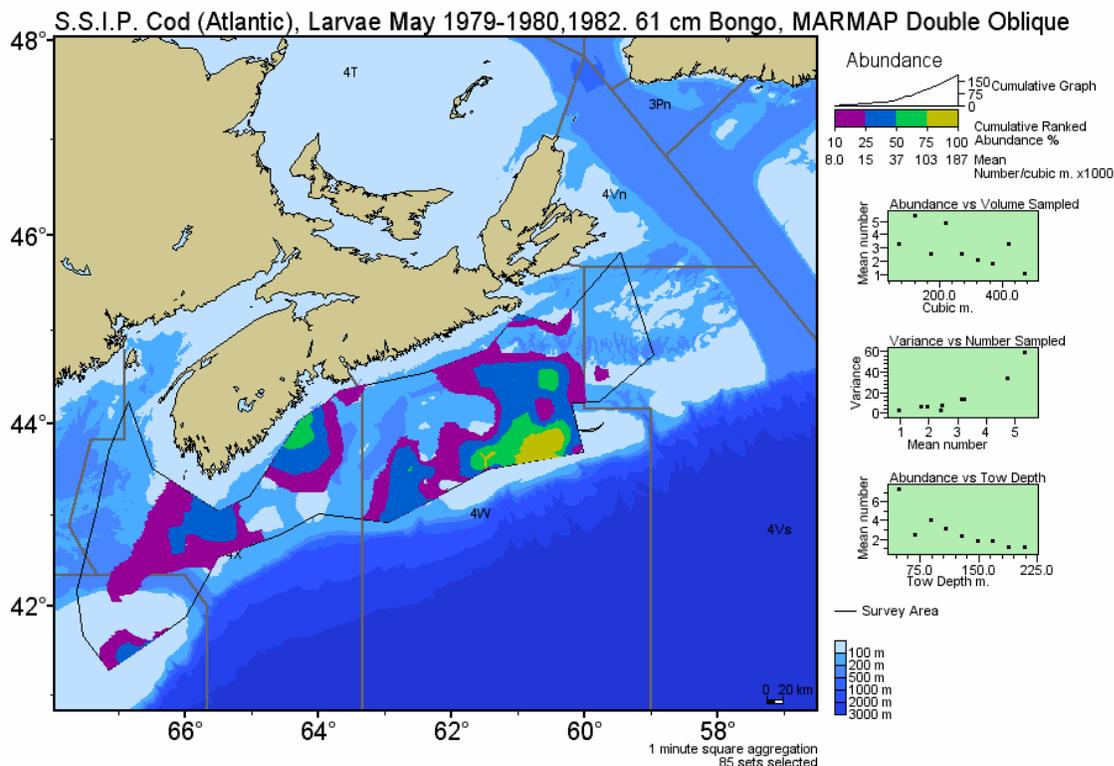


Photo courtesy of the Atlantic Reference Centre.

Data Base from the Arabian Sea Process Study (1990-1997)

As the last Chair of the Canadian JGOFS program, I still receive mailings and information bulletins from the JGOFS International Project Office. I have recently received a box of 20 CD-ROM's, each containing a data base from the Arabian Sea Process Study (1990-1997). These are available free of charge, on a first-come, first-serve basis. They would be excellent for student projects. Below is a description of the data base, taken directly from the CD-ROM jacket.

"The CD-ROM delivers nearly 2,500 profiles of temperature plus, in most cases, salinity and, in some cases, a subset from chlorophyll, dissolved oxygen and optical attenuation. Ships from six nations collected the data during 42 research cruises. The data are presented in a simple ASCII format in a cruise-based directory structure. In addition to the data, the cruise directories include documentation on how the data were collected, presented in text and ASCII formats."

Anyone interested in obtaining a copy of the data base should contact me by email at juniper.kim@uqam.ca

First Long-range CODAR HF Radar in Canada

Contact: Brian Whitehouse, info@oeatech.com

In wind-chill factors below -20 °C, the University of Maine's Physical Oceanography Group (<http://gyre.umeoce.maine.edu>) installed Canada's first long-range CODAR SeaSonde HF radar near Yarmouth, Nova Scotia. The site was activated on 23 January 2004.

