

ISLE ROYALE LOONS

A multiyear landscape ecology research project begins to answer basic population ecology questions of this wilderness bird

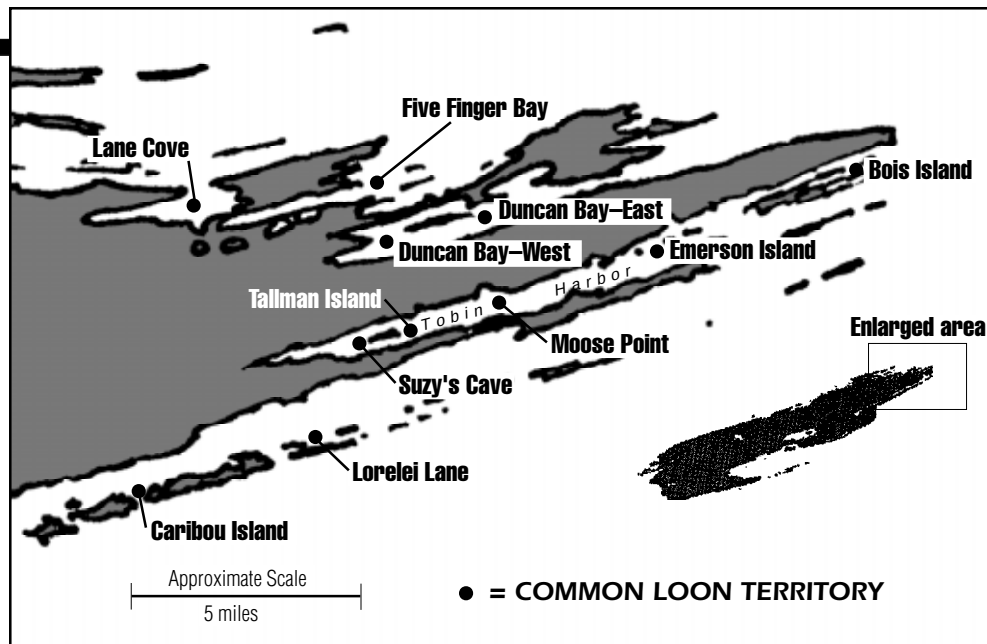


Figure 1. Territories of the common loon at Isle Royale National Park (eastern one-third of island).

BY DAVID C. EVERS

THE COMMON LOON (*GAVIA IMMER*) and gray wolf (*Canis lupis*) are symbolic wilderness creatures of Isle Royale National Park, Michigan. This Lake Superior island is well-known for its moose-caribou studies, but also happens to be an ideal site to investigate loon population ecology and contaminant parameters.

Investigators first surveyed Isle Royale loons in 1985 and again in 1990 in order to monitor loon breeding populations every five years. The 1990 numbers indicated that nesting pairs producing young had declined from 1985. These initial results, combined with complexities of the nesting population on the shores of Lake Superior, prompted us to complete annual loon censuses since then to detect changes.

Loons are well-known as residents of large water bodies, but because frequent and intense wave action reduces the already limited suitable nesting habitat, few areas in the Great Lakes can physically support successful breeding. The few areas with nesting pairs are rarely occupied long-term. If loon nests are spared by storm-produced waves, seiches (periodic surface fluctuations unrelated to storms) of up to 6 feet (2 meters) usually severely reduce hatching success rates.

Isle Royale is unusual, for it harbors protected coves, some of which are 5 miles (8 kilometers) long. Although infrequent seiches are enhanced within these coves, these waters are calm enough to allow around 20 territorial pairs (figure 1) to regu-

larly produce young. Surveys of these Lake Superior loon territories show that there is *not* a short-term decline and that productivity is normal, annually varying around one chick per pair.

Since 1990, we have accomplished more than surveys. We participated in a regional biomonitoring project that started in 1989 and also began to identify individuals through vocal-tagging in 1990. This voice recognition technique uses recordings of elicited loon yodels to identify individuals (see photo). Only male loons produce this distinctive territorial song known as a yodel, and studies indicate that the yodel of each bird is unique and constant over time.

In 1991, we expanded this passive marking program to include capturing and color-banding adults and juveniles. Although vocal-tagging provided information on the return rates of males to their territories, the technique was limited in its ability to help us determine other factors related to population dynamics. For example, we were unable to sample females, whatsoever. By color-marking loons with unique combinations of leg bands, we could monitor individuals over time, and could gather information on pair bond types, site faithfulness, turnover rates, recruitment, seasonal and daily movements, and wintering locations. Also, while in hand, we could take blood and feather samples to investigate contaminant loads, genetic makeup, and physiological parameters.

RESULTS AND DISCUSSION

Since 1991, we have captured and color-marked with leg bands 22 adults and 20 juveniles. The ensuing 82% annual rate of return for the adults (27 of 33 return possibilities) is higher than the 75% Great Lakes average. Nearly all of the returnees have appeared back at the territory where we originally captured them, exhibiting a high level of philopatry. Actually, within the Great Lakes study area, only six cases of individuals switching territories have been documented. Since adults are rarely captured unless accompanied by chicks, nearly all of these cases represent successful breeding pairs for the prior year.

