ESSAS Workshop

12-14 June 2006
St. Petersburg, Russia

Purpose:

The goal of ESSAS is to provide understanding of how global change, especially climate variability will affect the sustainability the Sub-Arctic marine ecosystems. The ESSAS approach to this goal is the use of comparisons of the Sub-Arctic marine ecosystems and their responses to climate variability. The St. Petersburg Workshop is the first step in this process. The Workshop will need to develop a methodology for conducting the comparisons, and then test these out by using these methods to compare the Okhotsk Sea/Oyashio region, the Bering Sea, the Newfoundland/Labrador Shelf and the Barents Sea. This comparison would thus include areas with currents both to and from the Arctic and those with marginal ice zones at quite low and rather high latitudes. The goals of the workshop will be: 1) to lay the groundwork for developing the data sets needed to achieve the appropriate comparisons and, 2) to commence developing the teams necessary to synthesize available data and develop models for predicting the effects of climate variability on these ecosystems.

Approach:

It is expected that the Workshop will build upon extant syntheses and on-going and planned synthesis efforts. For example, the syntheses in the PICES North Pacific Ecosystem Status Report (available at: http://www.pices.int/publications/special_publications/NPESR/2005/npesr_2005.aspx), and the ESSAS Science Plan and the Appendix to the ESSAS Science Plan (available at: http://web.pml.ac.uk/globec/structure/regional/essas/essas.htm) that assembled data from each of the Sub- Arctic Seas should provide much basic information. Additionally, papers such as those by Aydin et al. (2002) examining the similarities and differences between the eastern and western Bering Sea, Hunt and Megrey's (2005) comparison of the Bering and Barents Sea ecosystems, and the recent work by Ciannelli et al. (2005) comparing the Barents Sea and the Gulf of Alaska systems will provide a solid basis for moving forward with the analyses of these ecosystems. The workshop will also take advantage of advances made in the January 2006 PICES CFAME workshop on developing indices for North Pacific comparisons, and the results of workshops in the Norwegian funded program, Norway-Canada Comparisons of Marine Ecosystems (NORCAN), held in the autumn of 2005 and the late spring of 2006. The NORCAN workshops will develop specific plans for comparisons between the Barents Sea and the Labrador Shelf, including the use of biophysical models, and will initiate research on physical forcing, zooplankton dynamics and climate impacts on fish populations in these subarctic seas.

Many of the synthesis products available to date have provided excellent compendia of information about a particular sub-arctic ocean basin, but few have explicitly compared mechanisms and responses to climate forcing across basins or between Atlantic and Pacific systems. If the comparative method is to be used successfully, it will be necessary to identify important underlying structuring features of the ecosystems and how climate forcing, acting on those mechanisms, will result in ecosystem change. It will also be necessary to develop data sets that can be used in predictive modeling efforts. These data sets will have to be sufficiently closely aligned that inter-regional comparisons will be fruitful. Although all systems are unique, there must be a search for basic elements common to many, if not all, that can be usefully employed in a comparative approach. It is expected that the ESSAS St. Petersburg Workshop will also, through its review of the existing syntheses of North Pacific data sets and comparisons with data from North Atlantic systems, provide a solid basis for the development of revisions and updating of the first version of the PICES North Pacific Ecosystem Status Report.

Specifics

Goals: 1) Produce a report that:

a) Outlines fruitful approaches to assessing which processes, mechanisms, or aspects of populations are most sensitive to the expected changes in physical forcing that will result from climate change.
b) Identifies studies or data sets that will allow evaluation of the responses of specific mechanisms or population characteristics to climate forcing.
c) Develops methodologies for comparing responses of the different Sub-Arctic seas to climate variability. Do similar changes in climate cause similar responses in all of the Sub-Arctic seas?

2) Begin the assembly of Working Groups to synthesize knowledge and build comparisons of what we know about ecosystem function with respect to fishing and climate variability in the Sub-Arctic seas.

3) Develop mechanisms for coordinating and enhancing cooperation and collaboration between the efforts undertaken by the PICES CCCC program the ICES CCC program, and the ESSAS program.

