

# Population Demographics and Breeding Ecology of the Long-tailed Duck (*Clangula hyemalis*) in Churchill, Manitoba, in Relation to Global Climate Change

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## ABSTRACT

The population demographics and breeding ecology of long-tailed ducks (*Clangula hyemalis*) were studied in Churchill, Manitoba, from 2004-2011 and data are being compared with data collected 40 years ago by Dr. Robert Alison. This area is unique in that there are numerous nesting ducks, is readily accessible to researchers, and represents the most southern known breeding population of long-tailed ducks. Ducks on the study site were captured with mist nets set over water during a two-week period in mid-June. In addition, some females were captured with the use of a long-handled dip net while incubating eggs. Banding of 142 long-tailed ducks revealed an equal sex ratio among adults and juveniles. However, no second-year males were captured in any years, although second-year females were commonly captured on breeding site. During June, 107 nests were discovered and mean clutch size was 7 eggs. Several nest starts (1-2 eggs) were discovered, but eggs disappeared within a few days apparently from herring gull (*Larus argentatus*) predation. This study revealed the close association of long-tailed ducks and common eiders (*Somateria mollissima*) with arctic terns (*Sterna paradisaea*), which nest simultaneously and in the same habitat. Both duck species seem to benefit from the presence of aggressive terns by reducing predation by herring gulls, whose numbers are increasing in the study area. The use of islands or narrow peninsulas as nesting sites for ducks and terns was an important characteristic of nesting sites that has potential benefits from reduced predation. Some females used the same nest for 2 consecutive years as indicated by the presence of year-old embryo sacs among the new un-hatched eggs. Site fidelity of long-tailed ducks to the Churchill breeding area was documented by the mist-net capture of 10 (7.8%) ducks banded the previous years and one banded female captured in the same nest bowl she used in previous year. Understanding the Churchill population of long-tailed ducks could have important implications in understanding populations in more remote areas, especially in regard to global climate change.

## BACKGROUND

The population demographics and breeding ecology of long-tailed ducks (*Clangula hyemalis*) in Churchill, Manitoba, were extensively studied 40 years ago by Dr. Robert Alison (Alison 1975a&b). Increased knowledge of these factors will result in better population management for this species and seabirds in general, which are in need of more study. Population surveys conducted on the west coast of North America suggest drastic declines for the long-tailed ducks and there also is concern of wintering populations on the Atlantic coast. In many areas of its range there also is a disparate sex ratio that favors males. This study is collecting data on the population demographics of long-tailed ducks in the Churchill area as well as accumulating data on the nesting

habitat, on which this population is dependent. The Churchill, Manitoba, study site is unique in that there are numerous nesting ducks, is readily accessible to researchers, and represents the most southern known breeding population of long-tailed ducks. Climate change could impact breeding habitats for this circumpolar species.

The habitat surrounding the areas used for nesting or loafing was evaluated to determine biotic and abiotic factors important to the ducks using the area. The diversity and abundance of macro-invertebrates available for food for ducklings and adults are important factors in understanding optimum habitat for this species. The use of islands as nest sites was evaluated as a potential factor reducing predation.

Data are being compared with historic data collected at this study site, and are being used as the basis of future studies, possibly with satellite radio telemetry that will have more of a continental perspective to the Churchill population. This study is also providing information on common eiders (*Somateria mollissima*) and arctic terns (*Sterna paradisaea*), which nest simultaneously and in the same habitat. Eiders are believed to be increasing dramatically since the 1960s and also are believed to winter on Hudson Bay. Terns are a good indication of long-tailed nesting sites as they deter herring gulls (*Larus argentatus*). Population biology is considered to be the largest gap in our knowledge in the life history of long-tailed ducks. This study is trying to fill that gap by providing information on a breeding population of long-tailed ducks that will include nesting chronology, productivity, brood survival, and intra-specific interaction (Perry and Alison 2010).

