

THE UNIVERSITY OF MANITOBA

ASPECTS OF THE BIOLOGY OF THE GREAT GRAY OWL,
STRIX NEBULOSA FORSTER

by

K. MICHAEL COLLINS

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF SCIENCE

DEPARTMENT OF ZOOLOGY

WINNIPEG, MANITOBA

JUNE, 1980

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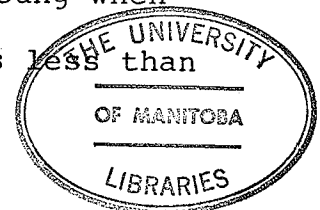
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ABSTRACT

Field studies of the Great Gray Owl (Strix nebulosa) were conducted in May and June 1975 and January to June 1976 in southeastern Manitoba and northwestern Minnesota. In addition, nesting records and records of occurrence of the Great Gray Owl in North America were obtained from museums, nest record programs and through correspondence with ornithologists. Several aspects of the biology of the Great Gray Owl, particularly breeding distribution, nesting habitat, breeding biology and vocalizations, winter hunting behaviour and population movements, are examined here.

Of 107 breeding records in North America up to 1976, 75% were situated in Pacific Rain, Closed Boreal and Montane Woodland forests, 18% in the Northern Hardwood-Conifer forest and 7% in unspecified habitat types. Most nests located in my study area in southeastern Manitoba and northwestern Minnesota were associated closely with large stands of tamarack (Larix laricina) and black spruce (Picea mariana).

The female incubates the eggs and cares for the young at the nest. The male owl hunts and obtains the food for his female, their young and himself. Young owls gain approximately 20 g/day. The mean weight of young when they leave the nest is 507 g (n = 7). This is less than



the mean adult weight of 953 g for males and 1298 g for females (Earhart and Johnson 1970). Growth of young was studied at two nests in 1976 and the growth patterns are discussed. Ten vocalizations used by adults and young birds during the nesting season are documented. A "Distraction Display" is also described for the first time in North America.

A little known hunting strategy of the Great Gray Owl is described in detail. Small mammal prey are captured by plunging headfirst into the snow. Measurements of snow hardness indicate that this behaviour may be affected by variations in this critical snow parameter.

Population movements of Great Gray Owls in North America between 1890 and 1976 are analyzed. This analysis is based on approximately 2,200 specimen and sight records gathered from the literature and museums, and by correspondence with observers throughout the continent. In this period, there were at least 23 winters of invasion into various regions of the continent. An hypothesis is proposed to explain the significance of population movements in this species.

The possible influence of food supply on the breeding biology of the Great Gray Owl is examined. Food supply may affect nest site selection, timing of breeding, clutch size and nestling survival within a given year, and may further influence the breeding effort of owls between

years. A general discussion of the role of food in breeding of other owl species is presented.

ACKNOWLEDGMENTS

Dr. Robert W. Nero deserves the credit for the initiation of this project. Dr. Nero devoted his seemingly inexhaustable energies to locating nesting birds and banding winter individuals. Dr. Nero and his co-workers (H. W. R. Copland, R. R. Taylor, S. G. Sealy and others) provided valuable assistance throughout this study and allowed me to summarize some of the results of their earlier, unpublished observations. It was the efforts of Dr. Nero and his co-workers that provided the impetus for this study. Dr. S. G. Sealy also acted as my supervisor.

During this study I received cooperation and assistance from many sources. Many of the staff of the Manitoba Department of Natural Resources were helpful in several ways. Some of these people are: W. Coder, E. Fast, M. Gillespie, D. Glays, D. Graham, J. Johnson, R. Kemp, J. Kowalchuk, T. Majure, J. Morrison, D. Purvis, S. Smythe, H. Tirschman and W. Urbanski. The staff of the Atomic Energy of Canada Limited's Pinawa Nuclear Research Establishment (S. L. Iverson, B. Schwartz, K. Severson and B. N. Turner) provided small mammal data and loaned traps for small mammal trapping. Dr. Robert E. Wrigley of the Manitoba Museum of Man and Nature also loaned small mammal traps. Robert R. Taylor loaned a parabolic reflector and portable towers for use at nest sites. Taylor also provided

the recordings used in 1975. Dr. Roger M. Evans permitted me to use his sonagram machine and S. Cosens provided the technical assistance for operating it. Dr. W. O. Pruitt, Jr. loaned equipment for measuring snow parameters and provided technical advice for these same endeavours. Dr. A. F. Oeming provided advice and assistance.

I offer special thanks to Donald A. Sexton whose advice and companionship throughout all phases of this research proved indispensable.

My deepest gratitude goes to my wife, Carol, for her encouragement and moral support throughout the many difficult portions of this study, and for her assistance in collating data and proof-reading.

I also thank Mr. F. Morris Flewelling (Director, Red Deer and District Museum and Archives) for allowing me to use typing and copying equipment.

