

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

**Project Title:** No. 29: Ecology of Common Eider ducks wintering in association with sea ice in the Belcher islands, Nunavut, Canada.

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**Partners:** Canadian Wildlife Service, Sanikiluaq Hunters and Trappers Association, Simon Fraser University, Dalhousie University.

**Project Description:** Several circumpolar sea duck species spend part of their year wintering in association with sea ice. Limited information suggests that this makes them vulnerable to mass starvation events during winter and migration. The frequency and magnitude of these die-offs, and their impact on sea duck population dynamics are unknown. The Hudson Bay Common Eider duck population winters in the Belcher Islands of Hudson Bay, and experienced a population decline of 75% during a heavy ice year in 1991-92. The Belcher Islands is perhaps the only location in the world where detailed studies of sea duck wintering ecology can be conducted in association with polar sea ice, and these studies are the focus of this research proposal.

**Objectives:** This study will generate information required to establish sustainable harvest levels, and to assess the vulnerability of the Hudson Bay eider population to winter starvation events. Specifically, this project will quantify, 1) the physical characteristics of polynyas and floe edge habitats in the Belcher Islands, 2) their use by sea ducks, Inuit hunters, and benthic invertebrates (e.g. urchins and mussels), 3) harvest levels and non-lethal human disturbance at polynyas, and 4) biotic and abiotic constraints to eiders that may limit their foraging efficiency and result in starvation (e.g. winter temperatures, tidal current velocity, day length).

The Belcher Islands are located in southeast Hudson Bay, Nunavut. This region is a key wintering area for the Hudson Bay Common Eider duck (Abraham and Finney 1986). Here, permanent areas of open water and shifting pack ice typically occur throughout the winter providing critical habitat for marine birds and mammals. Recent observations suggest that the dynamics of polynya formation and floe edge habitat in the region have changed, and that this has severely impacted marine wildlife wintering in the region. Unlike most other polynyas in the Arctic, the areas of open water around the Belcher Islands occur close to land and a permanent community. Both of these factors enable researchers to study polynyas, floe edge marine areas, and sea ducks during winter. This is perhaps the only location in the circumpolar Arctic where detailed research of this kind is possible.

**Preliminary Results:** This research generated the first quantitative information on the distribution of the Belcher Islands Polynyas, their use by sea ducks and Inuit hunters, eider foraging ecology during winter, and the demographic trend of the regional eider population. Of the 19 research priorities identified by the SDJV Scientific Technical Committee (Hudson Bay common eider; SDJV 2001), this research provided information on 14 of them. Although this study is ongoing, we have generated several scientific products to date. These publications reflect international interest in this study, that the research outlined in the original proposal was feasible, and that our scientific methodology has been reviewed by other scientists.

Regionally, the results of this study will help determine whether the breeding population of the Hudson Bay eider in the Belcher Islands continues to decline. These results will also provide insight into why declines have occurred and what management approaches should be taken to ensure that Inuit harvest levels are sustainable. Also, this study is providing the data necessary to identify marine habitat sites important for eider ducks, as well as their relative contribution to eider energy intake. Based on this information, several marine areas in the Belcher Islands have been identified as Key Marine Habitat Sites worthy of formal habitat protection.

**Project Status:** Preliminary studies were conducted in the region during the winters of 1998 and 1999. Expanded field work by Inuit and scientists was carried out successfully from January-March in 2002 and was repeated (with SDJV support) during the same winter period in 2003. Field work for the first components of the program are now complete. Computer modeling, final reports, presentations, and scientific manuscripts are being prepared in 2004 and 2005. Complete data sets will be stored with both the Canadian Wildlife Service and the Sanikiluaq Hunters and Trappers Association for future reference.

## APPENDIX 1. Scientific products generated by this research to date not including progress reports.

### PUBLISHED SCIENTIFIC ARTICLES

- Wayland, M., H. G. Gilchrist, T. Marchant, J. Keating, and J. E. Smits. Immune function, stress response, and body condition in arctic-breeding common eiders in relation to cadmium, mercury, and selenium concentrations. *Archives of Environmental Contamination and Toxicology* *In press*.
- Wayland, M., E. G. Smits, H. G. Gilchrist, T. Marchant, and J. Keating. Biomarker responses in nesting common eider ducks in the Canadian Arctic in relation to tissue Cadmium, Mercury, and Selenium concentrations. *Ecotoxicology*. *In press*.
- Robertson, G. R., and H. G. Gilchrist. Observations of Snowy Owls, *Nyctea scandiaca*, wintering in the Belcher Islands, Nunavut *Journal of Raptor Research*, *In press*.
- Wayland, M., H. G. Gilchrist, L. Dickson, Bollinger, C. James, R. Carreno, and Keating. Trace elements in King and Common Eiders in the Canadian Arctic. *Archives of Environmental Contamination and Toxicology* 41: 491-500.
- Robertson, G. R., A. Reed, and H. G. Gilchrist. 2001. Clutch, egg, and body variation among Common Eiders, *Somateria mollissima sedentaria*, breeding in Hudson Bay. *Polar Research* 20: 1-10.
- Wayland, M. A. J. Garcia-Fernandez, E. Neugebauer, and H. G. Gilchrist. 2001. Concentrations of cadmium, mercury and selenium in blood, liver, and kidney of common eider ducks from the Canadian Arctic. *Environmental Monitoring and Assessment* 71: 255-267.
- Jamieson, S. Robertson, G. R., and H. G. Gilchrist. 2001. Oldsquaw diet before and after ice formation in the Belcher Islands, Nunavut. *Waterbirds* 24: 129-132.
- Gilchrist, H. G. and G. J. Robertson. 2000. Observations of marine birds and mammals wintering at Polynyas and ice edges in the Belcher Islands, Nunavut. *Arctic* 53: 61-68.
- Gilchrist, H. G. and G. J. Robertson. 1999. Population trends of gulls and Arctic terns nesting in the Belcher Islands, Nunavut. *Arctic* 52: 325-331.
- Robertson, G.J. and H. G. Gilchrist. 1999. Eiders winter at the ice edge. *Arctic Bulletin* No 1.99: 17.
- Robertson, G. J. and H. G. Gilchrist. 1998. Evidence for population declines among common eiders breeding in the Belcher Islands, Nunavut. *Arctic* 51: 378-385.

- Gilchrist, H. G. and G. J. Robertson. 1998. Population trends of gulls and Arctic terns nesting in the Belcher Islands, Nunavut. *Bird Trends* 7: 28-30.
- Gilliland, S., G. J. Robertson, and H. G. Gilchrist. 1998. Sea ducks on the eastern breeding grounds. *Waterfowl* 2000 11: 23.

#### **MANUSCRIPTS RECENTLY SUBMITTED TO JOURNALS**

- Gilchrist, H. G., M. J. Mallory, and F. R. Merkel. Integrating Traditional Ecological Knowledge into adaptive management of migratory birds: examples and testable predictions.