

# **Small Mammal Abundance at Karrak Lake 1994-2009**



## **Progress Report**

**January 2010**

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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 2009 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 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 (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.

## 3. STUDY AREA

This study is done at Karrak Lake (67° 14' N, 100° 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 1.1 million nesting geese in 2009 (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 sibiricus* also known as *Lemmus trimucronatus*), and red-backed voles (*Clethrionomys rutilus*) (Bantle and Alisauskas 1998).

## 4. MONITORING OF SMALL MAMMAL ABUNDANCE

### 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 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. Captured small mammals are disposed of by incineration.

#### **4.2. Small mammal abundance 1994 to 2009**

Small mammal abundance at Karrak Lake varied considerably among years in 1994-2009 and showed peaks in small mammal abundance every 3-5 years during (Figure 1). We caught 147 small mammals during 9,914 trap-nights to date; red-backed voles were most common with 116 captures (79%), followed by collared lemmings with 27 captures (18%), and brown lemmings with 4 captures (3%).

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).

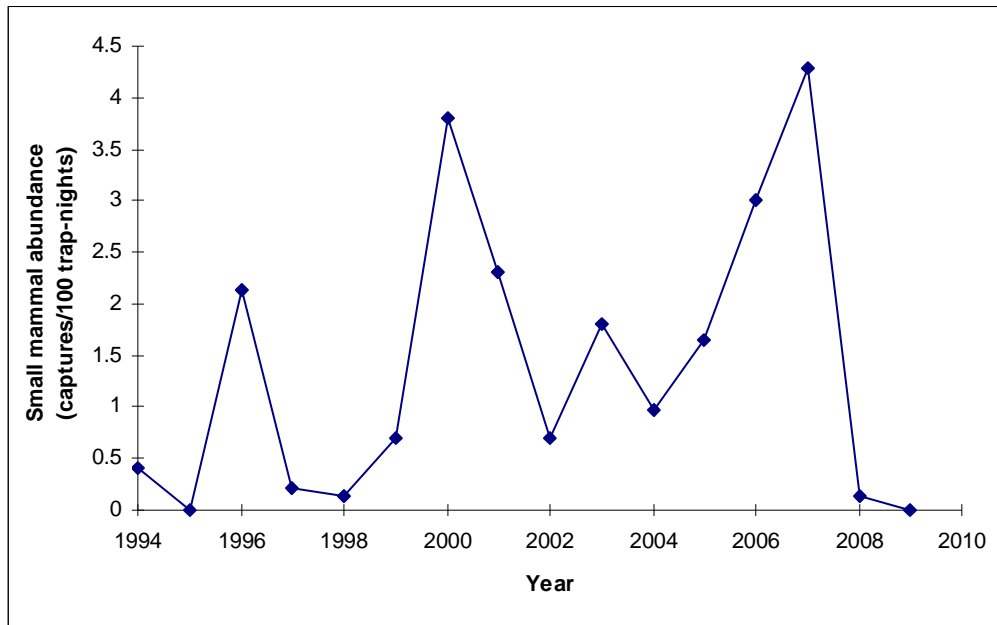
### **5. ACKNOWLEDGEMENTS**

We thank numerous field-assistants for help monitoring small mammal abundance at Karrak Lake. This study was funded by California Department of Fish and Game, Environment Canada, Delta Waterfowl Foundation, Ducks Unlimited Inc., Polar Continental Shelf Project, and University of Saskatchewan. Special thanks to J. Aitaok, B.R. Eyegetok, and D. Stern for help and hospitality in Cambridge Bay.

### **6. LITERATURE CITED**

Bantle J.L. and Alisauskas R.T. 1998. Spatial and temporal patterns in arctic fox diets at a large goose colony. *Arctic* 51: 231-236.

- Bêty J., Gauthier G., Korpimäki E. and Giroux J.F. 2002. Shared predators and indirect trophic interactions: lemming cycles and arctic-nesting geese. *Journal of Animal Ecology* 71: 88-98.
- Krebs C.J., Boutin S. and Boonstra R. 2001. *Ecosystems dynamics of the boreal forest*. Oxford University Press, New York.
- Krebs C.J., Boutin S., Boonstra R., Sinclair A.R.E., Smith J.N.M., Dale M.R.T., Martin K. and Turkington R. 1995. Impact of food and predation on the snowshoe hare cycle. *Science* 269: 1112-1115.
- Shank C.C. 1993. *The Northwest Territories small mammal survey: 1990-1992*. Department of Renewable Resources, Government of Northwest Territories, Yellowknife, NWT, Manuscript Report No. 72.
- Sinclair A.R.E. and Gosline J.M. 1997. Solar activity and mammal cycles in the northern hemisphere. *American Naturalist* 149: 776-784.
- Sovada M.A., Anthony R.M. and Batt B.D.J. 2001. Predation on waterfowl in arctic tundra and prairie breeding areas: a review. *Wildlife Society Bulletin* 29: 6-15.



**Figure 1.** Small mammal abundance at Karrak Lake in 1994 to 2009.