I thank my fellow students who provided advice, encouragement and empathy throughout the many difficult parts of this study. There are also many others, too numerous to mention, who provided assistance and data by responding to my requests for observations. I must specifically acknowledge the assistance of the many museums throughout North America that contributed information for this study: Alberta Provincial Museum and Archives, American Museum of Natural History, Bailey Collection of Natural History, Bemidji State Museum, Boston Museum of Science and

Hayden Planetarium, British Columbia Provincial Museum, California Academy of Science Museum, Canadian National Museum of Natural Sciences, Carnegie Museum, Charleston Museum of South Carolina, Cincinnati Museum of Natural History, Cleveland Museum of Natural History, Coe College Museum, College de Sainte-Anne-de-la-Pocatiere, Conner Museum, Cornell University, Delaware Museum of Natural History, Fairbanks Museum and Planetarium, Field Museum, Gouvernement du Quebec Complexe Scientifique, Grand Teton National Park Museum, Harvard University Museum of Comparative Zoology, Illinois State Museum, Iowa State University Museum, James Ford Bell Museum of Natural History, Kingman Museum of Natural History, Little Northern Museum, Los Angeles County Natural History Musuem, Louisiana State University Museum of Zoology, Loye Miller College/Jean Poitras College Museum, Manitoba Museum of Man and Nature, McGill University Redpath Museum, Milwaukee Public Museum, Montana State University Fish and Game Lab, Montana State University Museum of the Rockies, Montana State University Vertebrate Museum, Museum of Montana Wildlife, New Hampshire Fish and Game Department, New York State Museum and Science Service, North Carolina State Museum of Natural History, Ohio State University Museum of Zoology, Oregon State University Museum of Natural History, Patuxent Wildlife Research Center, Peabody Museum of Natural History, Philadelphia Academy of Natural Sciences,

Princeton Museum of Zoology, Regina Museum of Natural History, Rogers Environmental Education Center, Royal Ontario Museum, St. Bonaventure University Museum, San Bernardino County Museum, San Diego County Natural History Museum, Springfield Science Museum, Strecker Museum, Thomas Burke Memorial Washington State Museum, United States Bureau of Biological Surveys Accessions, United States National Museum of Natural History, University of Alberta Museum of Zoology, University of Arizona Museum, University of British Columbia Zoology Museum, University of California at Los Angeles Dickey Collection, University of California Museum of Vertebrate Zoology, University of Colorado Museum, University of Florida State Museum of Zoology, University of Idaho Museum, University of Iowa Museum of Natural History, University of Kansas Museum of Natural History, University of Manitoba Zoology Museum, University of Michigan Biological Station, University of Michigan Museum of Zoology, University of Montana Zoology Museum, University of North Dakota Museum, University of Puget Sound Museum of Natural History, Western Foundation of Vertebrate Zoology and the Yellowstone National Park Museum.

I wish to thank my committee members, Drs. B. D. J. Batt, T. Booth, R. W. Nero, W. O. Pruitt, Jr. and S. G. Sealy, for reviewing this thesis and providing many helpful comments. I also appreciated the advice and

encouragement of Dr. H. E. Welch.

This study was funded by grants to Dr. S. G. Sealy from the Manitoba Department of Natural Resources, Natural Sciences and Engineering Research Council of Canada (A9556), Northern Studies Committee of the University of Manitoba and the University of Manitoba Research Board. The Manitoba Department of Natural Resources also provided additional support in the form of vehicle use and accommodation in the field. Some accommodation was also provided by the Manitoba Forestry Association at Hadashville.

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INTRODUCTION

The Eurasian race of the Great Gray Owl, Strix nebulosa lapponica (Thunberg), is rather well-known with respect to its breeding biology and food habits in Sweden (Höglund and Lansgren 1968; Wahlstedt 1969, 1974, 1976), Finland (Mikkola 1969, 1971, 1976; Mikkola and Sulkava 1969a, 1970), and the U.S.S.R. (Dement'ev et al. 1966, Mikkola 1972). However, little information is available for the North American race, S. n. nebulosa (Forster). Some early authors provided limited information on its distribution, morphology and natural history (Baird et al. 1860; Bent 1938; Gmelin 1788; Henderson 1915, 1923; Ridgway and Forbes 1889; Roberts 1932; Swainson and Richardson 1831). Oeming (1955) further described its distribution, morphology and breeding biology, and added information on voice and food habits. Craighead and Craighead (1969) also reported on aspects of breeding biology and food habits. But these reports contained relatively little detailed information on the biology of the Great Gray Owl in North America.

In 1968 Dr. R. W. Nero first began his study of the Great Gray Owl in southeastern Manitoba and northwestern Minnesota. At that time there was no evidence of a breeding population extant in this area. Through the search efforts of Nero, H. W. R. Copland and R. R. Taylor (and others),

two active nests and evidence of two other nestings were located in the study area by 1973. In 1974, Dr. S. G. Sealy joined Nero and his co-workers to study three more active nests. By 1975, Nero's group had demonstrated that a breeding population was available for study in southeastern Manitoba and northwestern Minnesota.

