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ILLINOIS NATURAL HISTORY SURVEY
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Foraging Ecology of Fall Migrating Shorebirds in the Illinois River Valley

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Summary

As of mid-November 2008, we have: 1) removed, and preserved the ingesta of 134 shorebirds collected during fall 2008; 2) extracted habitat (core) samples from the collection site and a random site for each bird to determine food selection and availability; 3) computed size-corrected body mass (a body condition index) for collected shorebirds in 2007 and 2008, and; 4) sorted and summarized ingesta from 152 shorebirds collected in 2007. We are currently processing food availability samples from 2007 and will begin analysis of ingested food and habitat samples from 2008 collections. Below, we detail progress with respect to specific objectives.

1) **Annually collect a minimum of 30 (each) foraging Pectoral and Least Sandpipers, Lesser Yellowlegs, and Killdeer to investigate food habits during fall 2007 – 2008.** – In 2008 we collected 134 fall-migrating shorebirds during July and August (Table 1) 2008. We collected 33 Lesser Yellowlegs (*Tringa flavipes*), 30 Least Sandpipers (*Calidris minutilla*), 36 Pectoral Sandpipers (*Calidris melanotos*), and 35 Killdeer (*Charadrius vociferous*). Juvenile shorebirds migrate later than adults (O'Brien et al. 2006); thus, we attempted to collect birds later in migration during 2008. However, a late-summer flood raised water to levels that deterred shorebird use in most locations and precluded further collections. Additionally, between-year study-site replication was not entirely obtainable. Spring and summer floods left many 2007 study sites unsuitable for foraging shorebirds in 2008, because managers were unable to remove excess water before fall-migrating shorebirds arrived. We were able to revisit 2 study sites used in 2007; however, habitat conditions were different, and in one instance (Clear Lake) we were forced to sample in a different area of the wetland complex. We transported collected birds to the laboratory where morphometric measurements were taken, birds were aged, and body fat was scored prior to removal and preservation of the upper digestive tract and contents.

2) **Estimate selection of food items by comparing abundance and composition of ingesta to those identified at foraging/collection sites. –** We will estimate diet and food selection once sorting and identification of ingesta and habitat samples are completed. To date, we have sorted and identified ingesta from birds collected in 2007. Here, we summarize food items as plant seeds or invertebrates, and further into wide taxonomic groups (i.e., Order). We will categorize invertebrates to the lowest taxonomic level that can be reasonably determined (i.e., Family) in our final report. We have not estimated dry mass of ingesta, which may prove difficult due to the small volume of food consumed by individual birds and small size of individual prey items. Thus, to estimate dry mass of ingested items, we may calculate the average mass of an individual from each taxa based on dry-mass estimates of all individuals in the taxa obtained from the wetland core samples. Therefore, in this report we summarized diet by percent occurrence only (Table 2).

Killdeer – 30 of 35 Killdeer collected in 2007 contained ≥ 1 food item. Of these, 100% (n = 30) contained invertebrates and 16.7% (n = 5) contained plant seeds. Nematoda (round worms) were the most common item found in Killdeer diets, occurring in 66.7% (n = 20) of birds.

Least Sandpiper – 36 of 37 Least Sandpipers collected in 2007 contained food in their upper digestive tract. Invertebrates occurred in 94.4% (n = 34) of specimens, and plant seeds were found in 44.4% (n = 16). The most common food occurring in Least Sandpiper diets were Dipterans (order Diptera: e.g., flies, mosquitoes, etc., larvae, pupae and adults), found in 58.3% (n = 21) of individuals.

Pectoral Sandpiper – All 40 Pectoral Sandpipers contained food in their upper digestive tracts. Invertebrates were common, occurring in 97.5% (n = 39) of collected birds, whereas plant seeds occurred in only 12.5% (n = 5) of individuals. Dipterans were the most common prey item and were found in 72.5% (n = 29) of birds.

Lesser Yellowlegs – 37 of 40 Lesser Yellowlegs contained ≥ 1 food item. Invertebrate foods occurred in 100% (n = 37) of individuals, whereas plant seeds occurred in 40.5% (n = 15). The most

common food consumed by Lesser Yellowlegs were unknown invertebrates (primarily unidentifiable parts, e.g., heads, legs) which were present in 51.4% (n = 19) of collected birds.

3) **Model forage patch selection by fall migrating shorebirds using invertebrate biomass and relative abundance data from foraging/collection sites and at random sites in study area wetlands. –** We will address this objective after completion of objectives #1 and 2.

4) **Compute standardized body condition indices of collected shorebirds to document condition at important, mid-latitude, stopover locations during fall and use these data in modeling efforts. –** We used the following morphometrics to compute size-corrected body mass (SCBM) of shorebirds: 1) head length (± 0.1 mm); 2) culmen length (± 0.1 mm); 3) tarsus length (± 0.1 mm); 4) keel length (± 0.1 mm); and 5) wing-cord length (± 1 mm). First, we conducted a principal-components analysis of all morphometric measurements using the PRINCOMP procedure in SAS v9.1 (Anteau and Afton 2004, SAS Institute 2004). Then, we included the scores from the first principal component as a covariate in an analysis of variance for each species using the MIXED procedure and output least-squares means estimates of body mass accounting for morphometrics (i.e., SCBM) as our index of body condition.

