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Nestling Food Habits of 7 Grassland Bird Species and Insect Abundance in Grassland Habitats in Northern Illinois

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ABSTRACT

By sweep netting habitat and observing birds, we determined insect availability and use as food by 7 species of grassland birds: Henslow's sparrow (*Ammodramus henslowii*), dickcissels (*Spiza americana*), bobolinks (*Dolichonyx oryzivorus*), grasshopper sparrows (*A. savannarum*), savannah sparrows (*Passerculus sandwichensis*), red-winged blackbirds (*Agelaius phoeniceus*), and eastern meadowlarks (*Sturnella magna*). Of 9 orders of insects sampled, Orthoptera, Coleoptera, and Lepidoptera were fed most to nestlings. Bird species varied in choice of insects. In general, all bird species selected prey items that were large (>10 mm) and relatively easy to catch. We observed concentrations of insects mainly around clumps of forbs where most flowers occurred.

INTRODUCTION

Over 8.1 million ha of tallgrass prairie once covered 60 % of Illinois. By 1970, <1% of that remained in scattered parcels throughout the state (Anderson 1970). The meadows and hayfields that replaced the native prairie declined substantially in area due to intensification of row crop farming, mainly corn and soybeans, since the late 1950's.

Opportunities to observe birds in native grasslands are scarce (Johnsgard and Rickard 1957), especially in Illinois where the associations of native tallgrass prairie used by grassland birds were not studied before the prairies were plowed (Birkenholz 1973). As a result, the descriptions of habitats used by grassland birds in Illinois (e.g., Graber and Graber 1963) and many other states have been limited mostly to pastures and hayfields, as these usually are the only remaining extensive grassland habitats.

The objective of this study was to determine food habits of 7 bird species relative to food abundance within grassland habitat types. Food habits of this group of grassland birds have not been determined previously in Illinois, especially relative to food abundance.

STUDY AREA

The study was conducted in the Forest Preserve District of DuPage County, IL. Located in northeastern Illinois about 32 km west of Chicago, and within the Northeastern Morainal Division (Mapes 1979, Neely and Heister 1987), DuPage County is a heavily urbanized county of 847 km^2. Since 1960, >24,282 ha--28% of the county's area--have been converted from agricultural use. Presettlement vegetation in the county was 75% tallgrass prairie and wetland and 25% small savannas and groves timbered by widely scattered oaks (*Quercus* spp.)and hickories (*Carya* spp.) (Lampa 1985).

Currently, the District has about 8094 ha of open space within its system. Non-native grasslands comprise 3035 ha (42%) created by seeding former croplands to perennial grasses. The District acquired >2833 ha of agricultural lands since the mid-1960's. These lands were planted mainly to meadow fescue (*Festuca elatior*) and ladino clover (*Trifolium repens*) before 1979. From 1980 until the present, former agricultural lands were planted with a seed mixture of timothy (*Phleum pratense*), perennial rye (*Lolium perenne*), and ladino clover. The conversion cover type was changed because timothy, rye, and clover are less resistant than fescue to successional change.

Four grassland types were selected for this study on the basis of plant species composition and percent coverage by the dominant grass and forb species: a 60.7-ha fescue field in Springbrook Forest Preserve, a 40.5-ha field in Green Valley Forest Preserve, a 5.2-ha fescue-dominated grass/forb field in Herrick Lake Forest Preserve, and a 44.5-ha timothy-dominated field in Danada Forest Preserve.

Fescue Fields

Fescue fields consisted mainly of meadow fescue (80-95% coverage) (Kobal 1990). Other grasses such as Kentucky bluegrass (*Poa pratensis*), orchard grass (*Dactylis glomerata*), quackgrass (*Agropyron repens*), smooth brome (*Bromus inermis*), reed canary grass (*Phalaris arundinaceae*), and timothy were present in small percentages (≤ 5%).

Common species of forbs included red clover (*Trifolium pratense*), Queen-Anne's lace (*Daucus carota*), common milkweed (*Asclepias syrica*), thistles (*Cirsium* spp.), yellow sweet-clover (*Melilotus officinalis*), goldenrods (*Solidago* spp.), common sow thistle (*Sonchus oleraceus*), wild lettuces (*Lactuca* spp.), field bindweed (*Convolvulus arvensis*), hedge bindweed (*C. sepium*), and dandelion (*Taraxacum officinale*).

Mixed Grass Fields

Mixed grass fields contained varying mixtures of fescue, timothy, Kentucky bluegrass, reed canary grass, smooth brome, orchard grass, red top (*Agrostis alba*), and quackgrass (80-95% coverage) (Kobal 1990). Fescue and Kentucky bluegrass were the 2 main grass species in these mixtures. Remaining grass species were present in larger percentages (5-20%) than in the fescue habitat type.