As well as searching for nests, collecting pellets, studying nesting birds, and banding wintering owls, Nero actively solicited information on owl records from throughout North America (particularly in Manitoba). Although some of the results of these studies were published (Nero 1969; 1970a, b, c; 1971; Nero et al. 1974), much of these data on breeding biology, nesting behaviour and winter ecology were retained in Nero's unpublished field notes.

In 1975, I became involved in Nero's study of the Great Gray Owl in southeastern Manitoba and northwestern Minnesota. The objective of my study was to complement the efforts of Nero and co-workers by examining aspects of the biology of owls breeding and wintering in the study area. I also endeavoured to study aspects of breeding distribution and population movements by extending Nero's efforts of collecting specimen and sight records from North America.

In this thesis I summarize some of the results of Nero, Copland, Sealy and Taylor, and report my findings on

nesting habitat, breeding biology and vocalizations, and winter hunting behaviour of Great Gray Owls in the study area. I summarize much of the literature available for the Great Gray Owl in North America. I also report on breeding distribution and examine the population movements of this species in North America. Further, I discuss the apparent relationship between food supply and certain aspects of the biology of the Great Gray Owl.

BREEDING DISTRIBUTION IN NORTH AMERICA

Some authors have suggested that the Great Gray Owl is distributed widely as a breeding bird throughout the boreal and montane coniferous forests of North America (American Ornithologists' Union 1957, Bent 1938, Godfrey 1966). However, nesting records are few and a detailed report of its breeding distribution in North America does not exist. I have therefore compiled in this section most of the available information up to 1976 that pertains to the nesting of this species in North America, in order to identify the known limits of its breeding distribution. This information also permits the identification of the periodic movement of individuals in winter beyond the known breeding range in North America.

Methods

I attempted to obtain all available published breeding records up to 1976. I sent requests for information on Great Gray Owl egg sets and specimens to 293 museums in North America. Further data on breeding records were obtained from the Prairie Nest Record Scheme (Manitoba Museum of Man and Nature) and the nest records schemes at the Royal Ontario Museum and the Laboratory of Ornithology, Cornell University. Also, R. W.

Nero provided his unpublished data on nesting of this species. Finally, unpublished breeding records were solicited from ornithologists through requests for information in seven major, North American, ornithological journals.

In this study I have classified Great Gray Owl breeding information into three categories:

1) acceptable breeding records, 2) circumstantial evidence of breeding and 3) unconfirmed records of breeding.

Acceptable records are those data that indicate a breeding definitely occurred. The acceptable evidence for a breeding record is the location of a nest with eggs or young (i.e. a nesting record) or the location of individuals known to be young of the year.

Flightless birds are easily identified as young of the year. But fledged young (i.e. young capable of flying) are identified as young of the year on the basis of the juvenal plumage, since it seems that the juvenal plumage is lost in the first fall or winter (Oeming 1955). But the identification of this plumage characteristic may be difficult under field conditions. The location of a young of the year specimen from McMunn, Manitoba (Appendix I) on 10 August 1974 indicates that the correct identification of a young of the year bird in

the hand is still possible in August. Therefore, I have considered the location of a young of the year bird prior to September as evidence of breeding.

Circumstantial evidence of breeding includes three types of observations. For example, it is known that only the female incubates the eggs and develops a brood patch (see later). Therefore, I have accepted observations of birds with a brood patch as evidence of breeding. Also, it is described later how male owls carry prey to the female during the defined breeding season. This behaviour apparently does not occur at other times of the year. Consequently, the observation of an owl carrying prey during the breeding season is acceptable as circumstantial evidence. Finally, nests used for breeding by Great Gray Owls often retain many feathers of this species in the lining (R. W. Nero, pers. comm.). Therefore, the location of a nest with this evidence of previous use by Great Gray Owls was accepted as evidence of breeding.

Some of the potential records of breeding are in the form of unconfirmed records. Some authors have reported nests, but have not provided substantive data (i.e. number of eggs or young, dates of observations, or names of observers). Therefore, I have summarized these unconfirmed records of breeding with the circumstantial evidence of breeding.

Results and Discussion

Breeding records for North America are summarized in Appendix I and mapped in Figure 1. The unconfirmed records and circumstantial evidence of breeding are summarized in Appendix II. Figure 1 portrays the location of breeding records in relation to the distribution of some of the major "life areas" of North America (after Aldrich 1963). The Pacific Rain, Closed Boreal and Montane Woodland forests contained 75.2% of the known breeding records. The Northern Hardwood-Conifer forest contained 18.1%, and 6.7% occurred in unspecified vegetation types.

Figure 1 reveals that only three breeding records exist for areas east of the Great Lakes. These records are for Norwich, Connecticut (1885), Sullivan County, New Hampshire (1889) and Nipissing, Ontario (1911). It may be that these New England nests resulted from winter movements into the area (see later). There are no other known nesting records for the large areas of apparently suitable habitat (see later) north and east of the Great Lakes in North America. Much of eastern Canada and the northeastern United States are now urbanized. It is likely that these conditions are not conducive to nesting of the Great Gray Owl, since few nests were ever located near urban centres. However, there are yet large areas in Quebec and northern Ontario where apparently suitable

