

## ESSAS (Ecosystem Studies of Sub-Arctic Seas) Science Steering Committee meets in St. Petersburg, Russia

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From 15 to 16 June, 2006, the ESSAS SSC met in St. Petersburg, Russia, following the first ESSAS Workshop on developing comparisons of the sub-arctic seas (see accompanying article). Members in attendance included: Erica Head, Canada; Ken Drinkwater, Co-Chair, Norway; George Hunt, Co-Chair, USA; Jim Overland, USA; Egil Sakshaug, Norway; Yasunori Sakurai, Japan; Kai Wieland, West Greenland, and guests attending were: Manuel Barange, GLOBEC IPO; Bern Megrey, USA; Clarence Pautzke, USA and Vladimir Radchenko, Russia.

This was the second meeting of the ESSAS SSC, the first having been held in Victoria, BC, Canada in conjunction with the GLOBEC Symposium on Climate Variability and Sub-Arctic Marine Ecosystems. After the introduction of the members and guests, reports were heard from each of the presently-funded or expected national programmes. These were followed by a recap and discussion of the ESSAS Workshop that had been held over the preceding three days. On the second day of the SSC meeting, members discussed future activities and the formation of Working Groups.

### Funded National Programmes affiliated with ESSAS

There are presently four funded national programmes that have formal affiliation with ESSAS: NORCAN, NESSAS, J-ESSAS and BEST.

Erica Head reported on NORCAN, and other Canadian activities. Canadian scientists are involved in a Norway/Canada (NORCAN) comparative study of the Labrador/Newfoundland Shelf/Sea and the Barents Sea/Norwegian Sea ecosystems. In 2005-2006 scientists from both countries attended 2 workshops to develop a joint science plan. The plan consists of 4 modules: Retrospective analysis, Comparative field studies, Comparisons with other sub-arctic seas and Predictions of responses to climate change. The Norwegian and Canadian governments have provided directed funding for NORCAN activities. The first step in the implementation of the science plan involves scientists from both countries writing collaborative, comparative papers using existing data. Ongoing ecosystem monitoring programmes in both countries will continue to provide data that will be important to future assessments of the effects of climate change. In addition, it is hoped that Canadian International Polar Year (IPY) projects will fund data collection to enable a comparison of hydrographic and plankton conditions in the Davis Strait region with those of 30 years ago and to establish a series of baseline ecosystem indicators in previously un- or under-sampled northern regions against which future changes can be assessed.

Yasunori Sakurai reported on the J-ESSAS (Japan-ESSAS) Programme. The overall goal of J-ESSAS is to quantify the impact of climate variability on the structure and function of the Oyashio marine ecosystem, including areas with seasonal sea ice in northern Hokkaido, to predict ecosystem responses to possible future climate change and its potential economic impact. J-ESSAS is a part of Japan-GLOBEC and is intended to link and cooperate with the international and regional ESSAS Programme. The following projects are already funded and ongoing:

- Predicting stock fluctuations of key marine species around Japan related to climate change and human activity (funded by Japanese Fisheries Agency (JFA) and the Japanese Society for the Promotion of Science (JSPS), 2004-2008).
- The Shiretoko World Natural Heritage including marine and terrestrial ecosystems: towards coexistence with marine diversity and fisheries (funded by JSPS and Agency of Ecology, 2005-2010).

In addition, collaborative research cruises, using the T/S Oshoro-Maru, Hokkaido University, are planned for the Arctic Ocean and Bering Sea in the summers of 2007 and 2008 as an IPY collaborative research programme.



