

## **Terms of Reference**

### **National Workshop**

# **Aquaculture-Environment Interactions: Shellfish Aquaculture in the Marine Environment**

**February 28 – March 3, 2006  
Moncton, N.B.**

***Chairperson: Jake Rice***

## **Preamble**

A national workshop has been initiated to meet DFO Habitat Management's need for science advice related to the fish habitat effects of shellfish aquaculture in the marine environment.

Science advice is required to define the fish habitat effects of shellfish aquaculture, to define appropriate tools and methodologies (models, indicators and thresholds) for predicting and assessing these effects, to determine the sensitivity of selected fish habitats to these effects, and to enhance national coherence between regional decision-making approaches.

In addition to addressing farm-scale habitat effects under the *Fisheries Act*, there is also a need to consider the importance of ecosystem-scale and cumulative effects of shellfish aquaculture activities... This consideration of ecosystem effects requires sound science to inform decision-making. Developing a fully integrated ecosystem-based approach, however, is beyond the scope of this process and would detract from its focus; rather the goal here is to provide advice on shellfish aquaculture effects that will guide future Habitat Management site-specific decision-making and that may be pertinent to forthcoming ecosystem management initiatives. An attempt will be made, where scientific knowledge exists, to consider tools and methodologies for assessing both farm-scale and ecosystem-wide effects.

This advice on tools and methodologies will assist DFO's Habitat Management in reviewing shellfish aquaculture site applications and in assessing ongoing aquaculture operations in the marine environment. In addition, it will provide a basis for any future, more detailed examinations of aquaculture activities in a site-specific, or an ecosystem-based management context.

## Meeting Objectives

To the extent possible, the following questions will be addressed:

- A. What are the positive and the negative effects (benthic and/or water column) of marine shellfish aquaculture on fish habitat? How do shellfish aquaculture effects on fish habitat differ from the 'natural' effects of wild shellfish? What are the effects of the physical structures used in shellfish aquaculture on fish habitat (including lines, socks, bags, predator control devices, etc.)? How can these effects be assessed or measured?
- B. What chemical, biological or physical indicators developed and in use for monitoring the farm-scale fish habitat effects of marine finfish aquaculture are applicable to monitoring shellfish aquaculture effects? Describe the thresholds that apply. What other habitat indicators are available specifically to measure these shellfish aquaculture effects? What are the thresholds for these potential indicators?  
*NOTE: A threshold should be defined as a point where significant changes to fish habitat can be identified. It is equally important for the science advice to identify the threshold as it is to describe the change to habitat that is associated with the threshold.*
- C. What modeling methodologies or techniques are available to provide predictions of the potential effects of shellfish aquaculture operations on the marine environment? What are the advantages and disadvantages of these methodologies or techniques?
- D. What are the cumulative and far-field effects of shellfish aquaculture in fish habitat? How can the cumulative fish habitat effects of shellfish aquaculture (e.g. marine eutrophication, oxygen or phytoplankton depletion, community shifts, exceeding carrying capacity) be quantified? What tools or indicators are useful for quantifying the far-field or ecosystem-scale fish habitat effects of shellfish aquaculture? What are the advantages and disadvantages of these tools or indicators?
- E. What types of fish habitat are likely to be affected by shellfish aquaculture? How sensitive (in relative or absolute terms) are these habitats to shellfish aquaculture effects?

## Working Papers

The following working papers, each focusing on different themes, will inform the development of the science guidance. Where applicable, all working papers should include consideration of how regional and operational differences impact the applicability of tools and approaches for assessing shellfish aquaculture effects on fish habitat.

**Paper #1** *Identification of shellfish aquaculture effects on fish habitat*

- Overview of bivalves; shellfish aquaculture; ecological role of bivalves in natural habitat
- Identification of effects of shellfish aquaculture on fish habitat

**Paper #2** *Indicators and thresholds to assess the effects of shellfish aquaculture on fish habitat*

- Benthic, pelagic and shellfish performance indicators and thresholds, including near-, far-field and cumulative effects
- Monitoring frameworks for assessing fish habitat effects of shellfish aquaculture and methodologies, including case studies

**Paper #3** *Modeling approaches to assess the potential effects of shellfish aquaculture on the fish habitat*

- Modeling near-field benthic effects of shellfish farms (using DEPOMOD)
- Biogeochemical modelling; ecosystem-based modelling

**Paper #4** *Cumulative and far-field fish habitat effects of shellfish aquaculture*

- Identification of far-field effects (i.e. types, extent and consequences), and cumulative effects of shellfish aquaculture on fish habitat
- Determination of likelihood of far-field and cumulative effects

**Paper #5** *Determination of habitat sensitivity to shellfish aquaculture effects*

- Case studies exploring the sensitivity of shellfish aquaculture on fish habitat:
  - Effects of bottom oyster aquaculture on eelgrass
  - Intertidal shellfish aquaculture in Baynes Sound
  - Seabed classification in a mussel farming bay

## **Process and Outputs**

The latest date for submission of working papers is **February 10, 2006**. The workshop is planned for **February 28 – March 3, 2006** in Moncton, New Brunswick. Invited participants will receive copies of the working papers approximately two weeks prior to the meeting.

At the meeting a review of the papers will seek to determine whether the conclusions presented in the working papers are credible, supported by scientific data and complete relative to global knowledge. Specific guidance and advice to address the questions posed by DFO Habitat Management will also be developed.

Within four weeks of the meeting, papers will be revised, and the guidance will be provided to Habitat Management in the form of a Science Advisory Report (Guidelines report) released by the Canadian Science Advisory Secretariat (CSAS). Discussions and results from the workshop will also be documented in a CSAS Proceedings document.