Ecosystem Studies of Sub-Arctic Seas (ESSAS) programme update

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Margaret McBride is the ESSAS Coordinator at the newly established ESSAS Project Office in Bergen, Norway.

Establishment of an ESSAS Project Office

The GLOBEC regional programme ESSAS recently established a Project Office in Bergen, Norway, through funding by the Research Council of Norway and the Institute of Marine Research in Bergen. The office is funded at a level of a half time position for a period of 5 years. The office will help coordinate and promote activities within ESSAS and communicate ESSAS science to both the broader scientific community and the general public. ESSAS is pleased to announce that Ms Margaret Mary McBride will be the ESSAS co-coordinator who will head the Office. Ms McBride is a research fisheries biologist with over 30 years of broad international experience (28 years US Federal service), and a record of solid accomplishments strongly contributing at outstanding research institutions. She holds a BSc from Brandeis University (1975) and a MSc in Fish and Wildlife Science from Oregon State University (1989). She studied invertebrate zoology and marine ecology at the Marine Biological Laboratory in Woods Hole, MA. She also has studied biostatistics and survey sampling design at the Harvard School of Public Health Sciences. Her early career (1975-1992) was as a fisheries biologist in the Population Dynamics Branch of NOAA's Woods Hole Laboratory where she conducted stock assessments. She was invited to work (1990-1991) as a visiting scientist at the Institute of Marine Research in Bergen, Norway where she applied a method that she had developed to estimate discards to data from Norway's cod fishery in the Barents Sea. She worked three years (1993-1996) at the US Fish and Wildlife Service on the successful restoration effort for Atlantic coastal striped bass and next devoted three years (1996-1999) foreign service at the Fisheries Research Institute (IIP) in Maputo, Mozambique.

Upon return to the US, she joined NOAA's Chesapeake Bay Office where she led the development of a programme on Fisheries Ecosystem Planning for Chesapeake Bay. Again invited to work at IMR in 2007, she has been, and will continue, working on issues related to ecosystem-based research and management through an Intergovernmental Personnel Action (IPA) between IMR and NOAA Fisheries. As coordinator of the ESSAS Project Office at IMR, she hopes to facilitate collaborative research efforts that acknowledge our joint responsibility as ecosystem stewards to find effective solutions to issues, problems, and concerns shared between nations that jeopardise the health and productivity of sub-Arctic ecosystems. Those who want to contact the ESSAS Office can contact Margaret at margaret.mcbride@imr.no or telephone + 47 55 23 69 59.

New ESSAS Working Group

A major goal of ESSAS is to predict the potential impacts of climate variability on the sustainable use of the sub-Arctic seas. ESSAS has elected to employ a comparative approach to investigate, in each of the sub-Arctic seas, which energy pathways appear particularly vulnerable to decadal and longer-term climate change. The ecosystem response to climate change can be non-linear with thresholds, have complex interactions between species, and feature different species responses to similar climate fluctuations in different ecosystems. Reducing uncertainty about the future states of sub-Arctic ecosystems hinges on our ability to develop future regional climate scenarios as well as reasonable projections of the response of the ecosystem to changes in climate. Predicting future climate states is the primary focus of ESSAS Working Group I on Regional Climate Prediction. Understanding and modelling the complex linkages between observed and projected climate variability and species distributions is the primary focus of two ESSAS Working Groups (Working Group 2: Biophysical Coupling Mechanisms and Working Group 3: Modelling Ecosystem Responses).

A new Working Group (4) on Climate Effects at Upper Trophic Levels (WGCUTL) has been established to assess the effects of ocean climate variation and fishing on the interactions between gadoid fishes and crustaceans by conducting a comparative study across multiple sub-Arctic marine ecosystems. Gadoid fish and crustaceans are important components of the benthic food web in most sub-Arctic ecosystems and are often among the most important commercial fisheries in these systems. Much is already known about the responses of gadoid fish and crustaceans to physical variability in the ocean. However, there is a need to summarise what is known specifically about the responses of these populations in sub-Arctic seas to climate variability in the context of fishery takes and to contrast and compare these responses among different ecosystems. This working group deliberately focuses on a small set of interacting species to identify consistent associations between the major, commercially important, gadoid fish and crustacean species in each system and to evaluate their responses to observed climate variability. Identifying associations will improve our understanding of ocean climate effects or 'bottom-up' processes that are important in regulating these populations. The working hypothesis is that gadoid fish and crustaceans respond in opposite ways to ocean climate variation and that such variation results in differences in productivity and abundance between gadoids and crustaceans.

Physical aspects of the ocean that may be crucial in regulating these responses in sub-Arctic ecosystems include sea ice cover, ocean temperature, circulation, and stratification. The WGCUTL approach is consistent with the ESSAS approach of making comparisons across multiple ecosystems. It is recognised that population responses may not be consistent across all sub-Arctic ecosystems, but similarities and differences will help to identify ecosystem features that are related to the functional mechanisms governing gadoid-crustacean interactions and dynamics. These mechanisms may operate at the adult stages (e.g. through

predation or variations in reproductive success), during early life history stages (e.g. through effects on survival of larval or early benthic/demersal stages) and/or at lower trophic levels (variations in food availability). This study is intended to complement other studies of effects of ocean climate on productivity at low trophic levels (e.g. BSIERP/BEST in the Bering Sea, ESSAS Working Group on Biophysical Coupling) to elucidate how bottom-up processes function in regulating ecosystem structure.