*George Hunt (co-chair ESSAS and chair BEST) in St. Petersburg.*

The activities of the fourth of the funded programs, BEST (Bering Ecosystem Study), were described by George Hunt. BEST is intended as a broadly-based integrated ecosystem study that will cover issues from climate variability to energy flow through the eastern Bering Sea ecosystem to subsistence and commercial users. It will therefore have a social science component. Although BEST is expected to be primarily funded by the Arctic Section of the US National Science Foundation (NSF), it is also expected that there will be close collaboration between the many agencies and programmes working in the Bering Sea. It is hoped that, eventually, these different programmes will develop a well-integrated research programme with ties to other ESSAS programmes. BEST had its first call for proposals from NSF in September 2005 and five studies have been funded in this first competition, with a total of about \$3.2 million committed so far. The first cruise, on the icebreaker Healy, is expected to start in early April 2007 and will run for about 40 days. It is planned that the NSF-funded scientists will be joined by a group of NOAA-funded scientists from the Pacific Marine Environmental Laboratory and from the Alaska Fisheries Science Center, thereby ensuring a broad, integrated ecosystem study. There may be space for additional interested scientists to join the cruise. BEST will have a second call for proposals in 2006 for projects starting in 2008. It is expected that at least an additional \$7.5 to 8 M will be available to support 2 or 3 years of field work and a write-up year.

### Programmes likely to join ESSAS in the future

Two other national programmes are making plans to join ESSAS. Olafur Astthorsson reported on the status of the ISEP (Ecology of the Iceland Sea) Programme. The main goals of ISEP are to identify and evaluate inorganic and organic production processes in the Iceland Sea to obtain a holistic picture of the function of its ecosystem. In particular, a priority of this research will be to measure and link together the processes which determine the life history pattern of the capelin stock in time and space. The project involves interdisciplinary work on hydrography and currents, nutrients, phytoplankton, zooplankton and fish (capelin). The final goal is to define the ecological position of the capelin stock and try to explain what has caused marked changes in its distribution and biology during recent years. So far the project has been financed mainly by the Marine Research Institute through funds coming from the Ministry of Fisheries. A detailed evaluation of current knowledge and a science plan are complete. The first cruise specifically serving the project was undertaken during 11 July to 3 August 2006 on the RV Bjarni Saemundsson. Other field work in February and May/June 2006 was conducted in connection with ongoing biological oceanographic monitoring and as part of on-going surveys of capelin in January/February. Further field work is planned in autumn 2006 and for the following two years.

A second developing programme, ECOGREEN (Ecosystem West Greenland), was reported on by Kai Wieland. The goal of the ECOGREEN programme is to establish a scientific basis for a long-term ecosystem approach to the management of West Greenland's natural resources. The ECOGREEN idea has served as a framework for several of the activities of the Greenland Institute of Natural Resources (GINR). These include a PhD project on 'Lipids and stable isotopes in marine food webs in West Greenland', within which a food web model for West Greenland is being derived using stable isotope data from 34 species ranging from copepods to marine mammals. In addition, comparative studies of northern shrimp in the northwest and the northeast Atlantic were initiated in 2006 and GINR is among the participants in CLIMP (Climate and Northern shrimp) proposals.

The GINR received a five-year research professorship related to ECOGREEN in 2005. The Center of Marine Ecology and Climate Effects at GINR was established in 2006 with activities in both arctic and sub-arctic areas. A major research effort by the centre is a monitoring programme in the Nuuk fjord area. Monthly sampling of the physical environment and of the lower trophic levels in the pelagic and benthic part of the ecosystem is conducted throughout most of the year. These activities are supplemented by frequent observations of fish, birds and marine mammals. It is currently expected that the project will seek affiliation with ESSAS.

A proposal covering a major part of the original ECOGREEN activities was submitted to the International Polar Year (IPY) steering committee and this proposal has been selected as a lead project in the IPY cluster #122 'Arctic Marine Changes and Implications for Arctic Societies'. Cooperation with the ESSAS component in the IPY, ESSAR (Ecosystem Studies of Sub-arctic and Arctic Regions) is planned, but so far no concrete decision on funding for the IPY component of ECOGREEN has been made.



