THE UNIVERSITY OF MANITOBA

Feeding Guilds, Diets and Foraging Behavior of Insectivorous Passerines in a Riparian Habitat in Manitoba

by

© Gloria C. Pohajdak

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FEEDING GUILDS, DIETS AND FORAGING BEHAVIOR OF INSECTIVOROUS PASSERINES IN A RIPARIAN HABITAT IN MANITOBA

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A thesis submitted to the Faculty of Graduate Studies of
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ABSTRACT

Although riparian habitats are important avian breeding areas, few detailed studies of the foraging ecology of birds in such habitats have been reported. I quantified the diet and feeding behavior of 13 species of insectivorous passerines on two study sites in a riparian habitat near Delta, Manitoba, during the 1982-1985 breeding seasons.

The Manitoba study area was a typical riparian habitat. Vegetation was dominated by a few tree species, dense populations of birds inhabited the area and arthropods were often abundant.

Three distinct foraging guilds were identified by discriminant function analysis followed by cluster analysis. One group of birds primarily gleaned for insects in the canopy, another hawked and hovered to obtain prey and the third gleaned and probed to obtain insects below the canopy. Differential use of distinct feeding sites was not important in describing guilds.

The foraging behavior of individual species varied more between years than between the two study sites within a year. Two species, Warbling Vireos (Vireo gilvus) and Gray Catbirds (Dumatella carolinensis) belonged to different foraging guilds in different years. Weather conditions, particularly wind and temperature, primarily affected the height at which birds foraged and their use of different feeding maneuvers.

There was a high overlap in diet among the bird species because they all frequently fed on the frequently abundant adult midges. Birds in different behavior-defined foraging guilds often had diets as similar

to each other as to members of their own foraging guild. When food resources were not abundant, diet overlap among species decreased and diet breadth increased. Although the breadths of feeding behaviors used by individual species generally remained constant despite differing prey availabilities, overlap in behavior among the bird species decreased as arthropod abundance decreased. These findings are consistent with the hypothesis that interspecific competition for food occurred among the riparian birds when food resources were relatively low. Densities of the Manitoba riparian birds may be limited by both food resources and the availability of nesting sites.

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I thank the Portage Country Club and the Delta Waterfowl and

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I thank my parents for teaching me the value of education and for encouraging me throughout my life to do my best. Without this early and continuous encouragement, I never would have continued this far.

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GENERAL INTRODUCTION

Riparian zones are defined as areas that border streams, lakes or other bodies of water (Hall 1987). Riparian ecosystems are the most productive type of wildlife habitat, benefiting the greatest number of species (Kauffman and Krueger 1984) and may provide living conditions for a greater variety of wildlife than any other type of habitat found on the entire North American continent (Johnson, in Kauffman and Krueger 1984). However, the extent of natural riparian areas is declining rapidly throughout North America because of timber removal, agriculture, grazing, damming, fisheries and recreational use. Already, 70 to 90% of all riparian habitat in the United States has been altered (Kauffman 1987). Surprisingly, little is known about the ecological relationships among animals in riparian habitats. By far the best information has been obtained on the birds in desert riparian ecosystems (e.g. Carothers et al. 1984, Ohmart and Anderson 1982, Rosenberg et al. 1982).

The importance of desert riparian habitats as breeding areas for birds has been well documented (Carothers et al. 1974, Stamp 1978, Ohmart and Anderson 1982, Rosenberg et al. 1982, Szaro and Jakle 1985). These areas characteristically support high densities of breeding birds (Carothers et al. 1974, Stamp 1978, Stauffer and Best 1980, Ohmart and Anderson 1982, Rosenberg et al. 1982, Szaro and Jakle 1985) that are thought to be sustained by abundant food supplies (Carothers et al. 1974, Rosenberg et al. 1982). Because desert riparian habitats are often subjected to natural flooding, plant communities tend to be characterized by a few dominant water-tolerant tree species (Carothers et al. 1974, Ohmart and Anderson 1982). The lack of diversity of tree species may

influence the availability of perceived nest-sites to birds, since only a few different structural configurations are present (MacKenzie et al. 1982). Carothers et al. (1974) concluded that bird population sizes in desert riparian habitats were limited not by food, but probably by nest-site availability. They also reported that many species defended only their nest-site rather than both the nest-site and feeding areas, which had been observed for many of the same species in other habitats. Defence of nest-sites only was related to the use of adjacent habitats as foraging areas, primarily by the larger bird species (Carothers et al. 1974) and may contribute importantly to the high nesting densities observed.

Bird communities in non-desert riparian habitats have received less attention (Carey 1987), although studies of the bird community where I worked, in the forested dune-ridge that separates Lake Manitoba from the Delta Marsh, Manitoba are changing this situation. There appear to be many similarities between this area and desert riparian habitats. The first objective of this study was to examine the characteristics of the Delta Marsh riparian habitat (Chapter I).

