

**Sea Duck Joint Venture**  
**Annual Project Summary for Endorsed Projects**  
**FY 04 – (October 1, 2003 to Sept 30, 2004)**

**Project Title:** SDJV Project #15: Evaluating Effects of the Shellfish Industry on Scoter Populations in Coastal British Columbia

**Principal Investigator(s):**

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**Partners:**

US Fish and Wildlife Service, US Geological Survey, Nestucca Oil Spill Fund, NSERC Strategic Grant

**Project Description:**

Coastal British Columbia supports important concentrations of surf scoters and white-winged scoters. The habitats used by scoters also support shellfish aquaculture, an industry that has the potential to expand dramatically. Our research investigates the interactions between scoter populations and the shellfish industry, with the intent of evaluating potential effects, either detrimental or beneficial, of shellfish aquaculture on scoter population sustainability, at local and regional scales and short- and long-term time frames.

The research is designed to use several approaches at three coastal sites (Baynes, Barkley, and Desolation Sounds) to: (1) answer questions about basic scoter biology that will indicate potential mechanisms by which shellfish aquaculture (or other activities) could have population-level effects, (2) directly evaluate relationships of shellfish aquaculture to behaviour, survival, and habitat quality, (3) provide information necessary to set appropriate management goals for scoters, and (4) provide implications for management of shellfish aquaculture optimizing long-term sustainability of both the industry and scoter populations.

Specific research directions include: (1) documenting scoter abundance and distribution in relation to habitat attributes, proximity to shellfish aquaculture, and seasonal and annual variation, based on intensive surveys and habitat sampling; (2) describing movements and foraging behaviour of radio-marked individuals; (3) quantification of survival rates of radio-marked birds; (4) evaluation of various radio-marking packages on scoters; and (5) describing scoter trophic interactions with their primary prey.

**Objectives:**

This work will lead to a clearer understanding of non-breeding biology of these poorly studied species, as well as an explicit conclusion about the population-level effects of

shellfish aquaculture. Further, this work will allow us to estimate effects of other forms of habitat change.

### **Preliminary Results:**

Findings and results to date include:

-In winter 2001-02, 21 surveys were conducted throughout the Baynes Sound study site from October through March. Similarly, 15 surveys in Baynes Sound were conducted in 2002-03. These surveys are spatially explicit, allowing subsequent GIS analyses of variation in bird densities over time and space.

-In winter 2002-03, we also expanded our survey efforts to Desolation and Barkley Sounds. In Desolation Sound, we conducted 4 boat surveys, including areas with and without aquaculture. In Barkley Sound, we conducted 1 boat survey, and repeated aerial surveys.

-in winter 2003-04, we conducted surveys in all 3 study regions. Those in Baynes Sound were conducted from land, following protocols established in previous years. Those in Desolation and Barkley Sounds were boat surveys, using methods specifically designed for this study.

-We radio-marked 99 scoters (58 WWSC, 41 SUSC) in Baynes Sound during 10-21 December 2001. In December 2002, we marked 81 scoters (34 WWSC, 47 SUSC). Our 2 year totals were 180 marked, including 92 WWSC and 88 SUSC. In December 2003, we marked 75 scoters (48 WWSC, 27 SUSC). **After 3 years, our marking totals are 140 WWSC and 115 SUSC.** In all years, we monitored the radioed birds through April to determine locations, diving behavior, and survival.

-We have generated thousands of precise locations of radioed birds, with corresponding information about whether they were actively feeding.

-We have collected > 8000 minutes of foraging behavior data from radioed birds during the day, and > 4000 minutes at night.

-Survival of radioed birds was generally high after the 30 day post-marking period.

-Most of the marked birds did not move beyond Baynes Sound during winter and, in fact, many stayed within relatively small areas within the sound. Dispersal increased in association with herring spawn.

-We are seeing returns of radioed birds in subsequent years, typically to the exact areas in which they spent the previous winter.

-Foraging occurred primarily in intertidal habitats and almost all foraging occurred during daylight hours.

-Diet of captured scoters was inferred from analysis of shell fragments in fecal samples; varnish clams (*Nuttallia obscurata*) and manila clams (*Venerupis phillipinarum*) were the taxa most abundant in the fecal samples (based on dry mass of shell fragments).

-Clams were sampled throughout Baynes Sound during summer 2002 and 2003. In 2002, Nineteen transects, spaced 3 km apart, were sampled with quadrats at 50m intervals from high tide line to low tide. 237 quadrats were dug, yielding 8852 clams > 10mm. In 2003, more than 40 transects were sampled throughout Baynes Sound; those data are still being summarized.

These results are preliminary as data preparation and rigorous analysis have not been applied. However, we are confident that the data gathered this winter will be valuable for understanding scoter interactions with aquaculture (and other forms of habitat change), as well as lending new insight into wintering biology of these poorly known species.

### **Project Status**

Based on our successes, we intend to repeat the research approach used in the first 2 winters in Baynes Sound during winter 2003-04. Accomplishment of this work will be enhanced by participation of 1 M.Sc. student, Tyler Lewis, and 1 post-doctoral fellow, Ramunas Zydalis, from the SFU Centre for Wildlife Ecology, as well as technical support, infrastructure, and funds from the NSERC industrial grant.

This work is continuing this winter (2004-05), with intensive prey sampling and telemetry work shifting to the Desolation Sound study site.