Terms of Reference

ESSAS Working Group 3: Modeling Ecosystem Response (WGMER)

Ecosystem Studies of Sub-Arctic Seas (ESSAS)
28 February 2007

Introduction

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, investigating in each of the sub-arctic seas which energy pathways appear particularly vulnerable to decadal and longer-term climate change. Ecosystem-level response to climate can vary spatially, geographically, and ontogentically. It can manifest itself locally (i.e., be non-linear with threshold responses), involve complex species-to-species interactions (i.e ecosystem reorganization in response to climate change, and/or demonstrate different within-species responses between different regional geographic locations within the same ocean basin, all originating from similar climate fluctuations.

Reducing uncertainty about the future states of ESSAS ecosystems depends on knowledge of the response of the ecosystem to changes in climate and a quantitative ability to project future climate states. The first ESSAS goal of prediction requires a fundamental understanding of climate-biological interactions. With understanding comes the ability to model the complex linkages between climate variables and species distributions, which are the primary focus of the other two ESSAS Working Groups (ESSAS Working Group 1: Regional Climate Prediction and ESSAS Working Group 2: Biophysical Coupling Mechanisms).

The goal of the **Working Group on Modeling Ecosystem Response (WGMER)** is to develop conceptual, mechanistic/process, statistical/empirical, and simulation models to facilitate comparison of ESSAS ecosystems and to forecast the impacts of climate change on ecosystem structure and function in multiple ESSAS ecosystems.

Much data has already been collected in ESSAS ecosystems. Thus a major task of WGMER will be to inventory these data and evaluate the suitability of using these data in comparative analysis, modeling and forecasting climate impacts.

Tasks
1. Identify modeling methodologies that will facilitate comparison of the biological, physical, and trophodynamic aspects of the ESSAS

ecosystems across regions. Identify and suggest suitable conceptual, mechanistic/process, statistical/empirical, and simulation models to examine for potential application.
2. Assemble existing biophysical datasets and time series from ESSAS ecosystems to facilitate joint comparative studies.
3. Apply the identified candidate models and modeling techniques to ESSAS ecosystems and ecosystem data sets to describe and validate the models.
4. Evaluate ESSAS modeling proposals and offer recommendations to the SSC.

Implementation
1. The Working Group on Modeling Ecosystem response shall exist for a period of three years, ending six months after the 2009 annual meeting of ESSAS.

2. Six to eight members will be chosen from the fields of quantitative ecology and fisheries oceanography. Input from experts on future climate variability and ecosystem process will be sought through collaboration with ESSAS WG 1 and 2, respectively.

3. The development of the proposed products will include conducting workshops held at the annual ESSAS meetings and also inter-sessional workshops as required. The purpose of the workshops will be to review candidate modeling methodology, to facilitate ecosystem comparisons, and the identification of suitable data sets. Inter-sessional work will involve pre-workshop preparation, data analysis, model coding, model application post-workshop report preparation, and the preparation of peer-reviewed manuscripts.

Expected Results
Workshop products will be one or more review papers, to be published in the refereed literature, that summarize the important ecosystem features that facilitate comparison.

Other products will include short position reports on the models evaluated, strategies for implementing the models, recommendations on future data collection and on synthesis of existing data, and methodological recommendations for ensuring appropriate among and between ecosystem comparisons. Joint efforts on these and other specific topics will be done in collaboration with the WG 1 and WG 2.

Membership
The initial members of WG 3 are as follows:

Bernard A. Megrey	USA, Co-Chair
Shin-ichi Ito	Japan, Co-Chair
Kenneth Rose	USA, Co-Chair
Paul Budgell	Norway
Lorenzo Ciannelli	USA
Dr. Masahiko Fujii	Japan
Gennady Kantakov	Russia
Franz Mueter	USA