HF radar signals travel well beyond the horizon and respond to the ocean in a predictable manner. According to Dr. Brian Whitehouse, president of OEA Technologies, "this results in HF radar being the technology of choice for near-real time synoptic surface current and sea state information." HF radars also have the potential to detect surface targets and therefore are also being developed for coastal surveillance purposes.

The Nova Scotia site is a component of GoMoos - the Gulf of Maine Ocean Observing System (www.gomoos.org). One of the site's first maps of surface current radials can be viewed at www.oeatech.com/hfradar.htm.

Surface current radials are the components of surface current that flow directly towards or away from the radar. Two adjacent radars are required to obtain full surface current vectors. Although still in the commissioning phase, GoMoos is generating current vectors by combining data from the Canadian site with data obtained from radars installed on the American side. Additional information on HF radar can be found at www.oeatech.com/hfradar_tutorial.htm.

The installation was led by Karl Schlenker and Rob Bell of U. Maine and included assistance from Hugh Roarty (Rutgers University), Chad Whelan (CODAR Ocean Sensors) and Brian Whitehouse (OEA Technologies). For further information on U. Maine's physical oceanography

program, or GoMoos, access the above referenced Web sites. For additional information on OEA Technologies and CODAR radars in Canada access www.oeatech.com.

Online Marine Earth-observation Satellite Resource

Contact: Brian Whitehouse, info@oeatech.com

At any given time more than 30 civilian Earth-observation satellite sensors are monitoring the marine environment. Their operating frequencies range from the ultraviolet to the microwave and collectively their applications are relevant to all of the primary disciplines of oceanography.

For more than a decade, Brian Whitehouse has tracked the marine applications, limitations and technical details of all of these satellites. Last October, he updated his files on this subject and subsequently synthesized the information into four interactive tables. This month, he placed the tables on the Web, where everyone can access the information.

The tables can be accessed at www.oeatech.com/eos.htm by clicking on any one of fourteen listed coastal applications. They can also be accessed by sensor type, as follows: (i) Land-optimized Multispectral Satellite Sensors, (ii) Marine Multispectral and IR Sensors, (iii) Altimeters and Synthetic Aperture Radars, and (iv) Passive Microwave Sensors. Each table provides a link to the satellite's home Web site and identifies the sensor's marine applications, defines acronyms, explains satellite technical terms, etc. The site also provides an online remote sensing tutorial through a link to the Canada Centre for Remote Sensing.

Comments regarding errors, omissions or updates to the tables, or suggestions for additional information that would be useful to the marine community, would be greatly appreciated. Send all comments and suggestions to info@oeatech.com.

Macroscopic Perspectives on Microscopic Life in the Sea

William Li, Bedford Institute of Oceanography, LiB@mar.dfo-mpo.gc.ca

Revised and reprinted, with permission of the BIO Annual Review 2002

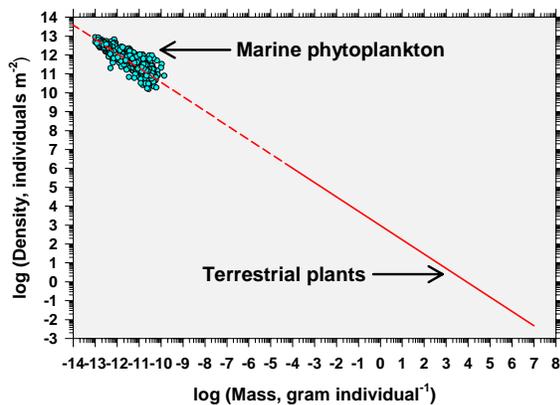
In the oceans, microscopic forms of life constitute the bulk of living matter. Collectively, marine microbes represent an enormously rich genetic biodiversity since they include organisms from all three of the most fundamental domains of life on earth, namely *Bacteria*, *Archaea*, and *Eukarya*. In addition, viruses are found everywhere in the sea as infectious biological agents of other microbes. As this new paradigm of the marine food web takes hold in oceanography, we face the difficult task of characterising and explaining the abundance, distribution and diversity of these microbes; in other words, the task of ecology. Anyone who has looked at satellite images of ocean colour cannot fail to notice how the patchwork of blues, greens and reds locate in different regions and change over time. These are global views of the phytoplankton in the surface sunlit layers of the ocean: they are but one manifestation of the tremendous variability in the occurrence and growth of the plankton. In this regard, marine microbial ecology largely emphasises the distinctions between different kinds of organisms and ecosystems, and on the extensive spatial and temporal variation within ecosystems. Ecological systems are viewed as