References Cited:

Aydin, K.Y., Lapko, V.V., Radchenko, V.I., and Livingston. P.A. 2002. A comparison of the Eastern Bering and Western Bering Sea Shelf and Slope ecosystems through the use of mass-balance food web models. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-130, 78 pp.

Ciannelli L, Bailey KM, Chan KS, et al. 2005. Climate change causing phase transitions of walleye pollock (*Theragra chalcogramma*) recruitment dynamics. Proc. Royal Soc. B 272 (1573): 1735-1743.

Hunt, G.L., Jr. and B.A. Megrey. 2005. Comparison of the Biophysical and Trophic Characteristics of the Bering and Barents Seas. ICES Journal of Marine Science 62: 1245-1255.

Structure of the Workshop: In a three-day meeting, one day will be devoted to talks and two days to examining avenues for building a set of comparative studies of the ESSAS regions and for strengthening the next edition of the PICES North Pacific Ecosystem Status Report.

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Agenda

Monday, 12 June
08:30: Welcome from the Giprorybflot Institute and from Alex Bychkov of PICES

09:00: Introductions, goals of workshop and adoption of the Agenda (George Hunt and Ken Drinkwater)

09:30: Overview of Climate forcing patterns and mechanisms (Jim Overland)

10:00: Overview of Circulation Patterns and Modeling (Wieslaw Maslowski)

10:30 Break

11:00: Barents Sea (Harald Loeng, Vladimir Ozhigin, and others)

12:00: Lunch

13:30: Newfoundland/Labrador Shelf (Erica Head, Ken Drinkwater, Earle Dawe)

14:30: Sea of Okhotsk and Oyshio Current: (Yasunori Sakurai, Sei-ichi Saito, Valdimir Radchenko, and others)

15:30: Break

16:00: Bering Sea (east and ?west) (Frantz Mueter, Lorenzo Cianelli, and others?)

17:00: Discussion: What are the major pathways of energy flow in common or that are different among these regions?

17:30: End of Monday sessions

Tuesday 13 June:
08:30: What are the mechanisms controlling energy flow that are most susceptible to being affected by climate variability/change? Are they the same in all four systems? Are they of equal importance in all systems? For a given type of perturbation, are they expected to respond similarly? (Discussion leaders: Paul Wassermann, Franz Mueter)

10:00: Break

11:00: Summing up and building a table of pathways, mechanisms and potential responses.

12:00: Lunch

13:30: Do we have appropriate models to address the issues? (Discussion leaders: Wieslaw Maslowski, Bern Megrey, Lorenzo Ciannelli)

14:30: Breakout Sessions: What are the appropriate data sets and are they available?
a) Climate and Physics

b) Lower Trophic Levels (Phytoplankton, Zooplankton and Microplankton)
c) Upper Trophic Levels (Fish, Seabirds, Marine Mammals, and People)

15:30: Break

16:00: Continue Breakouts

16:45: Plenary: What have we learned? Reports from the Breakout Groups

17:30: End of Session

17:45: Dinner Cruise Bus from meeting venue; spouse meet bus at hotel at 17:30

Wednesday, 14 June

09:00: What are the ways forward? (Ken Drinkwater and George Hunt)
a) Brief reports from other regional studies (e.g., BEST, NORCAN, etc)
b) How do we structure comparative studies and collaborations?
c) What is the role of regional ecosystem status reports?
d) How can reports such as the PICES North Pacific Ecosystem Status Report be strengthened?
e) How does ESSAS strengthen collaborations and exchanges with PICES and ICES?