Lesser Yellowlegs – Lesser Yellowlegs SCBM in 2008 (112.2g, Table 3) was considerably greater than average masses reported by Tibbitts and Moskoff (1999; 67 – 94g), but nearly identical to SCBM of Lesser Yellowlegs collected in 2007 (112.3, Table 3). All morphometric measurements fell within reported ranges, however, precluding the possibility that some individuals were misidentified as Greater Yellowlegs (*Tringa melanoleuca*). We attribute this body mass difference to a thick fat layer present in most birds. In fact, using the Monitoring Avian Productivity and Survivorship (MAPS) method to score body fat (comparative scale of 1 to 7; 1 = no fat and 7 = obese, DeSante et al. 2008), many (n = 18, 54.5%) Lesser Yellowlegs scored 6 or 7. Thus, we conclude that Lesser Yellowlegs were in good to excellent body condition at our study site.

Least Sandpiper – SCBM of Least Sandpipers (28.4g, Table 3) fell near the upper range of body mass reported in Cooper (1994; 19 – 30g). This estimate was slightly greater than our 2007 estimate of 27.0g (Table 3).

Pectoral Sandpiper – SCBM of Pectoral Sandpipers (102.9g, Table 3) in 2008 also fell within the reported range of body masses (50 – 105g, Holmes and Pitelka 1998). This estimate was nearly 13% greater than the 2007 estimate of 91.1g (Table 3), and 95% confidence intervals about annual estimates did not overlap (Table 3), suggesting this difference may be statistically significant.

Killdeer – Mass of Killdeer varies considerably (65 – 121g, Jackson and Jackson 2000, O'Brien et al. 2006), but our 2008 SCBM estimate of 88.6g (Table 3) fell within the reported range. The SCBM of Killdeer collected in 2008 was 4.2% less than our 2007 estimate of 92.5g (Table 3). Confidence intervals (95%) about each estimate did not overlap (Table 3); indicating the difference may be statistically significant.

Based on our estimates of SCBM, we believe that Lesser Yellowlegs, Least and Pectoral sandpipers, and Killdeer were in good to excellent body condition at fall migratory stop-over locations along the central Illinois River.

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Table 1. Species and site totals for shorebirds collected along the Illinois River during fall 2008.

Collection Site	Killdeer	Least Sandpiper	Lesser Yellowlegs	Pectoral Sandpiper	Total
Anderson Lake	2	7	5	25	39
Clear Lake	7	13	12	0	32
Crane Lake	7	2	1	7	17
Grand Island	0	0	15	4	19
Rice Lake	7	5	0	0	12
Spring Lake	12	3	0	0	15
Total	35	30	33	36	134

Table 2. Percent occurrence of foods consumed by fall-migrating shorebirds collected along the Illinois River during fall 2007.

Taxa	Killdeer	Least Sandpiper	Lesser Yellowlegs	Pectoral Sandpiper
Invertebrates	100.0	94.4	100.0	97.5
Annelida	0.0	2.8	0.0	7.5
Arachnida	0.0	2.8	0.0	0.0
Bivalvia	0.0	0.0	2.7	0.0
Coleoptera	43.3	30.6	40.5	22.5
Diptera	46.7	58.3	37.8	72.5
Ephemeroptera	0.0	2.7	13.5	0.0
Gastropoda	0.0	0.0	0.0	12.5
Hemiptera	16.7	2.8	43.2	17.5
Hirudinea	6.7	5.6	5.4	2.5
Hydracarina	0.0	2.8	0.0	2.5
Nematoda	66.7	2.8	24.3	37.5
Odonata	0.0	0.0	2.7	0.0
Oligochaeta	10.0	2.8	0.0	0.0
Ostracoda	16.6	5.6	48.6	22.5
Trichoptera	6.7	0.0	10.8	5.0
Unknown invertebrates	53.3	41.7	51.4	30.0
Seeds	16.7	44.4	40.5	12.5
Amaranthus spp.	3.3	0.0	2.7	0.0
Cyperus spp.	16.7	5.6	32.4	5.0
Echinochloa spp.	0.0	0.0	0.0	2.5
Ludwigia spp.	0.0	2.8	2.7	0.0
Polygonum spp.	0.0	0.0	0.0	5.0
Eragrostis spp.	0.0	0.0	2.7	0.0
Unknown seed	3.3	38.9	13.5	0.0

Table 3. Size corrected body mass (SCBM; grams), standard error (SE), and 95% confidence limits (LCL and UCL) of shorebirds collected in central IL during fall 2007 and 2008.

Species	SCBM	SE	LCL	UCL
2007				
Killdeer	92.5	1.0	90.5	94.5
Least Sandpiper	27.0	0.6	25.8	28.2
Lesser Yellowlegs	112.3	3.3	105.6	118.9
Pectoral Sandpiper	91.1	2.2	86.6	95.5
2008				
Killdeer	88.6	0.9	86.7	90.4
Least Sandpiper	28.4	0.9	26.5	30.2
Lesser Yellowlegs	112.2	3.5	105.1	119.3
Pectoral Sandpiper	102.9	2.5	97.9	107.9

Submitted by:

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