highly idiosyncratic, being contingent on the organisms present, and the particular circumstances of the environment in space and time.

The eminent scientist John Lawton has argued that this contingency is tractable at two levels of ecological organisation. Tractability is evident at relatively simple levels such as the population dynamics of single or small numbers of species. However, at the intermediate scales of community ecology, the overwhelming number of case histories complicates the contingency to an unmanageable form. Interestingly, the contingency becomes manageable once again in large sets of species, over large scales of space and time in the form of statistical patterns when local details are subsumed; in other words "macroecology". We should therefore not be surprised to find widespread, repeatable patterns emerging from a large collection of observations in spite of the numerous contingent processes that underlie the collection.

A macroecological study requires enough observational data to ensure that the range of natural variability is covered as fully as possible. Measurements of the abundance and diversity of marine microbes through the depths of the entire water column are painstakingly acquired from collections at sea. Remote sensors to provide real-time data for "armchair" oceanographers are not yet a practical reality. Not surprisingly, microscopic organisms are usually examined by microscopy, a method that reveals much taxonomic detail at the expense of low sample throughput. Alternatively, methods have been developed that sacrifice taxonomic detail in favour of a greatly enhanced speed by which cells can be counted. With this capability, it is feasible to map - in both space and time - the properties of marine microbes at a resolution limited only by the number of water samples recovered in hydrographic surveys. As one of the international pioneers in the shipboard use of flow cytometry for rapid plankton analysis, the Bedford Institute has acquired a dataset of North Atlantic phytoplankton and bacterioplankton that is arguably the most extensive, and almost certainly the most methodologically-consistent in existence. Out of this dataset has emerged some interesting patterns (Li, WKW 2002 *Nature* 419:154-157). These patterns point to rules, and perhaps even general laws by which we might understand the nature of plankton assemblages.

In the northwestern North Atlantic Ocean, a striking feature emerges from the statistical distribution of phytoplankton. When we consider all the plants of the world together on the common basis of body mass, a universal law seems to describe the natural areal abundance of all photosynthetic organisms as a function of individual body mass, from the largest tree on land to the smallest unicellular cyanobacterium in the ocean. In an interesting essay on estimating marine primary productivity on the global scale, John Raven considered the problems of scaling up local measurements and asked "Today a bottle of seawater, tomorrow the world?". This may not be too far-fetched. A useful approach may be to view the microorganisms through a microscope.



Allometric scaling of the areal abundance of plants. The relationship derived for terrestrial plants by Enquist et al. (1998, Nature 395:163-165) for body masses in the range 10^{-4} to 10^{+7} grams can be extrapolated to the cell mass range for phytoplankton 10^{-13} to 10^{-10} grams.

Hypoxia in the Lower St. Lawrence Estuary

Contributed by Bjørn Sundby, bjorn_sundby@uqar.qc.ca

The lower St. Lawrence Estuary is the landward part of the most important topographic feature in the Gulf of St. Lawrence, the Laurentian Trough. This is a 1200 km long, more than 300 m deep, submarine valley that originates on the Atlantic continental shelf off Nova Scotia and ends near the mouth of the Saguenay Fjord. Like many other coastal environments throughout the world, The St. Lawrence Estuary is under pressure from the activities of Man. One of the most alarming problems in coastal areas is that increasing discharges of nutrients increase production rates of plant biomass whose decomposition can lead to low oxygen concentrations (hypoxia) in bottom waters. Notable examples of this problem are the Baltic, the Kattegat, the Chesapeake Bay, and the shelf region of the northern Gulf of Mexico. One does not normally think of the lower St. Lawrence Estuary as deteriorating, but measurements made in 2002 and 2003 revealed that the concentration of dissolved O_2 in the bottom water is below the 65 μM limit that defines hypoxia. Below this limit, many fish species can not survive, and the benthic community structure is believed to undergo significant modifications. The area presently bathed in hypoxic water covers more than 1000 km^2 . A recent search of the historical record has brought to light that the oxygen concentration in the bottom water of the Lower Estuary has decreased by 50% during the last 70 years (Gilbert et al., submitted).