We are now beginning to gather new and interesting population ecology information that indicates a higher incidence of territory switching. Five pairs of loons occupy territories in Tobin Harbor (figure 1). In 1994, the female from the Moose Point territory (banded in 1991) switched to the adjacent Emerson Island territory and paired with that male (also banded in 1991). Both these loons produced chicks in 1991 and 1992 in the territories where they were originally captured and marked. In 1993, the banded female from Moose Point was displaced by an unbanded female. The banded female was observed once on May 22 on a nearby bay but disappeared for the remainder of the year. The new Moose Point female (unbanded) successfully produced young with the banded Moose Point male. The Emerson Island banded pair also produced chicks in 1993.

Switching mates among successful territories would seem inefficient for a population-optimal reproduction rate. The risk of abandonment and the disruption of a previously proven pair relationship seems to outweigh any short-term reproductive advantages of developing a new pair bond. However, genetic variability, competition for highest quality habitats, and alternative breeding strategies may be long-term issues that are of higher importance for these long-lived birds. In our example, the Moose Point pair produced one chick while the Emerson Island pair nest failed. Interestingly, the female that produced chicks with the Emerson Island male from 1991-93 was found in her territory in late May, but was not observed with the territorial male.

Two other cases of within-year mate switching at Isle Royale are recorded. These and observations from other sites researched in the project have shown that the common loon is not lifetime monogamous and, although strongly faithful to a territory, both sexes do change breeding areas, even after a productive year.

Documenting the return of banded loons gives us an understanding of the turnover and recruitment dynamics. However, the yearly result of returning adults is not a reflection of the mortality rate. In many cases, including one on Isle Royale, adult loons disappeared for an entire breeding season and then reappeared as territory holders.

THE RECRUITMENT DYNAMICS OF LOONS banded as chicks remains unclear. A small sample at the Seney National Wildlife Refuge, Michigan, and the Turtle-Flambeau Flowage, Wisconsin, shows some natal site fidelity. In 1994, however, we did not observe on the island any of the loons banded as juveniles in 1991 ($n=8$). Since young loons acquire their breeding plumage after their third winter and only return at that time to the breeding grounds (the first 2½ years are spent on the ocean for over 95% of this cohort), following their movements is difficult. Add to this their late probable first-breeding age of six to seven years and the need to study loons over the long-term becomes clear.

Loon banding also provides information on their seasonal movements. Two Isle Royale loons have been recovered outside of the Great Lakes. An individual banded as a juvenile on August 3, 1991, on Five Finger Bay was found dead on March 15, 1993, at Surf City, North Carolina. Other records of Great Lakes subadults that



Project assistant Dan Cristol (right) and NPS resource manager Steve Fetting record loon yodels using a parabolic microphone. The recordings are used later to identify individual loons for subsequent field study.

oversummer in this region also exist. The other, an adult female from the Duncan Bay-west territory, was banded on July 1, 1993, and was found dead on March 29, 1994 at Englewood Beach, Florida.

Other recoveries indicate a west-to-east migration of upper Great Lakes loons through the Finger Lakes region of New York to the Chesapeake Bay by mid-November. By early December, most of the adult loons will have probably arrived on their wintering grounds in North Carolina continuing south, along the Florida Coast, and into the Gulf of Mexico to the Texas-Mexico border. In mid-to-late March, the birds begin their northward spring migration; most Great Lakes loons probably leave the northern Gulf of Mexico and arrive on their northern Michigan territories immediately after the ice melts in mid-to-late April.

Another important component of the Isle Royale common loon monitoring program is tissue (blood and feather) sampling for contaminant and genetic analysis. Preliminary analyses show feather mercury (Hg) levels ranging from 5.7 to 26.4 parts

per million—ppm—($n=5$), with corresponding selenium (Se) values of 4.46 to 4.93 ppm for Isle Royale loons. Since selenium offsets the toxicity of mercury in a bird's system, it is the mercury-selenium ratio (molecular ratio is 2.54) that is most indicative of the bird's health. One adult male from Rock Harbor-Lorelei Lane territory had a ratio of 5.69 (26.4 ppm of Hg/4.64 ppm of Se), over double the mitigating impact of the selenium. Many trace elements ($n=22$) are being analyzed from the feather and blood samples. We are currently emphasizing mercury, although we are closely monitoring the levels of other non-essential heavy metals that probably have an anthropogenic origin, like lead and cadmium. We will soon learn the impacts of organochlorines and PCBs.

This biomonitoring project will need to continue on a long-term basis to provide specific answers on the health of the common loon population and on the quality of the environs within Isle Royale

National Park. Plans for the next three years include continuing this biomonitoring scheme, and investigating water quality, prey base, and other piscivores in Isle Royale, Pictured Rocks, and Apostle Islands national lakeshores. ■

Evers is a conservation biology Ph.D. student with the University of Minnesota, Department of Fisheries and Wildlife and is a visiting researcher at Isle Royale working on population ecology of the common loon. Isle Royale is but one of his many study sites, which also include areas in Minnesota (Voyageurs National Park), Wisconsin, New Hampshire, Maine, Alaska, and, in winter, Florida. He is part of a large, interagency, landscape ecology project that is being supported by federal, state, private, and nonprofit funds. He can be reached at 200 Hodson Hall, Saint Paul, MN 55108, (612) 624-3600 (until mid-March) and (906) 492-3359 (from mid-March through August), then back at the first number in September.