The vegetation of the dune-ridge is dominated by a few tree species (MacKenzie 1982). The breeding densities of bird species in this area are reported to be much higher than elsewhere in the species' breeding ranges (Sealy 1980, Goossen and Sealy 1982, MacKenzie et al. 1982, Briskie 1985). Although not quantified, food resources have been tentatively labelled abundant (Sealy 1980, MacKenzie et al. 1982). Nest-sites may be limiting, at least for some species (MacKenzie et al. 1982). So far, two species, the Northern Oriole (Icterus galbula) (Sealy 1980) and the Gray Catbird (Dumetella carolinensis) (Harcus 1973) have

been identified as defending only their nest-sites in this area, although at least the catbird defends both nest-site and feeding areas in other habitats (Darley et al. 1971). Thus, there are apparently many similarities in vegetation, food resources and avian densities and behavior between desert riparian habitats and this non-desert riparian area. However, the food exploitation patterns of birds in this Manitoba area are not as well understood as in desert riparian areas.

In a desert riparian community, Rosenberg et al. (1982) examined the foraging behavior of 12 species of birds and identified four major feeding guilds: bark-feeding woodpeckers, ground-feeding species, canopy-feeding gleaners, and canopy-feeding species that aerially hawk or hover to obtain prey. Although several single-species feeding studies have been conducted on the dune-ridge forest near Delta, Manitoba (Busby and Sealy 1979, Biermann and Sealy 1982, Briskie 1985, Guinan and Sealy 1987), the foraging guilds in the community have not been defined quantitatively. The second objective of the present study was to define quantitatively the feeding guilds of the birds nesting and feeding on the dune-ridge forest in Manitoba and to describe the behavioral characteristics that define the guilds (Chapter II).

In non-riparian habitats, weather conditions (Grubb 1979) and habitat characteristics (Maurer and Whitmore 1981, Seidel and Whitmore 1982, Franzreb 1983, Landres and MacMahon 1983) influence the foraging behavior of birds. Between-year variation in avian feeding behavior also occur (Saether 1982, Robinson and Holmes 1982), but the cause is unknown. The third objective of this study was to examine the effects of habitat, year and weather conditions on avian foraging behavior to determine the stability of the foraging guilds in the dune-ridge forest (Chapter II).

Rosenberg et al. (1982) found a high degree of overlap in diets between and among desert riparian birds, and noted that a large number of the species preyed heavily on the apparently abundant cicadas (Diceroprocta apache). Interestingly, species whose diets were most similar to each other were usually from different behavior-defined guilds. However, Rosenberg et al. (1982) obscured the similarities and differences in the diet of the birds they studied by sampling over a two-month period during which the proportions of different prey types in the environment probably changed greatly. The fourth objective of this study was to quantify the diets of bird species in the dune-ridge forest to determine the degree to which they overlap among species, to quantify the importance of the most abundant food resource, Chironomidae, and to examine the effect of differing prey densities on diet and diet overlap by sampling the birds' diets several times during the breeding season as prey availabilities changed. The relationship between bird size and diet was also examined (Chapter III).