The St. Lawrence estuary is more than one internal Rossby radius wide and can thus accommodate features not usually found in smaller estuaries: shelf waves, baroclinic instabilities and eddies. The circulation is estuarine with water flowing seaward in the surface layer and landward in the deep layer. The deep and slow (less than 5 cm s^{-1}) landward flow brings oxygen rich water from the Atlantic into the Gulf of St. Lawrence, but this deep water is isolated from the atmosphere by a broad deep permanent (100-150 m) pycnocline at the boundary with the overlying cold intermediate layer. This intermediate layer, which is also found on the shelves of Labrador, Newfoundland and Nova Scotia, extends to 125 m depth. It is largely the product of *in situ* winter cooling, although a fraction of its volume, up to 35%, comes from Labrador Shelf waters

entering through Belle Isle Strait. While very active in this seasonally ice-covered region, winter convection never reaches beyond 150 m. Thus, the deep water is isolated from the atmosphere. As it flows landward along the bottom, it loses oxygen gradually through respiration and remineralization. Because the oxygen lost cannot be replenished by winter deep convection or vertical diffusion, the oxygen balance in the deep water is precarious: increased respiration and/or decreased deep estuarine landward flow should lead to lower oxygen concentrations.

Several processes may have contributed to the observed 50% decline in oxygen levels in the deep waters of the St. Lawrence Estuary since the 1930s. These include 1) a change in the properties of the oceanic water mass at the continental shelf edge that supplies the deep water in the Laurentian Channel; 2) an increase in the flux of terrigenous and/or marine organic matter to the seafloor in the Laurentian Channel; 3) a decrease in the landward advection velocity in the bottom. A multidisciplinary group of researchers from Quebec universities (B. Sundby, G. Desrosiers, B. Zakardjian – UQAR; C. Gobeil, Y. Gratton – INRS-ETE; A. de Vernal – UQAM; A. Mucci – McGill) and the Department of Fisheries and Oceans (D. Gilbert, P. Archambault – IML) has initiated a research program that aims to examine the causes of the oxygen decline and determine how sensitive the bottom environment is to environmental pressures. A second group of IML scientists is investigating the effects of low oxygen on organisms, including fish, that normally spend part of their life cycle in the bottom waters of the estuary or the three deep channels of the Gulf of St. Lawrence.

University of Victoria – Ocean Sciences Board - news

Report by Geoff Holland, hollandg@saltspring.com

The University of Victoria is the lead institution for the two major Canadian investments in coastal and ocean underwater observatories, NEPTUNE and VENUS. These unique and exciting investments, together with many other substantial capabilities in earth, ocean and related research at the university, and with the support of partners in academia, industry and government, have created an opportunity to establish a nationally and internationally recognized centre of excellence for ocean science and technology. An Ocean Sciences Board has been established by the University Board of Governors to provide expert and experienced advice to the University and its partners on the development of such a centre with anticipated benefits to scientific research, the economy, improved decision-making, policy formulation, public outreach and training.

The Ocean Sciences Board had its inaugural meeting on February 18 in Victoria. Members are: Geoff Holland (2WE Associates, Chair), Gail Gabel (ESI), Paul Lacroix (OISI), Kim Juniper (UQAM), Jeremy Hall (MUN); Wendy Watson-Wright (DFO), Peter Harrison (NRC), James Baker (Academy of Natural Sciences, USA) and Arthur Nowell (Univ. Washington, USA). A member from the Province of B.C. is to be added in the near future. In addition the University Vice Presidents of Research (Martin Taylor), Finance and Operations (Jack Falk) and the Executive Director of the Ocean Sciences Board (Tim Walzak) are ex-officio members of the Board. Cecilia Freeman-Ward is the Executive Secretary.

