Small Mammal Abundance at Karrak Lake 1994-2012

Progress Report

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Summary: Variation in small mammal abundance (i.e. lemmings and voles) can impact population dynamics of arctic-nesting birds. This is largely because arctic foxes switch from small mammals to birds in years when small mammals are scarce. Monitoring of small mammal abundance at Karrak Lake is, thus, critical for our studies on waterfowl and fox ecology. Small mammal abundance at Karrak Lake varied considerably among years in 1994 to 2012 with peaks in small mammal abundance every 3-5 years. Population dynamics of arctic foxes appeared to be closely linked to variation in small mammal abundance whereas nesting success of waterfowl was unrelated to small mammal abundance. We suggest that the large number of geese nesting at Karrak Lake acted as a buffer against arctic fox predation (often referred to as predator swamping). Continued monitoring of small mammal abundance is important for our work on waterfowl and fox ecology.

1. INTRODUCTION

The abundance and distribution of animals often fluctuate considerably among years in northern ecosystems (Sinclair and Gosline 1997, Krebs et al. 2001). These fluctuations are often related to variation in food abundance and predation pressure (Krebs et al. 1995). Variation in predation pressure on arctic-nesting birds is often related to arctic foxes switching from small mammals to birds and their eggs when small mammals are scarce (Sovada et al. 2001, Bêty et al. 2002). Monitoring of small mammal abundance is, thus, crucial for our studies on waterfowl and fox ecology.

2. OBJECTIVES

The objective of this study is to gather data on small mammal abundance at Karrak Lake which, linked with our studies on waterfowl and fox ecology, will be used to evaluate the effects of small mammal abundance on population dynamics of waterfowl and arctic foxes in the Queen Maud Gulf Bird Sanctuary. As well, rodents collected during field work have been necropsied and examined for the presence of *Echinococcus multilocularis,* but this aspect of the project is complete.

3. STUDY AREA

This study is conducted at Karrak Lake (67º 14' N, 100º 15' W) in the Queen Maud Gulf Bird Sanctuary, Nunavut. Karrak Lake is one of the largest Ross's and lesser snow goose colony in the Sanctuary, consisting of nearly 1.3 million nesting geese in 2012 (R. T. Alisauskas unpubl. data). This study is part of long-term research on nutritional and population ecology of Ross's and lesser snow geese by Dr. R. T. Alisauskas and Environment Canada. Small mammals known in the area are collared lemmings (*Dicrostonyx groenlandicus*), brown lemmings (*Lemmus trimucronatus*), and red-backed voles (*Clethrionomys rutilus*) (Bantle and Alisauskas 1998).

4. MONITORING OF ABUNDANCE AND PREVELANCE OF DISEASE IN SMALL MAMMALS

4.1. Methods

Monitoring of small mammal abundance at Karrak Lake started in 1994 by establishing two trap-lines following methods by Department of Renewable Resources at the Government of

Northwest Territories (Shank 1993). A third trap-line was established in 1998. Trap-lines consist of 25 trap-sites, spaced 10 m apart for 2 trap-lines and 25 m apart for 1 trap-line, with 1 snap-trap placed within 1 m of each trap-site. We monitor small mammal abundance for 10 consecutive nights and use the number of small mammals caught per 100 trap-nights as the sample unit. Trap-lines established in 1994 are monitored during the second half of July and the trap-line established in 1998 is monitored during the second half of June. Trap-lines include habitats ranging from wet lowland to dry upland hills and bedrock. In 2011, two extra traplines were established for the purpose of collecting additional samples for examination of the prevalence of *Echinococcus multilocularis* in this ecosystem, and carcasses were exported to Saskatchewan for analysis. Thirty-seven brown lemmings and 72 collared lemmings were collected in 2011, and none tested positive for *Echinococcus multilocularis*.

4.2. Small mammal abundance 1994 to 2012

Small mammal abundance at Karrak Lake varied considerably among years in 1994-2012 and showed peaks in small mammal abundance every 3-5 years during (Figure 1). We caught 212 small mammals during 12,451 trap-nights to date; red-backed voles were most common with 128 captures (60%), followed by collared lemmings with 68 captures (32%), and brown lemmings with 16 captures (8%). In 2011, high numbers of rodents, particularly lemmings, were captured (Fig. 1).

