

ECOSYSTEM RESEARCH INITIATIVE (ERI)  
DFO, Pacific Region – “The Strait of Georgia in 2030”

**Update on Activities**

The Strait of Georgia is the focus of many resource management and scientific issues for Fisheries & Oceans Canada. Public perception and on-going work in the Strait of Georgia shows that this marine ecosystem is changing, and may be facing significant stresses. Some of these changes have not been seen before in the Strait of Georgia, and management will benefit from advice that warns and explains these events based on an approach which considers the linkages among all species and the environment.

The Strait of Georgia is different now than it was 25-30 years ago. The Strait has warmed by 1°C over the past 100 years, and the freshwater discharge from the Fraser River is changing. Pacific hake now dominates the resident fish biomass in the Strait, contributing to the increase in the seal population (a major predator on hake). Coho and Chinook fisheries are at very low levels. Conversely, abundances of pink, chum and sockeye salmon in watersheds that flow into the Strait are relatively high. Herring have been at high abundances but may be declining. Groundfish, such as Pacific cod, have traditionally been fished in the Strait of Georgia but are today nearly absent.

The *Central Theme* of this Ecosystem Research Initiative is “The Strait of Georgia in 2030”, i.e. what might the Strait of Georgia be like in 2030, and what should be done now to respond to current concerns. This challenge of *imagining the future* and how to achieve it involves:

- 1) understanding how this ecosystem works,
- 2) identifying the various drivers of change most likely to determine future conditions,
- 3) analyzing possible future responses of the system under the influences of these changes.

The research conducted within this Initiative is designed to align with the Departmental goals of ensuring a healthy and productive aquatic ecosystem in the Strait of Georgia, and to support sustainable fisheries and aquaculture in the Strait.

Two central research questions have been posed for this Ecosystem Research Initiative:

1. **Productivity: What controls the productivity of the Strait of Georgia (including timing mismatches)?**
2. **Ecosystem Resilience: What properties/characteristics of the Strait of Georgia ecosystem provide resilience against major disruptions and collapses of the system?**

Funding during the first round of proposals (from January to March 2008) focused on computer modeling activities and gathering historical data for the Strait of Georgia. Funding for this second round (April 2008 to March 2009) is focused on continuing these core projects plus additional work on field studies to support the computer modeling as well as studies to address the two central questions (above).

DFO is taking an approach based on three key outcomes:

*1. Development of tools for ecosystem-based marine management*

**Why?** Ecosystem-based assessment and management requires new tools to be developed, which take a whole-ecosystem approach rather than focus on single species. Many of these tools are still at very early stages for the Strait of Georgia.

**What will the Strait of Georgia ERI do?**

a) Computer models. This key activity is centered on the development of modeling tools for understanding how the ecosystem functions. These are a physical circulation model, a lower trophic level model, an upper trophic level model, and a whole-ecosystem model which uses a different modeling framework from the previous three models.

b) Indicators, and historical information. Models may not be able to incorporate rare or unexpected events (such as species invasions), therefore ecosystem indicators are being developed to assess the current status of the Strait and to reveal linkages for use in the computer models. In addition, a bibliography of what is already known about the Strait is being finalized.

c) Observations of present conditions. Computer models and ecosystem indicators require data on current and historical conditions. A number of small field observational programs are being funded to provide this information. These include classification of bottom types and near shore habitats throughout the Strait, high-frequency observations of winds and resulting plankton blooms, satellite observations, and exchanges of nutrients and contaminants between the bottom and the water column.

*2. Problems with salmon populations, in particular coho and Chinook*

**Why?** Pacific salmon are iconic species in British Columbia. Some species migrating into the Strait of Georgia, such as coho and Chinook, have suffered significant declines, whereas abundances of other species such as pink and chum are strong. Salmon are key indicators of the Strait of Georgia ecosystem. It is crucial to understand what is causing these changes.

**What will the Strait of Georgia ERI do?**

Several projects are studying how salmon interact with this marine environment, including the quality of prey for salmon, how coho, Chinook and sockeye use the Strait of Georgia (migration patterns, key growing areas, when they leave the Strait), and the impact of large numbers of pink salmon on the feeding environment for coho and Chinook salmon, as well as compiling historical salmon data.

*3. Food-webs, and the role of Harbour seals.*

**Why?** The abundance of Harbour seals has increased substantially over the past decades, and they are likely to have significant effects on several species in the Strait. The interactions of these animals with the marine environment can be used to assess the overall condition of the Strait.

**What will the Strait of Georgia ERI do?**

Several projects are studying the food webs leading to seals. These include seal-hake-herring interactions, abundances of and key locations for forage fishes, predators on these forage species in addition to seals (such as small cetaceans and dogfish), and the physiological health of the seals as an indicator of contaminant stresses.

Overall, this DFO initiative is intended to provide a foundation for assessing the changes in the Strait of Georgia, evaluate potential management responses to these changes, and to collaborate with research activities in the Strait of Georgia that may be conducted by universities and other interested groups.