8th International Estuarine Biogeochemistry Symposium, 16th - 20th May 2004
Solomons, Maryland, USA

Symposium Venue. Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, Solomons, Maryland, USA. Relevant websites: www.cbl.umces.edu and <http://sba.solomons.md.us/>

Background: This conference is the 8th in a series of meetings which were first titled as the International Model Estuaries Symposium. The focus of the meeting is Estuarine Biogeochemistry. The meeting will have a wide perspective and should appeal to marine chemists and biogeochemists as well as scientists working in the boundary zone between chemistry/geochemistry and biology/microbiology. Estuaries are the buffer zones between land and the ocean and are an environment where the mixing of freshwater and saline water results in strong chemical, physical and biological gradients, and where biogeochemical processes have substantial influence on the water and sediment chemistry. These systems are dynamic and diverse and novel approaches are required to understand the biogeochemistry of such systems and the exchanges at the interfaces between the estuarine/coastal zone and the ocean, atmosphere and the deep sediment.

The focus of the symposium is the biogeochemistry of estuaries. There will be only plenary sessions. Oral presentations or posters are welcome. We can accommodate 40-50 oral papers and six keynote speakers, so please consider a poster presentation. The program will allow time for discussions after each speaker.

Contact Details. Secretariat: Mrs. Brenda Yates, E-mail: yates@cbl.umces.edu, Phone: +1 410 326 7363, Fax : +1 410 326 7341 ; On-site organisers: Dr. Robert Mason E-mail: mason@cbl.umces.edu, Phone: +1 410 326 7387, Fax: +1 410 326 7341; Dr. Fabien Laurier, E-mail: laurier@cbl.umces.edu, Phone: +1 410 326 7383, Fax: +1 410 326 7341

ICARP II

Report by Geoff Holland, hollandg@saltspring.com

The Steering Group for planning the second International Conference on Arctic Research Planning met in Copenhagen on January 19 –20, 2004. Canada was represented by Barry Goodison and Geoff Holland. The ten major themes for the Conference planned for Denmark in 2005 were decided and a provisional list of Chairs for the Theme Working Groups was drawn up. Over the next few months, these will be finalized and WG members selected. The themes are:-

The Deep Central Basin of the Arctic Ocean;
Ocean Margins Atmosphere-Ice-Ocean Interactions;
Shelf Seas;
Coastal;
Terrestrial Processes and Systems;
Sustainable Development of Arctic Economies;
Globalization, Change and Human Adaptation;
Arctic Communities;
Future Trends and Patterns of Change in Climate, Ozone, Ecosystems, and other
Systems;
Understanding and Fostering Linkages for Science to Societal Needs

Canadian scientists interested in participating could submit their names for consideration to the IASC Secretariat at iasc@iasc.no

Forum Québécois en Sciences de la Mer

The *Hudson Bay Complex : Status of Knowledge and Research Priorities* is the theme of the 2004 edition of the Forum Québécois en Sciences de la Mer which will be held on 15-16 April 2004 at the Maurice Lamontagne Institute, Department of Fisheries and Oceans, Mont-Joli, Québec.

Background

Within the context of climate variability and high anthropogenic pressures on the marine environment –issues that are more and more perceptible especially in northern areas -this edition of the Forum will present important information on broad questions related to northern marine ecosystems, in particular, the Hudson Bay complex. We know that the Hudson Bay area and adjacent bays, basins, and straits risk major upheavals in the current century. It is therefore important that we examine some of the key elements related to the potential changes and impacts that may occur in this northern environment.