## **OBJECTIVES**

The goals of this study are to determine components of breeding ecology of the local Churchill group of long-tailed ducks and to compare current status of long-tailed ducks and their habitat at Churchill with data collected by Dr. Alison 40 years ago. These data are providing baseline information that might have important value for long-term changes (e.g., global warming) that might be occurring in the Churchill area and throughout northern North America. Specific objectives include:

1. Determine nesting chronology and productivity of long-tailed ducks at the Churchill study site.
2. Develop a population of marked ducks and methods of marking to enable more detailed study of demographics.
3. Determine intraspecific relationships and habitat conditions that affect nest location and outcome of nesting activity.

## **TECHNIQUES**

Long-tailed ducks were studied on 3 sites near Churchill, Manitoba, in 2004-11. Ducks were captured during a 2-week period in mid-June with mist nets set over water, which were monitored continuously to avoid injury of ducks. In addition, females were captured while nesting with the use of dip nets. All nest examination and trapping was conducted late in incubation to minimize the possibility of nest desertion. Success or failure of all nests was determined by presence of embryo sacs detached from the eggshell. Size of broods was determined at hatching. Broods were drive-trapped into mist nets above and below water in early August in 2005 to capture young of the year and molting females to determine brood survival.

All captured long-tailed ducks were banded with USGS-issued bands, and were aged, sexed, and weighed before release at capture site. Ducks were aged by use of bursa depth and plumage characteristics (especially scapulars, remiges, and retrices). The location and number of eiders and terns observed during this study were recorded. Intraspecific relationships in the study site were determined by recording all other avian species associated with the nesting site of the long-tailed ducks. Distance between nests, clutch size, and any intraspecific activities were recorded.

Each nesting site was recorded as being on an island, peninsula, or mainland. The habitat around each site used for nesting was described using biotic and abiotic characteristics, including elevation of nest above water, distance of nest from water, size of island, and distance from human influence (e.g., road). Vegetation surrounding each nest was identified and percent cover for each plant species was estimated in the 2-meter area around each nest.

## **RESULTS**

Initial work on the project started in 2004 while searching for long-tailed duck eggs for a captive colony in Laurel Maryland. During eight years (2004-11) of nest searching in June, a total of 107 nests were discovered and mean clutch size was 7 eggs. Number of discovered nests declined during the study, although search effort remained the same. Many nest starts (1-2 eggs) were discovered, but eggs disappeared within a few days apparently from herring gull predation. Numbers of this species have increased in recent years in LTDU nesting areas. LTDU nests were located an average 2.2 m from the water edge and 31 cm above water surface. Mean bowl depth late in incubation was 5.9 cm.

In June and August of the six-year study a total of 142 LTDUs were banded and sex ratio was equal among after-hatching-year adults and hatching-year young. However, no second year males were captured in June, although second year females were common on breeding site. In 2007, two ducks banded in 2006 and one duck banded in 2005 were recaptured on the same pond where originally captured indicating homing tendency. A pair banded in June 2007 was caught in 2009 at the original capture site.

Previous studies on the Churchill site by both principal investigators have revealed the close association that long-tailed ducks have with common eider and arctic terns. Arctic terns are very aggressive to predators such as gulls. Special consideration was given in this study to determine the commonality of factors in regard to nesting sites for these three species. The use of islands or narrow peninsulas as nesting sites for these species was evaluated as an important characteristic of nesting sites that might have potential benefits from reduced predation.

## **CONCLUSIONS**

This study is an attempt to increase demographic and nesting ecology data originally obtained in the 1970s by R. Alison, and determine long-term changes in the population and habitat of long-tailed ducks that could possibly be related to global climate change. Churchill is a unique area where this species is relatively easy to study. Island nesting seems important to reduce mammalian predation, but does not seem to deter herring gull predation. Arctic terns do deter gull predation, although numbers of each species are probably an important variable. Understanding the Churchill population

of long-tailed ducks also could have important implications in understanding populations in more remote areas.

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