Common forbs included Queen-Anne's lace, wild lettuces, common sow thistle, daisy fleabane (*Erigeron annus*), field bindweed, hedge bindweed, dandelion, red clover, white clover (*Trifolium repens*), yellow hop-clover (*T. agrarium*), alsike clover (*T. hybridium*),

and lamb's quarters (*Chenopodium alba*). Thistles, milkweeds, goldenrods, yellow sweet-clover, and white sweet-clover (*M. alba*) also occurred.

Grass/Forb Fields

Grass/forb fields contained mixtures of fescue, timothy, Kentucky bluegrass, reed canary grass, smooth brome, orchard grass, and quackgrass (Kobal 1990). The field dominated by timothy was characterized by dense coverage of forbs and other vegetation relative to the field dominated by fescue.

Forbs such as thistles, milkweeds, goldenrods, sweet-clovers, red clover, white clover, alsike clover, common sow thistle, field bindweed, hedge bindweed, daisy fleabane, Queen-Anne's-lace, dandelion, wild lettuces, and common ragweed (*Ambrosia artemisifolia*) covered 25-40% of grass/forbs fields. A few trees and shrubs such as willow (*Salix* spp.), eastern cottonwood (*Populus deltoides*), and multiflora rose (*Rosa multiflora*) usually were present, mainly in wet depressions and along fencerows. These woody species comprised <10% of the area of each field.

METHODS

We determined food items brought to nestlings by monitoring nest sites 13-22 July 1987 between 0530 and 1200 hours with a 15-45X spotting scope. We observed each bird 20 min from ≥20 m to reduce observer-related disturbances, and recorded all insect food items presented to nestlings. We observed 4 Henslow's sparrows, 6 dickcissels, 7 bobolinks, 10 grasshopper sparrows, 16 savannah sparrows, 18 red-winged blackbirds, and 22 eastern meadowlarks.

We determined composition and abundance of insects within habitat types by sweep netting (Menhinick 1963) within fields representative of each of 3 habitat types on 23 and 24 July 1987. Five sampling locations were selected along each of 4 bird census transect routes. The different physiognomy of timothy and fescue might affect insect species composition and abundance. Sweep transects were located at right angles to bird census transects. Ten steps were taken along each 20-m sweep line. The vegetation was swept in front of each step, and a 2nd sweep was made after each step. The 1st sweep was made from right to left 50 cm ahead of the collector. A 2nd sweep was made from left to right about 30-35 cm ahead of the 1st sweep.

The vegetation was swept vigorously by keeping a standard 38-cm net as close to the ground as possible (Menhinick 1963). To sample insects from the entire strata, sweeps were made from top of vegetation to soil surface. Each sweep covered a horizontal distance of 100-115 cm. This procedure continued for 10 steps and 20 sweeps (pers. comm. R.C. Anderson, Univ. Illinois). We placed insects from each sweep line in 70% ethanol for later identification. Chi-square ($\underline{P}$ = 0.05) was used to compare insects observed being used to those available.

RESULTS

The 3 most common orders ($P<0.05$) fed to nestlings, in decreasing order of abundance, were Orthoptera, Coleoptera, and Lepidoptera (Table 1). All 7 bird species fed their nestlings greater proportions ($P<0.05$) of Lepidoptera and Orthoptera than available in fields. Grasshopper sparrows and savannah sparrows fed nestlings greater proportions ($P<0.05$) of Coleoptera than available. Savannah sparrows and eastern meadowlarks used Homoptera in lower proportions than available ($P<0.05$). Savannah sparrows used Diptera in lower proportions than available ($P<0.05$) (Table 1). In general, all birds species selected prey items that were large (>10 mm) and relatively easy to catch.

Homoptera (leafhoppers) and Diptera (flies) represented 69% of insects captured in sweep nets in fescue habitat and 59% in mixed grasses. Diptera and Coleoptera comprised 58% of the sample in fescue-dominated grass/forb fields and 48% in timothy-dominated fields (Table 1).

Orthoptera, Coleoptera, and Lepidoptera represented 70-90% of insects fed to nestlings, but only 27% of insects captured by sweep net in all 3 habitat types. Grass/forb fields had 33% of these orders in fescue-dominated fields and 41% in timothy-dominated fields. Homopterans represented >30% of insects captured in fescue and mixed grasses habitat types. Homopterans in grass/forb fields comprised only 10% of the total number of insects captured. All fields sampled contained the same relative number (8-9) of insect orders captured. We observed concentrations of insects mainly around clumps of forbs, where flowers occurred.

DISCUSSION

All insects found in sweep samples were of orders common to agricultural land oldfield habitats in Illinois (Wright 1955). Birds did not select insects in proportion to availability.