During the conference, experts in various northern domains will present the current state of the marine environment for the Hudson Bay system, and a public debate will focus on priorities in terms of development, research, and monitoring of this region. The Forum thus represents an excellent opportunity for the scientific community, university students, northern managers, and the general public to acquire information and to discuss rising issues such as climate variability, changes in hydrology (e.g., freshwater regime modifications), impacts of climate changes on living resources (e.g., birds, marine mammals), the northern oceanic environment and the health of human populations, and the needs and aspirations of the Inuits. This Forum will provide an excellent occasion to gain a better understanding of the fundamental issues facing northern regions and to foster the development of partnerships to better address many of these scientific and societal issues. To obtain more information on the Forum and to fill in an inscription form, just consult the web site of the Forum at the following Internet address:
<http://www.osl.gc.ca/Forum2004>

Forum Québécois en Sciences de la Mer

L'édition 2004 du Forum québécois en sciences de la mer portera sur le thème « *Le complexe de la baie d'Hudson : état des connaissances et priorités de recherche* ». Ce Forum sera tenu les 15-16 avril 2004 à l'Institut Maurice-Lamontagne, Ministère des Pêches et des Océans, Mont-Joli, Québec.

Problématique

Dans le contexte des pressions anthropogéniques importantes sur le milieu marin et des variations climatiques qui sont de plus en plus évidentes, surtout dans les milieux nordiques, cette édition du Forum présentera de l'information importante sur les grandes questions touchant le milieu marin nordique et en particulier celui du complexe de la baie d'Hudson. On sait que la région de la baie d'Hudson et des baies, bassins et détroits avoisinants risquent de connaître des bouleversements majeurs au cours du présent siècle. Il semble donc tout à fait pertinent d'examiner certains éléments clefs reliés aux changements et aux impacts qui peuvent se produire dans ce milieu nordique.

Au cours de ce Forum, des experts de divers domaines nordiques nous présenterons le statut présent de l'environnement marin du système de la baie d'Hudson, et un débat public portera sur les priorités en terme de développement, recherche et monitoring dans cette région. Le Forum représente donc une excellente opportunité pour la communauté scientifique, les étudiants universitaires, les gestionnaires du nord, et le public en général de s'informer et de discuter d'enjeux nordiques émergents tels que la variabilité climatique, les changements hydrologiques (ex., modifications du régime des eaux douces), l'impact des changements climatiques sur les ressources vivantes (ex., oiseaux et mammifères marins), l'environnement océanique marin et la santé des populations humaines, et les besoins et aspirations des Inuits. Ce Forum va représenter une excellente occasion pour acquérir une meilleure compréhension des enjeux fondamentaux auxquels font face les milieux nordiques, et pour susciter le développement de partenariats qui permettront de mieux affronter plusieurs de ces enjeux scientifiques ou sociétaux. Pour en connaître plus sur le Forum et pour s'inscrire, vous pouvez consulter le site web du Forum : <http://www.osl.gc.ca/Forum2004>

Review of the British Columbia Offshore Oil & Gas Moratorium

The Report of the Expert Panel on Science Issues Related to Oil and Gas Activities, Offshore British Columbia was released on February 17, 2004. The report may be found on the web site of The Royal Society of Canada at: <http://www.rsc.ca/>

Call for New SCOR Working Groups

The Scientific Committee on Oceanic Research (SCOR) is accepting proposals for new working groups, from now until April 30, 2004. SCOR considers several proposals for new working groups each year. It is expected that two such proposals may be funded to start in 2005. Working groups are usually formed of not more than 10 members, to deliberate on a narrowly

focused topic and develop a publication for the primary scientific literature. The intent is to have their work completed within 4 years or less. SCOR has sponsored (alone or with other organizations) over 120 working groups, including the current ones. Selection of new working groups will be made at the 36th SCOR General Meeting in Venice, Italy on September 27-30, 2004. The intervening May-August timeframe will allow for proposal review and modification. A model proposal and other information about working groups may be found at www.jhu.edu/scor/wkgrpinfo.htm

National SCOR committees are an important aspect of SCOR's operation and play a key role in reviewing working group proposals. Proponents should submit their proposals through their national committees, although SCOR will also accept proposals from individuals and other organizations. Information regarding the Canadian National Committee for SCOR may be found at www.cncscor.ca

ICSU Priority Area Assessment Panel on Environment and its Relationship to Sustainable Development

As part of the ICSU strategy development the ICSU Committee on Scientific Planning and Review (CSPR) commissioned three Priority Area Assessments. The first of these reports, environment in relation to sustainable development, is now available and may be found on the ICSU web site at: <http://www.icsu.org/>. The key findings of this December 2003 report, which will help guide ICSU's activities in for the next 5-10 years, are summarized in the executive summary and should be of interest to the ICSU family, its partners, and decision makers.

