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Feeding Ecology of a Dense  
Population of Nesting Yellow Warblers

by

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## ABSTRACT

The feeding ecology of a dense population of nesting Yellow Warblers (Dendroica petechia) was studied on the Delta Beach Ridge, about five km west of Delta, Manitoba (58° 11' N., 98° 19' W.), during the breeding seasons of 1975 and 1976. Prey availability, prey consumed and foraging behaviors are described for the adults during the pre-egg, egg-laying and incubation, nestling and post-nesting periods.

The total numbers and taxonomic composition of the arthropods available to Yellow Warblers fluctuated irregularly throughout both breeding seasons. Major changes in the arthropod fauna were due to massive emergences of adult chironomids and geometrid larvae. The Chironomidae was the most abundant group during both breeding seasons and comprised more than half of the available prey. Arthropods were more numerous in the lower vegetation (0.3-3.0 m) than the upper vegetation (7.0-9.0 m).

Adult chironomids were the chief prey, comprising 58% and 56% of the diet in 1975 and 1976, respectively. The diets of males and females were similar throughout the breeding seasons; differences in diet are attributed to feeding locations rather than differential prey selection. The prey consumed by Yellow Warblers varied temporally and spatially according to the arthropods available; prey was taken in proportion to its availability.

Males foraged higher and in taller trees than females. The tree sections used differed between the sexes; males used primarily the upper and outer sections and females used mainly the lower and inner sections. Foraging movements of males were longer than those of females during the egg-laying and incubation period but differences during the remaining periods were not significant. The foraging methods of males and females differed; males gleaned more and hovered less than females. Males foraged in willows more and maples less than females

Rapidly changing prey populations, generalized diet and sexual segregation of the habitat are discussed.

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## INTRODUCTION

The regulation of bird populations in nature has interested population ecologists since Howard's (1920) treatise on territoriality was published. The importance of density-independent factors (eg. climate, disease) versus density-dependent regulation (eg. through competition for food or nest sites, predation) has been debated for the past two decades (see Andrewartha and Birch 1954; Lack 1954, 1966; Kluyver and Tinbergen 1953; Nicholson 1958; Hairston et al. 1960; Murdoch 1966; Slobodkin et al. 1967; Royama 1977). Lack contended that clutch size and ultimately breeding densities are controlled by density-related food conditions (see also Gibb 1960; Yom-Tov 1974). Morse (1976) found an inverse correlation between population density and the standing biomass of food but that physical characteristics of the habitat provide the proximate factor in site selection.

When one species coexists with other similar species that exploit similar resources, for example, food, we might expect its breeding density to be reduced, and its realized niche (Hutchinson 1957) to be compressed, compared to areas where competitors are absent. If, however, this common resource (food) is in unlimited supply both spatially and temporally, then it should be possible for several similar species to live in the area, provided other essential

resources are present.

Such a situation appears to exist on the narrow Delta Beach Ridge that separates the southern shore of Lake Manitoba and the Delta Marsh, Manitoba. Unusually dense populations of seven insectivorous bird species nest in the deciduous habitat on this ridge. The Eastern Kingbird (Tyrannus tyrannus), Western Kingbird (T. verticalis), and the Least Flycatcher (Empidonax minimus) are mainly aerial foragers. The Gray Catbird (Dumetella carolinensis), Warbling Vireo (Vireo gilvus), Yellow Warbler (Dendroica petechia) and Northern Oriole (Icterus galbula) comprise a foliage-gleaning guild (see Root 1967).

The Ridge experiences frequent massive swarms of adult midges (Diptera: Chironomidae)(Fig. 1) that emerge from both Lake Manitoba and the Delta Marsh throughout the late spring and summer. Since the appearance of these insects, which settle on the ridge foliage, occurs annually, it appears that an unlimited supply of food exists throughout the breeding seasons of these insectivorous birds.

The objective of the present study is to examine aspects of the feeding ecology of the Yellow Warbler, the most abundant bird on the Delta Beach Ridge, under apparently unlimited food conditions. Since the studies of Gibb (1954, 1960), Lack (1954) and MacArthur (1958), resource partitioning and niche segregation have received much attention, with small insectivorous birds being a popular focal point. Information on foraging behavior, food habits and food

FIGURE 1. Photograph of distant (above) and near  
(below) chironomid swarm during a peak of emergence.

availability have been obtained, however few studies have considered all of these critical aspects to provide a more detailed description of the factors which influence the species' feeding ecology.

I studied the feeding ecology of adult Yellow Warblers with respect to the seasonal availability of prey, the prey consumed by both sexes, and the foraging tactics of males and females. These aspects were examined during two breeding seasons and the relationships between feeding and the stage of breeding are discussed.

## THE STUDY AREA

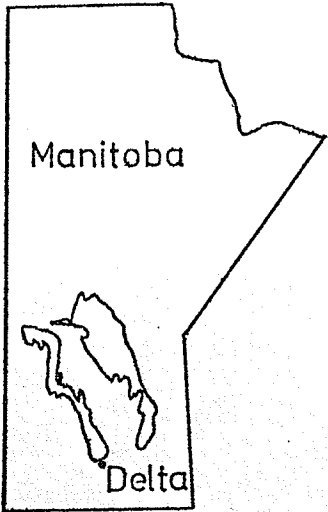
The study area is a 500 m portion of the Delta Beach Ridge (Fig. 2), adjacent the University of Manitoba Field Station, Delta Marsh. This forested ridge is a remnant shore-line of Glacial Lake Agassiz (Walker 1965, Sproule 1972) built up by north winds, waves and ice (Löve and Löve 1954), and averages 80 m in width. Lake Manitoba extends 180 km to the north of the ridge and the 15,000 ha Delta Marsh lies to the south, extending about 30 km east-west and eight km southwards.

