

## 2003 Lake Guardian Cruise – Bird Modules

*This component will consist of two parts. The main project is focused on measuring the abundance and dispersion of pelagic seabirds, described in module 1. We will also gather some data on over-water migration of landbirds, described in module 2.*

### **Module 1 – Dispersion of pelagic birds in relation to lake productivity and shoreline**

The purpose of this module is to learn how to accurately estimate the abundance and spatial dispersion of a population of animals, non-invasively and in-the-field. We will focus on pelagic ‘seabirds’ – birds that spend a significant part of their lives foraging far offshore in very-large water bodies. Pelagic seabirds, because of their diets and life-histories, provide important indicators of certain forms of environmental change, including the presence of bioaccumulating chemical contaminants in the food-chain, changes in lake productivity and foodweb structure, blooms of toxic aquatic microbes, and changes in shoreline land use. There are ongoing research projects to measure levels of bioaccumulating toxic chemicals in the body tissues or eggs of nesting ‘seabirds’, and population monitoring based on shoreline censuses or counts at breeding colonies.

However, there is very little monitoring of pelagic seabirds offshore. This is unfortunate; one can learn a lot by knowing where birds collect their food. For example, it is critical to know where birds forage to understand how they have become exposed to environmental toxins. One can also potentially monitor changes in lake productivity by monitoring the spatial dispersion and abundance of pelagic seabirds.

We will monitor seabirds using two standard census methods: **point counts** and **line transect counts**. Point counts will be made when we are ‘on station’ at the various sampling points (e.g. LOLA stations). Transect counts will be made while the ship is moving between sampling stations. I will show you how to create sampling protocols that are *valid* and *reliable*. We will work together initially to create our specific sampling protocols, then use them to plot the density and dispersion of seabirds during the voyage. We will compare our census data with the data you collect on primary productivity (Dr. Twiss’s module) and on shoreline distance to ask *does (1) primary productivity or (2) shoreline distance influence the distribution of pelagic seabirds?*

We will focus on 9 species, which are all conspicuous and common, but differ in their life-histories and how they have been affected by environmental changes in Lake Ontario and the surrounding region. We will pay careful attention to how the methods we select to census these birds may result in more or less biased counts for each species.

### ***Focal species***

#### **Common Loon *Gavia immer***

**Natural history:** Deep-diving piscivore. Breeds in northern lakes and ponds, winters on Lake Ontario until freeze-over.

**Environmental stresses:** Shoreline development disrupts breeding, bioaccumulates chemical contaminants (especially methyl-mercury), lead poisoning from fishing sinkers, die-offs caused by avian botulism.

**Population trend:** Generally stable, but declining some parts of the southern range limits. Mixed trends in New York and New England, where environmental stresses are most severe.

**Double-crested Cormorant *Phalacrocorax auritus***

**Natural history:** Deep-diving piscivore. Breeds on islands around Lake Ontario and St. Lawrence River.

**Environmental stresses:** Bioaccumulates many chemical contaminants. Benefits from fish stocking and aquaculture. Presently, management practices including egg-oiling (to cause breeding failure) and shooting permitted to reduce populations considered 'nuisance'.

**Population trend:** Explosive increase in population size, especially in the last two decades.

**Parasitic Jaeger *Stercorarius parasiticus***

**Natural history:** Breeds in the arctic, where it is a predator of birds and small mammals. On migration and winter, it is a kleptoparasite that steals food from gulls and terns. Passage migrant on Lake Ontario, on voyage between Hudson Bay and the Atlantic Ocean.

**Environmental stresses:** None known.

**Population trend:** Stable.

**Great Black-backed Gull *Larus marinus***

**Natural history:** Scavenger, also predator of small birds and kleptoparasite of other gulls. Also forages on shores and inland. Breeds on islands Lake Ontario and St. Lawrence River, population augmented by migrants from elsewhere.

**Environmental stresses:** Benefits from refuse production by humans. Bioaccumulates many chemical contaminants.

**Population trend:** Dramatic increase in population size, especially in the last three decades.

**Herring Gull *Larus argentatus***

**Natural history:** Scavenger, kleptoparasite, and predator of surface invertebrates and fish. Also forages on shores and inland. Breeds on islands Lake Ontario and St. Lawrence River, population augmented by migrants from elsewhere.

**Environmental stresses:** Benefits from refuse production by humans. Bioaccumulates many chemical contaminants.

**Population trend:** Dramatic increase in population size, especially in the last four decades.

**Ring-billed Gull *Larus delawarensis***

**Natural history:** Scavenger, kleptoparasite, and predator of surface invertebrates and fish. Also forages on shores and inland. Breeds on islands Lake Ontario and St. Lawrence River, population augmented by migrants from elsewhere.

**Environmental stresses:** Benefits from refuse production by humans. Bioaccumulates many chemical contaminants.

**Population trend:** Explosive increase in population size, especially in the last four decades.

**Bonaparte's Gull *Larus philadelphia***

**Natural history:** Shallow diver for small invertebrates and fish. Also forages on shores. Breeds in the Arctic, winters on Lake Ontario.

**Environmental stresses:** Bioaccumulates mercury, probably many other chemical contaminants.

**Population trend:** Stable or increasing.

**Caspian Tern *Sterna caspia***

**Natural history:** Shallow diver for small fish. Breeds on shores and islands in Lake Ontario and St. Lawrence River, population augmented by migrants from elsewhere.

**Environmental stresses:** Bioaccumulates many chemical contaminants. Decline in breeding success associated with increases in gull populations (nest site competitors and nest predators) and cormorants (nest site competitors), as well as shoreline development by humans.

**Population trend:** Significant decline in population size, especially in the last four decades.

**Common Tern *Sterna hirunda***

**Natural history:** Shallow diver for small fish. Breeds on shores and islands in Lake Ontario and St. Lawrence River, population augmented by migrants from elsewhere.

**Environmental stresses:** Bioaccumulates many chemical contaminants. Decline in breeding success associated with increases in gull populations (nest site competitors and nest predators) and cormorants (nest site competitors), as well as shoreline development by humans.

**Population trend:** Significant decline in population size, especially in the last four decades.

There are many other groups of birds that potentially would make good bioindicators, but are unsatisfactory for this cruise. Some are exclusively near shore feeders (e.g. bald eagles, dabbling ducks, most shorebirds), are too difficult to detect or uncommon to count (e.g. phalarope), or are migrants that have not yet arrived in numbers (bay and sea ducks, mergansers, grebes).

## **Module 2 – Over-water migration of landbirds and raptors on Lake Ontario**

Fall migration is in full swing in September, especially for neotropical migrants (those that winter in tropical America or the Caribbean) and raptors. Most neotropical migrants travel at night, whereas the raptors travel during the day. Most information on timing and routes comes from onshore observers. Migrants seem to hug the shore – large concentrations are observed on the southeast shore of Lake Ontario, and in the Lake Erie – Lake Ontario gap.

Very little is known about over-water migration, despite anecdotal accounts of birds landing on ships at mid-lake, observations of exhausted birds at certain shoreline sites, and recent evidence from radar that many birds make the passage. We will collect some data on over-water migration in two ways:

- (1) At dawn, we will patrol the decks for migrants that have landed on the ship. We will identify them, and collect any dead birds for later measurement.
- (2) After dark, we will use the ship radar to try and detect migrating birds.

For both types of data, we will examine whether there is a correlation between the number of migrants and the weather conditions or distance from shore.