Historically, ICSU has had a very strong environmental portfolio (e.g. 16 of its 18 Interdisciplinary Bodies have environmental foci). This report marks the first time that these programmes have been examined as an ensemble. The portion of the ICSU report that refers to SCOR is very complimentary to SCOR.

ACZISC COASTAL UPDATE

The ACZISC COASTAL UPDATE for February 2004 may be found at <http://www.dal.ca/aczisc/new>. It contains information on upcoming ACZISC meetings; incorporating climate change into the EIA process; towards a sustainable environment in Nova Scotia; St. John's harbour clean-up; ocean zoning: can it work in the northwest Atlantic?; call for papers - 6th bay of Fundy workshop; wastewater regulation and shellfish aquaculture: a comparative study; a new oceans action plan for Canada; Atlantic littoral intelligence reconnaissance and surveillance experiment (ALIX); reducing greenhouse gas emissions in Canada; large-scale salinity changes in the Atlantic Ocean; groundwater in freshwater-saltwater environments of the Atlantic coast; Canadian Ocean Science Newsletter; alien invaders in ballast water - new convention adopted at IMO; WWF report on financing marine conservation; global GIS data; various publications and proceedings; upcoming deadlines; and upcoming conferences and other events.

Edmonton CMOS Goes the Extra Mile to Attract Oceanographers

The Edmonton Congress, May 31 – June 3, 2004, should be particularly interesting as organizers have proactively sought out interesting oceanographic speakers and sessions in an effort to ensure a broadly based oceanography program. Of course the final program will be abstract driven, so its ultimate success depends on participation. Early indication of plenary speakers at the Edmonton Congress includes Eddy Carmack, IOS on linkages between oceans surrounding Canada, Dale Haidvogel, Rutgers University on new ocean and coupled models, and Vice Admiral Conrad Lautenbacher, NOAA Administrator on global earth observations (invitation made but formal acceptance yet to be received). Other plenary speakers, while not speaking on oceanography topics per se, have an oceanographic connection to some degree, namely Gordon McBean, Institute for Catastrophic Loss Reduction and current Chair of the Canadian Foundation for Climate and Atmospheric Sciences, and Virendra Jha, Vice President of the Canadian Space Agency. CNC/SCOR is working with the Congress Scientific Program Committee to identify invited speakers for some of the ocean science sessions at Congress; these are still under negotiation but will likely result in several key talks from oceanographers who do not normally attend CMOS Congress.

While the program in Edmonton will be driven by abstracts received, efforts have been taken to encourage session convenors to proactively seek submissions for various sessions, including: Operational Oceanography - Doug Bancroft; Ocean Data Assimilation - Doug Bancroft and Keith Thompson; Air-sea Interaction - Hal Ritchie; High Latitude Oceans - Paul Myers; Unstructured Grid Modelling - Paul Myers; Geophysical Fluid Dynamics - Bruce Sutherland; CLIC/Cryosphere & Climate - Tim Papakyriakou. Of course the traditional sessions will also be organized as abstracts are received; e.g. coastal oceanography, climate, remote sensing, etc.

A special welcome to oceanographers has been included on the Congress web site and in the last issue of the CNC/SCOR Newsletter. Visit the Congress web site at <http://www.cmos.ca/> to find additional details on the program, and register early. **Please note: the abstract submission deadline has been extended to March 15, 2004.**

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

Previous newsletters may be found on the CNC/SCOR web site.
Les bulletins antérieurs se retrouvent sur le site web du CNC/SCOR.

Newsletter #7 will be distributed on April 20, 2004. Please send contributions to dick.stoddart@sympatico.ca
Bulletin #7 sera distribué le 20 avril 2004. Veuillez faire parvenir vos contributions à dick.stoddart@sympatico.ca

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