Löve and Löve (1954), Walker (1959, 1965), Tamsitt (1962), Hochbaum (1966) and Sproule (1972) have described aspects of the ridge. However since vegetational characteristics vary in different portions of the ridge, a brief description of the specific study area will be given. All scientific names follow Scoggan (1957).

Four tree species are common on the study site. Willows (Salix amygdaloides and S. interior), Manitoba maple (Acer negundo) and green ash (Fraxinus pennsylvanica) accounted for 57%, 21% and 20% of the tree flora, respectively. They provide a forest canopy about 10-14 m in height. The prominent shrubs are elderberry (Sambucus pubens), dogwood (Cornus stolonifera) and raspberry (Rubus idaeus). Later in the season the forest floor becomes matted with herbs and creepers. Most common are stinging nettles (Urtica dioica), wild cucumber (Echinocystis lobata), Virginia creeper

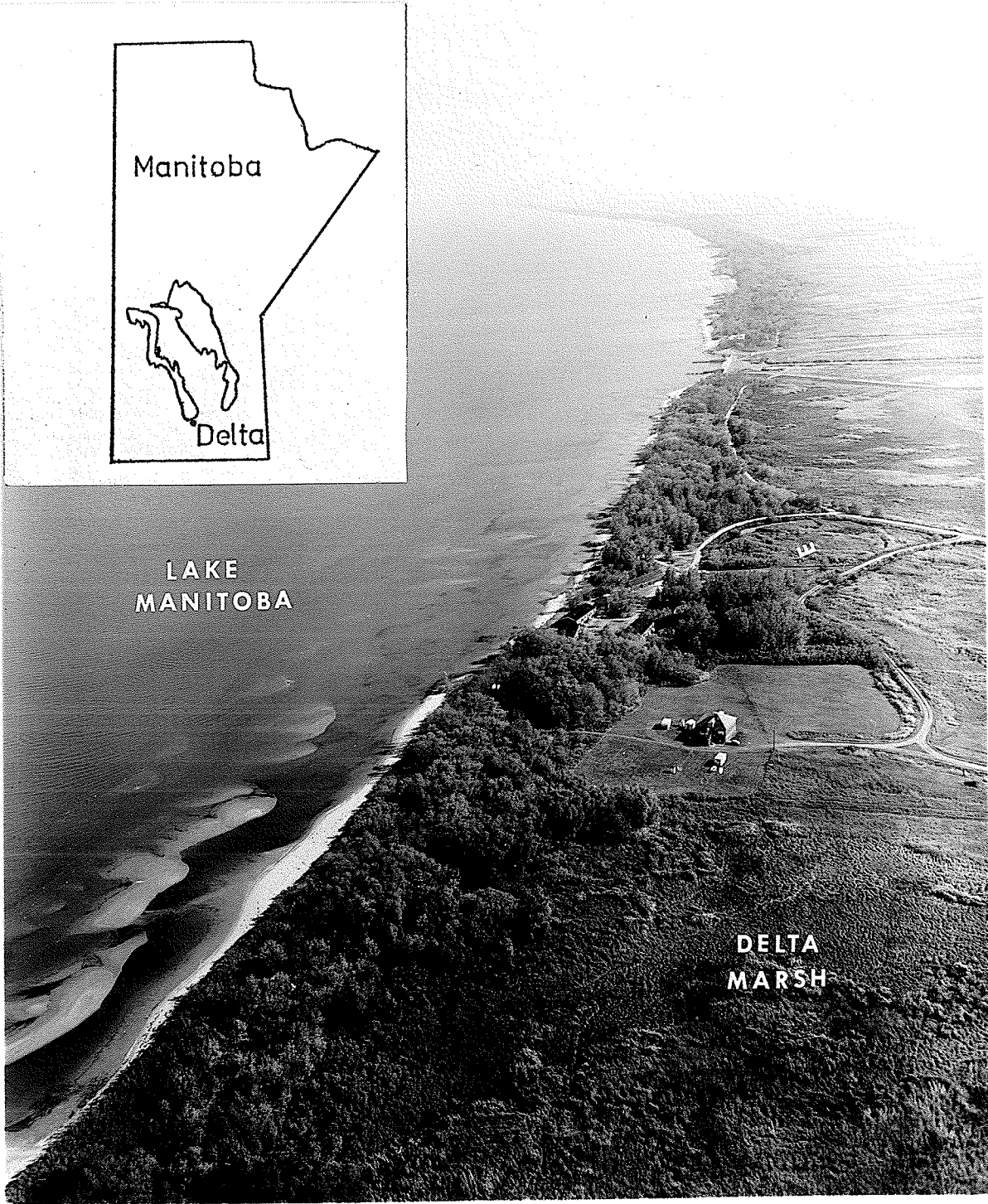
FIGURE 2. Illustration of the Delta Beach Ridge with  
inset showing location of study area.





LAKE  
MANITOBA

DELTA  
MARSH



(Parthenocissus quinquefolia), hedge bindweed (Convolvulus sepium) and wild hop (Humulus lupulus).

The Delta Marsh is characterized by extensive shallow water which provides optimal habitat for aquatic organisms. Chironomid larvae were the most abundant macroscopic organism, represented by over 30 species with densities of greater than 12,000 larvae / m<sup>2</sup> (Wright 1969). The relative abundance of these species was found to change during the summer as did seven species found in Lake Manitoba (Tudorancia 1974). Each chironomid species has its own non-random period of emergence (Oliver 1971) which accounts for the nearly continual presence of this family throughout the breeding season.