*Egil Sakshaug, Harald Loeng and James Overland.*

ESSAS is also a co-sponsor of the ECONORTH Symposium on the Norwegian and Barents Seas. Conveners, Dr Torstein Pedersen and Professor Kurt Tande of Tromsø, Norway, during the interim between the 2005 and 2006 ESSAS SSC meetings, requested and were granted sponsorship of a symposium, 'Ecosystem Dynamics in the Norwegian Sea and Barents Sea', planned for 12-15 March 2007. Although this is a local project and involves an area outside the ESSAS area of focus, it was believed that the aims of the symposium fit well within the aims of ESSAS, especially since the Barents Sea is a focal area of ESSAS interest. ESSAS was not able to offer financial support, but it did endorse the symposium such that it could be listed as an ESSAS-affiliated event.

ESSAS will have an active role in the IPY programme through the Ecosystem Studies of Sub-arctic and Arctic Regions programme within ESSAS (see accompanying article). This IPY participation will be important for the support of field programmes within national IPY activities.

### Relations with PICES

Since the inception of ESSAS, PICES (North Pacific Marine Science Organization) has taken interest in the activities of ESSAS and has been a strong supporter of its programme. This support has included hosting the initial GLOBEC symposium, Climate Variability and Sub-Arctic Marine Ecosystems, held in Victoria in May 2005 and providing travel support for several of the symposium speakers. PICES also helped to organise the St. Petersburg Workshop on Developing Comparative Studies of Sub-Arctic Seas and again provided travel support so that Russian scientists were able to participate in the Workshop. Just prior to the June 2006 SSC meeting, PICES extended a formal invitation to ESSAS to attend the 2006 PICES annual meeting in Yokohama, Japan, with Observer status, and ESSAS will be represented by Ken Drinkwater in that capacity.

### Results of the ESSAS St. Petersburg Workshop

The SSC discussed at length the Workshop's progress in developing approaches for comparing the ways in which climate variability affects sub-arctic marine ecosystems (see accompanying article). The SSC saw a need to focus on mechanisms by which climate could influence processes that control the amount of production and its fate (such as sea ice, advection from either higher or lower latitudes, temperature and light cycles) which are potentially the avenues whereby climate variability would affect the production

of sustainable fisheries. Note was also taken of the potential of top-down influences, other than fishery removals, that could impact commercially valuable fish and shellfish stocks. The SSC felt that the workshop discussions were a first step before more quantitative modelling efforts could move forward.

The participants in the workshop agreed that it would be valuable to write one or more review papers comparing aspects of the ecosystems of the four regions discussed in the Workshop (Barents Sea, Bering Sea, Sea of Okhotsk/Oyashio region, Newfoundland/Labrador Shelf) and how present climate variability is affecting them. Paul Wasserman and Egil Sakshaug agreed to take the lead in this project.

### **Future directions for ESSAS**

The ESSAS SSC also agreed that ESSAS will form three Working Groups, on Prediction, Modelling, and Biophysical Coupling:

1. Working Group on Prediction (WGP): Jim Overland to lead and other participants remain to be decided. This working group will examine the various global models of climate change and will down-scale the expected scenarios to the sub-arctic regions that are the focus of ESSAS activities.
2. Working Group on Modelling (WGM): Bern Megrey, to lead, with Lorenzo Ciannelli, Shin-ichi Ito and Wieslaw Maslowski, joining in as initial members. The goal of the WGM will be to work toward developing a suite of linked models that will

go from climate forcing through to fisheries and, possibly, social and economic impacts on humans.

3. Working Group on Biophysical Coupling (WGBC): George Hunt to lead with Ken Drinkwater, Erica Head, Franz Mueter, Vladimir Radchenko, Yasunori Sakurai and Kai Wieland, joining as the initial members. The WGBC will examine the various physical aspects of sub-arctic ecosystems (e.g. sea ice, advection from either higher or lower latitudes, temperature, light cycles) that are potentially the avenues whereby climate variability would affect the production of sustainable fisheries.

### **Acknowledgments**

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