Chapter I

The Forested Dune Ridge,

Delta Marsh, Manitoba

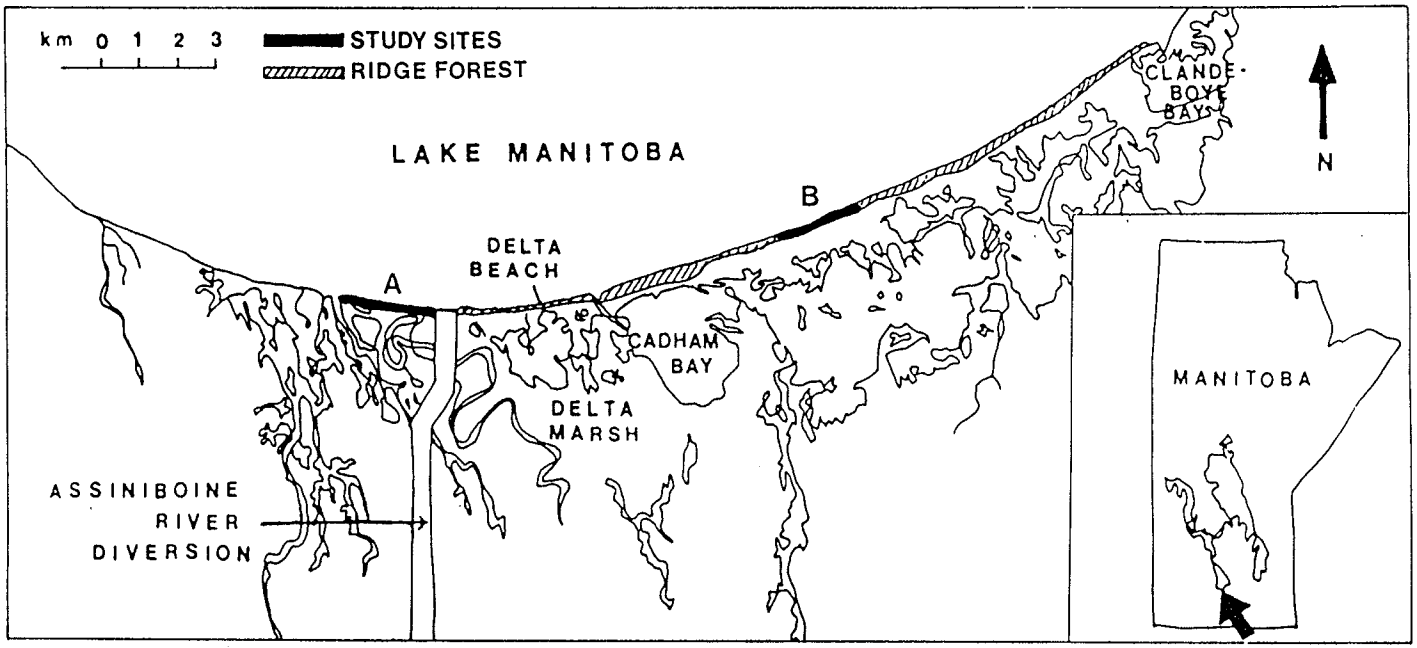
INTRODUCTION

The dune-ridge forest that separates Lake Manitoba from the Delta Marsh, Manitoba, is a narrow riparian habitat that extends about 25 km along the southern shore of Lake Manitoba (MacKenzie 1982). The forest presents about 11 species of breeding birds that are primarily insectivorous in the summer with a continuous edge habitat. In this chapter, the characteristics of this riparian habitat are examined.

I conducted this project on two study sites, each a portion of the forested dune ridge. One site, hereafter Site A, was a 3-km (in 1982) and 2-km (in 1983-1985) portion of the ridge west of the Assiniboine River diversion, approximately 5 km from the village of Delta, Manitoba ($50^{o}11'N$, $98^{o}19'W$) on the properties of the University of Manitoba Field Station and the Portage Country Club (Figure 1). Site B was about 5 km east of Delta, on the property of the Delta Waterfowl and Wetlands Research Station.

The objectives of this chapter are four-fold: 1) the overstory vegetation is compared between the two sites; 2) the arthropod fauna sampled during the four summers (1982-1985) of the study is compared between study sites and years; 3) weather conditions during the study are presented; 4) the bird community is described.

Figure 1. Maps of Delta Marsh, Manitoba, showing the location of the forested dune ridge (hatched area) and study sites A and B. Feeding birds were observed on Site A in 1982 to 1985 and on Site B in 1984 and 1985. Site B was used to collect birds in 1982 and 1984.


km 0 1 2 3
STUDY SITES
RIDGE FOREST
LAKE MANITOBA
CLANDE-BOYE BAY
N
B
A
DELTA BEACH
CADHAM BAY
DELTA MARSH
ASSINIBOINE RIVER DIVERSION
MANITOBA

METHODS

Habitat Sampling

The size and abundance of the important tree species on Site A have been described in detail by MacKenzie and Sealy (1981), MacKenzie (1982) and MacKenzie et al. (1982). Using 5 x 20 m rectangular plots set in a partial random sampling scheme, they calculated the conventional Wisconsin school summary statistics (see MacKenzie 1982) and identified a distinct north-to-south zonation of the vegetation. However, the composition and structure of the overstory vegetation on Site B has not been described quantitatively. In 1984, four study plots were established on Site B, three adjacent to each other and one about 1 km west of the other three. Each plot was about 0.5 km long (range 320-546 m) and between 87 and 132 m wide. The size of the plots varied because of differences in bird distributions. I ensured, where possible, that at least two pairs of each of the less common bird species were in each plot. On each of the four plots, I established 12 circular plots 5-m in radius using a stratified random sampling scheme in which four plots were located on each of the north, central and south zones of the dune-ridge forest. Within each circular plot, trees of diameter at breast height (dbh) $\geq$ 5 cm were identified to species and recorded in the appropriate diameter-size class at intervals of 5 cm. As in MacKenzie (1982) nomenclature follows Scoggan (1957) except green ash follows Hosie (1969). The conventional Wisconsin school summary statistics were calculated using the entire sample of 48 plots.

These results can be compared with those obtained on Site A by MacKenzie (1982). Zones were compared between the two sites by examining differences in the vegetation among the three portions of the ridge on Site B and relating the results to MacKenzie's (1982) work.

Five randomly chosen north-to-south transects were established on each of the four plots on Site B. Five of 20 north-to-south transects permanently established on Site A for foraging observations were randomly selected and transects were established 2 m west of these transects. Each transect was approximately 100 m long. Stopping every three or four paces along each transect, I established evenly spaced sampling points (usually 20 per transect). At each point, I recorded the presence or absence of non-herbaceous foliage or wood within 3-m height classes (except the lowest 3-m height group was divided into two 1.5-m categories). These data yielded tree profiles for each area (Maurer and Whitmore 1981, Landres and MacMahon 1983). I also calculated the proportions of ground and canopy cover on each transect (James and Shugart 1970). All shrubs or saplings (dbh $\leq$ 5 cm) encountered within approximately 1 m on either side of each transect were counted so that the shrub component of the two areas could be compared (James and Shugart 1970).

Invertebrate Sampling

Invertebrates were sampled from foliage using a standard sweep net 38 cm in diameter. Eight sweeps at each of 1- and 3-m heights in the foliage were made at about 0900 h (all times were CDT) on days when