To achieve its goals, WGCUTL will engage experts from as many sub-Arctic ecosystems as possible to obtain available datasets from each ecosystem on the variability in abundance of gadoids and crustaceans, as well as relevant ocean climate indices and fisheries removals from each system. Data analyses will be conducted within and across ecosystems to identify important associations and to examine similarities and differences among ecosystems. Results from these analyses will provide a better understanding of the functional relationships between populations of gadoid and crustacean species, and the effects of climate variability on these populations. The Working Group is chaired by Franz Mueter (fmueter@alaska.net) and Earl Dawe (Earl.Dawe@dfo-mpo.gc.ca).

2008 ESSAS Annual Meeting

Erica Head with Neptune at a previous ESSAS Annual Meeting.

ESSAS was invited by Dr Erica Head of the Department of Fisheries and Oceans, Bedford Institute of Oceanography, to hold its 2008 Annual Meeting 13-15 September in Halifax, Nova Scotia, Canada at the Lord Nelson Hotel. The meeting consisted of a half-day workshop on the Role of Advection in Sub-Arctic Marine Ecosystems, a one-day workshop on developing realistic scenarios of the effects of global warming on the climates of the sub-Arctic seas, and a one-day workshop comparing the results of ECOPATH modelling across the sub-Arctic seas. An additional half-day was spent reviewing the results of past workshops on biophysical coupling.

The Workshop on Advection was convened by Dr Ken Drinkwater (ken.drinkwater@imr.no). It compared and contrasted the role of advection within sub-Arctic ecosystems. Of particular interest was the difference between those sub-Arctic seas that receive significant amounts of warm water from the south, such as in the Barents and the Bering Seas, compared to those that receive arctic water from the north, such as the Oyashio and the Labrador and Newfoundland regions. In addition comparisons in advective processes between the sub-Arctic and the Antarctic were explored. In this regard Dr Sally Thorpe (British Antarctic Survey, Cambridge, UK) gave an invited talk on the role of advection on krill in the Antarctic. Other invited presentations included work in the northwest Atlantic on zooplankton (Dr Andrew Pershing, USA) and fish (Dr Ken Frank, Canada). From Pacific sub-Arctic regions there were presentations on the advective supply of offshore prey into the continental shelves in the Oyashio area (Dr Orio Yamamura, Japan) and on advection in the eastern Bering Sea (Dr George Hunt, USA). Rounding out the programme were presentations on larval drift off West Greenland, Iceland and Norway (respectively, Drs Kai Wieland, Denmark; David Brickman, Canada; and Trond Kristiansen, Norway). This workshop took place at the Bedford Institute of Oceanography. The possibility of writing a review paper examining the role of advection on sub-Arctic marine ecosystems was discussed.

The Workshop on Future Climate Scenarios was convened by Dr Jim Overland (NOAA/PMEL, USA, James.E.Overland@noaa.gov). It developed methods to select the most appropriate set of IPCC models for each of the sub-Arctic seas. Selected models must not only hindcast mean climate conditions, but also capture the range of natural variability. The objective was to be able to select a suite of models that can be used to forecast expected climate scenarios, and to then downscale these forecasts so that they can be used to develop physical oceanographic scenarios for each of the various sub-Arctic regions. These essential steps will provide the ESSAS Working Groups on Modelling and Biophysical Coupling with realistic input to determine potential future impacts of climate change on marine ecosystems in sub-Arctic regions and the sustainability of the fisheries. Invited presentations were given on the IPCC model assessments (Dr Vladimir Kattsov, Russia), regional models and downscaling from global models (Drs John Walsh, USA; Enrique Curchister, USA; Mike Foreman, Canada, on the NE Pacific; Simon Prinsenberg, Canada, on the NW Atlantic; and Paul Budgell, Norway, on the Nordic and Barents Seas) and on ecological impacts of future climate (Dr Ken Drinkwater).

The Workshop on Model Comparisons was co-convened by Dr Bernard Megrey (NOAA, USA, Bern.Megrey@noaa.gov), Dr Kenneth Rose (Louisiana State University, USA, karose@lsu.edu), and Dr Shin-ichi Ito (Tohoku National Fisheries Research Institute, Japan, goito@affrc.go.jp). It brought together the results of applications of the ECOPATH modelling system from a number of the sub-Arctic seas including the Barents Sea, the Iceland Sea, West Greenland, the Labrador Shelf, the Bering Sea, the Sea of Okhotsk, and the Oyashio Current system. The aim was that by using the same model to compare the different systems, differences in the model outcomes should reflect differences in the structure or function of the system, rather than in the assumptions or architecture of the models. There was also an invited presentation by Professor Michio J. Kishi, (Hokkaido University, Japan) on a comparison of simulated particle fluxes using NEMURO and other ecosystem models in the western North Pacific, and by Dr Bernard Megrey (NOAA Alaska Fisheries Science Center, USA) on the ECOPATH comparisons that were conducted as part of the MENU (Marine Ecosystems of Norway and the US) programme, and by Dr Kenneth Rose (Louisiana State University, USA) on "Can we compare models without also considering the modeller?" and an invited presentation by Dr Enrique Curchitser and Dr Paul Budgell on "A comparison of sea ice conditions in sub-Arctic seas over the last 50 years."

The ESSAS Science Steering Committee met on 16-17 September in Halifax immediately following the Annual Meeting. They discussed upcoming events including ESSAS contributions to the GLOBEC Open Science Meeting in June of 2009, a multiple session workshop being held by the ESSAS Working Group on Modelling, the potential transition from GLOBEC to IMBER after 2009, and next year's annual meeting.