Population dynamics of arctic foxes appeared to be closely linked to variation in small mammal abundance (e.g. fox abundance followed that of small mammals in the previous year) whereas nesting success of waterfowl appeared to be unrelated to small mammal abundance. We suggest that the large number of geese nesting at Karrak Lake acted as a buffer against arctic fox predation at Karrak Lake (often referred to as predator swamping).

4.3. Prevalence *of Echinococcus multilocularis* in 2011

To date, only 20 of the 123 rodent carcasses have been neocropsied, yielding four cysts that may contain *E. multilocularis.* This will be confirmed using molecular techniques.

5. ACKNOWLEDGEMENTS

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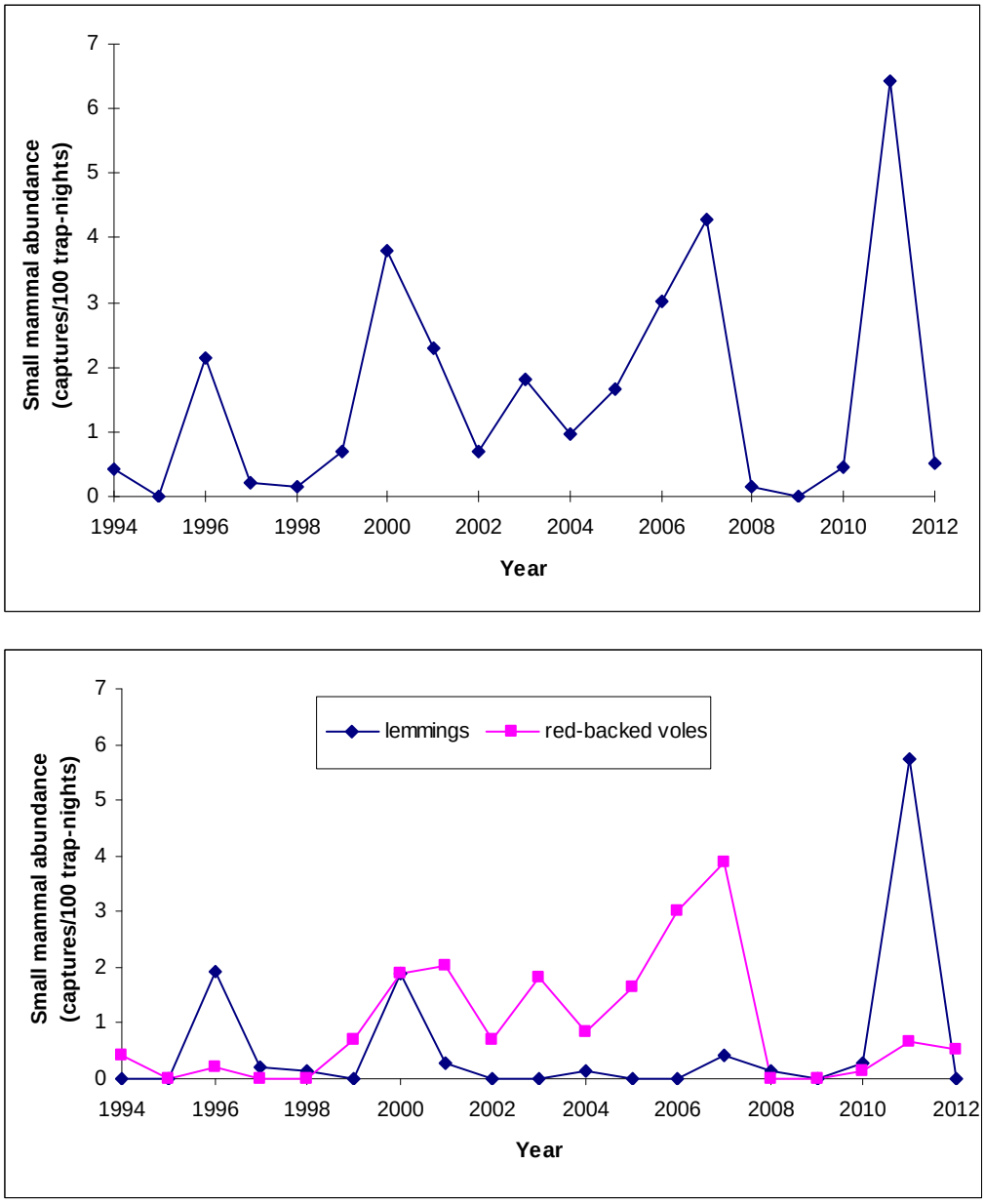

Figure 1. Small mammal abundance at Karrak Lake in 1994 to 2012.