

## **PICES FISP Proposal: North Pacific Marine Ecosystem Response to Global Change**

**Introduction:** During PICES CCCC program, we advanced our knowledge of the relationship between climate variability and ecosystem responses and also identified some of the impacts of human activities on the marine ecosystem. Human society depends on marine ecosystems for goods and services, such as fisheries production, nutrient cycling and climate regulation. The potential degradation of marine ecosystems by anthropogenic forcing (i.e., increased CO<sub>2</sub> emission, climate-induced changes in physical forcing and temperature, changes in nutrient concentrations particularly in coastal waters, pollution by toxic substances, increasing fisheries activities, etc) is of significant concern. However, we do not adequately understand what impact anthropogenic forcing has on marine ecosystems and how anthropogenic forcing coupled with natural forcing (i.e., climate variations) change or degrade marine ecosystems. One of the reasons for the uncertainty is the complex interactions among marine organisms and between them and abiotic forces. For a sustainable use of marine ecosystems, it is essential to understand the ecosystem components, their functional roles in end-to-end food-webs dynamics (from viruses to top predators) and biogeochemical cycles, and sensitivity and responses of ecosystem components to natural and anthropogenic perturbations.

**Overall Objective:** To gain a better understanding of end-to-end marine food webs and biogeochemical cycles, fundamental interactions between them, and their responses to natural and anthropogenic forcings for the sustainable use of the marine ecosystems.

PICES is well positioned to significantly contribute to this objective since it brings together scientists from a wide range of disciplines, regions and nations, and can promote the intercomparison of data from a wide range of ecosystems.

**Duration:** Similar to the duration of the CCCC programme, constituted in discrete phases of 3-5 years each, with each phase having its own objectives.

### **Key Scientific Questions:**

- How do nutrient cycles regulate marine ecosystem components and dynamics? How does anthropogenic forcing impact them?
- How does harvesting of marine resources change the marine ecosystem components, biodiversity and dynamics? What are the impacts of these changes on biogeochemical cycles?
- How does the North Pacific respond to increases in CO<sub>2</sub> and what are the impacts on marine organisms?

**Relationship with the other projects:** IMBER (IGBP/SCOR) is a 10-year project from 2005 to investigate marine biogeochemical cycles and ecosystems and their responses to global change. The proposed program is suitable as a regional program of IMBER. GLOBEC, a project investigating the structure and functioning of ocean ecosystem and its response to physical forcing, will be completed in 2009. Prior to 2009 IMBER will work collaboratively with GLOBEC on the structure and function of end-to-end webs through a joint working group.