

## ***SYNTHESIS AND COMPARATIVE ANALYSIS COMMITTEE***

***Terms of Reference:*** *Develop strategies for synthesis of U.S. GLOBEC regional studies and explore avenues for comparative analysis among U.S. GLOBEC regional studies and related national and international programs.*

### **I. BACKGROUND/INTRODUCTION**

#### **A. Overview of U.S. GLOBEC Goals and Objectives**

#### **B. Goals of Synthesis**

1. A framework for integrating process-oriented, broad/meso-scale, and retrospective studies in conceptual and mathematical models
2. The role models in synthesis. Developing predictions of ecosystem response to climate change and variability.
3. Synthesis within regional U.S. GLOBEC study locations and the program as a whole

#### **C. Goals of Comparative Analysis**

1. The role of comparative analyses in extracting broader lessons of ecosystem response to climate change and variability
2. Modes of comparative analysis
  - a. Across systems and system types
  - b. Across taxa

### **II. SYNTHESIS**

#### **A. Specification of Conceptual and Mathematical Models used in U.S. GLOBEC**

#### **B. Models used in U.S. GLOBEC**

##### **1. Physical Models**

- a. Quoddy Finite Element Model
- b. S-Coordinate Rutgers University Model
- c. Others
  - Spectral-Element Ocean Model
  - Princeton-Ocean Model
  - Intercalibration of Models

##### **2. Biological Models**

- a. NPZ Models
- b. Age/Stage Structured Models
  - Zooplankton
  - Fish
- c. Individual-Based Models
  - Zooplankton
  - Fish
- d. Metapopulation Models
- e. Inter-relationships of Biological Models

#### C. Coupling Physical and Biological Models

#### D. Data Collected in Support of Modeling Efforts

- 1. Direct Measurements
- 2. Derived Measurements
- 3. Intercalibration Issues

#### E. Mapping of Data Collected in U.S. GLOBEC Field Studies to Models

- 1. Model Data Requirements
  - a. Physical Models
  - b. Biological Models

#### F. Predictive Capabilities

#### G. Other Synthetic Methods

### III. COMPARATIVE ANALYSIS

#### A. Modes of Comparison within U.S. GLOBEC Studies

##### 1. Comparison Across System Types

##### a. Classification of System-Types in U.S. GLOBEC

- Retentive/Strong Tidal Mixing (Georges Bank)
- Upwelling/Advective ( California Current)
- Buoyancy-driven Flow/Downwelling/Advective (Coastal Gulf of Alaska)
- Ice-Dominated System/Retentive System (Marguerite Bay Antarctic Peninsula)

##### 2. Comparison Across Taxa

- a. Calanoid Copepods (Georges Bank/Gulf of Alaska)
- b. Euphausiids (California Current/Antarctic Peninsula)
- c. Salmon (California Current/Gulf of Alaska)

##### 3. Comparison Across Models

## B. Comparisons between U.S. GLOBEC and other Programs

1. Cod in the North Atlantic
  - a. Canada GLOBEC, OPEN, Northern Cod Recovery Program
  - b. ICES Cod and Climate
2. *Calanus finmarchicus* in the North Atlantic
  - a. Canada GLOBEC
  - b. TASC
3. Salmon in the North Pacific
  - a. Canada GLOBEC
  - b. EVOS
  - c. Ocean Carrying Capacity
  - d. PICES Climate Change and Carrying Capacity
4. Krill
  1. International GLOBEC
  2. CCAMLR

## C. 'Currencies' for Comparison

1. Mean Fields
  - a. Physical Measurements
  - b. Biological Measurements
2. Variance (or CV)
  - a. Physical Measurements
  - b. Biological Measurements
3. Energy Flow
  - a. Ecological/Biological Measurements
4. Transportation
5. Concentration
6. Enrichment

## D. Analytical Methods for Comparative Studies

1. Use of Longitudinal (Time Series) and Cross-Sectional Studies
  - a. Differences over time within regions
  - b. Differences Among Systems or Taxa
2. Methods of Meta-Analysis

#### IV. CONCLUSIONS/RECOMMENDATIONS

- A. Blueprint for Synthesis and Comparative Analysis in U.S. GLOBEC
- B. Transferring information on ecosystem properties among systems
- C. Levels of aggregation and their effects on predictability
- D. Implications of Human Impacts in Marine Ecosystems in understanding environmental effects.
- E. Implications of lessons learned in GLOBEC in design of monitoring programs and other programs such as the Census of Marine Life and the Global Ocean Observing System, U.S. Ocean Observing System etc.