Abundance of various prey types influences prey selection by foraging adults (Maher 1979). Although insect availability determined through sweep samples is a valuable index of quantity of food available to grassland songbirds, it does not include larvae. Nearly absent in sweep samples, Lepidoptera larvae and Orthoptera adults made up most of the nestlings' diet. Difficulty usually exists in matching field samples with diet no matter how intensive and careful field sampling might be (Meunier and Bedard 1984).

Grassland birds in DuPage Co. seem to select insects that are large (>10 mm), relatively easy to catch, and common in oldfield habitats in Illinois. Kaspari and Joern (1993) found that small prey were avoided, intermediate-sized prey were preferred, and preferences for larger prey increased with size of grassland birds in Nebraska. Henslow's sparrows fed Lepidoptera to nestlings 44% of the time (Robins 1971). Grasshopper sparrows used Orthoptera 37% of the time during May-August (Smith 1968). Dickcissels consumed Orthopterans 41% of the time (Judd 1901). Eastern meadowlarks consumed 26% Orthoptera and 25% Coleoptera (Bent 1958). Bobolinks fed nestlings 44% Lepidoptera and 14% Orthoptera (Wittenberger 1980). Red-winged blackbirds fed nestlings mainly Odonata and Lepidoptera (Robertson 1973). Similar nestling diets for these species were

observed in our study. Prey selection in grassland birds seems to be a complex function of prey size, energy, nutrients (Kaspari and Joern 1993), and availability.

Supply of food items present during brood rearing period seemed abundant. Evans (1964) concluded that food was superabundant in an oldfield in Michigan in which field sparrows, chipping sparrows (*Spizella passerina*), and vesper sparrows (*Pooecetes gramineus*) nested.

More detailed evaluation of insect availability and nestling diets is needed at different stages of nestling development during the breeding season. Diet composition changes with age of nestlings (Welsh 1975), and insect availability fluctuates during summer.

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Table 1. Proportion (%) of sweep net samples represented by 10 insect orders and arachnids and percentage of food items brought to nestlings by each bird species in 3 habitat types (fescue, mixed grasses, and grass/forb) in northern Illinois, July 1987.[a]

Order[b]	% available	Henslow's sparrow (13)	Dickcissel (14)	Grasshopper sparrow (21)	Savannah sparrow (29)	Eastern meadowlark (43)	Red-winged blackbird (24)	Bobolink(9)
Fescue (172)								
Homoptera	34.8	–	–	–	6.9*	–	–	–
Diptera	34.3	–	–	–	3.4*	–	–	–
Coleoptera	10.5	–	–	23.8*	34.4*	–	–	–
Hymenoptera	8.1	–	–	–	–	–	–	–
Lepidoptera	4.6	–	–	19.1*	34.4*	–	–	–
Orthoptera	1.7	–	–	42.8*	13.8*	–	–	–
Hemiptera	0.6	–	–	–	–	–	–	–
Odonata	0.6	–	–	–	–	–	–	–
Neuroptera	0.6	–	–	–	–	–	–	–
Unidentified	--	–	–	4.7	3.4	–	–	–
Arachnida	4.1	–	–	9.5	3.4	–	–	–
Mixed grasses (207)								
Homoptera	32.8	–	–	–	–	–	–	–
Diptera	26.6	–	–	–	–	2.3*	–	–
Coleoptera	12.5	–	–	–	–	27.9	–	22.2
Hymenoptera	10.1	–	–	–	–	6.9	–	–
Lepidoptera	2.9	–	–	–	–	25.5*	–	44.4*
Orthoptera	6.7	–	–	–	–	16.2*	–	22.2*
Hemiptera	1.9	–	–	–	–	–	–	–
Odonata	0.0	–	–	–	–	–	–	–
Neuroptera	0.5	–	–	–	–	–	–	–
Unidentified	--	–	–	–	–	6.9	–	–
Arachnida	5.8	–	–	–	–	13.9	–	11.1
Grass/forb (239)								
Homoptera	10.1	–	–	–	–	–	–	–
Diptera	31.2	–	–	–	–	–	–	–
Coleoptera	23.3	15.4*	14.4*	–	–	–	25.1	–
Hymenoptera	13.1	7.7	7.1*	–	–	–	12.5	–
Lepidoptera	5.3	38.5*	21.3*	–	–	–	20.9*	–
Orthoptera	10.2	30.7*	42.8*	–	–	–	33.3*	–
Hemiptera	4.2	–	–	–	–	–	–	–
Odonata	1.0	–	–	–	–	–	–	–
Neuroptera	1.0	–	–	–	–	–	–	–
Unidentified	--	–	14.1	–	–	–	4.2	–
Arachnida	4.1	7.7	–	–	–	–	4.2	–

[a]Number of observations per bird species is given in parentheses.
[b]Total number of insects captured in each habitat type is given in parentheses.
*Significant at P=0.05 (chi-square).