10:30: Break

11:00: Develop Report Outline

11:30: Breakout Sessions for Report preparation
a) Climate and Physics
b) Lower Trophic Levels (Phytoplankton, Zooplankton and Microplankton)
c) Upper Trophic Levels (Fish, Seabirds, Marine Mammals, and People)

12:00: Lunch

13:30: Report Preparation as Breakout Groups

17:00: Plenary Summary of Workshop and future directions (Ken Drinkwater and George Hunt)

17:30 Close of Workshop

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Participants

PERSON	COUNTRY	REGION	DISCIPLINE
Alexander Bychkov	PICES	North Pacific	Ecosystem
Lorenzo Ciannelli	USA/Norway	E. Bering/Barents Sea	Ecopath Modeling
Earl Dawe	Canada	Nfld/Labrador	?
Andrey Dolgov	Russia	Barents Sea	plankton/ecosystem
Ken Drinkwater	Norway	Nfld/Labr shelf	Physics
Elena Dulepova	Russia	Okhotsk Sea	Zooplankton
Erica Head	Canada	Nfld/Labr Shelf	Zooplankton
George Hunt	USA	E. Bering Sea	Birds/Ecosystem
Shinichi Ito	Japan	Okhotsk/Oyashio	Ecosystem Modeling
Harald Loeng	Norway	Barents Sea	Physics/Ecosystem
Wieslaw Maslowski	USA	ALL Regions	Physics modeling
Bern Megrey	USA	Bering/Barents Sea	Modeling
Georgy Moiseenko	Russia	Atlantic Region	Data/Meta-data
Franz Mueter	USA	Bering Sea	Fish/Ecosystem
Emma Orlova	Russia	Barents Sea	Plankton/ecosystem
Jim Overland	USA	Arctic & Sub-Arctic	Climate/Physics
Vladimir Ozhigin	Russia	Barents Sea	Physics/Ecosystem
Clarence Pautzke	USA	Bering Sea	Fisheries
Vladimir Radchenko	Russia	Bering/Okhotsk Sea	Fish/Ecosystem
Marit Reigstad	Norway	Barents Sea	Zooplankton/Ecosystem
Sei-ichi Saitoh	Japan	Oyashhio/Bering Sea	Primary Production
Egil Sakshaug	Norway	Barents & Bering Seas	Prim Prod/Ecosystem
Yasunori Sakurai	Japan	Oyashio and Okhotsk	Squids/Mesopelagics
Igor Shevchenko	Russia	Pacific	Data/Meta-data
Oleg Titov	Russia	Barents Sea	physics/ecosystem
Paul Wassermann	Norway	Barents Sea	Lower trophic Prod
Kai Wieland	Greenland	Greenland	Fish

Table1. Major pathways of energy flow: What are the species involved? And the length of their life cycles?

Trophic level	Barents sp I	Barents Sp II	Barents Sp III	Nfld/Labdr Sp I	Nfld/Lbdr Sp II	Nfld/Lbdr Sp III	E. Bering Sp I	E. Bering Sp II	E. Bering Sp III	Oyashio Sp I	Oyashio Sp II	Oyashio Sp III	Okhotsk Sp I
Phytoplankton													
Microplankton													
Meso-zooplankton herbivores													
Meso-zooplanton, planktivores/omnivores													
Forage Fish													
Commercial Fish													
Commercial Crustaceans													
Marine Mammals													
Marine Birds													

For each trophic level in your system, name the two or three most important species on the food chain to an important fisheries species and put length of life cycle (in months) after the name. Leave question marks where not known.

Table 2: Major control mechanisms influencing energy flow to fisheries.

Control Mechanism	Barents Sea I	Barents Sea II	Barents Sea III	Nfld/Lbdr I	Nfld/Lbdr II	Nfld/Lbdr III	E. Bering I	E. Bering II	E. Bering III	Oyashio I	Oyashio II	Oyashio III	Okhotsk I	Okhotsk II
Climate to Ocean														
Ocean to Primary Production Advection														
Ocean to primary Production Stratification														
Primary Production to Herbivores														
Secondary Production to carnivores I														
Secondary Production to Carnivores II														
Top-down effects of predators on species														

Indicate the primary mechanisms, as known, controlling flow from one level to the next. Rank control mechanisms, where possible, in terms of importance. Do this for the three most important commercial species in your region. Indicate whether the mechanism operates by changing the amount or the timing, or both, of the flow of energy or material to the next trophic level.