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Connie S. Skipper

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Connie S. Skipper
293 Bray Hill Lane
Oakland, MD 21550

ABSTRACT

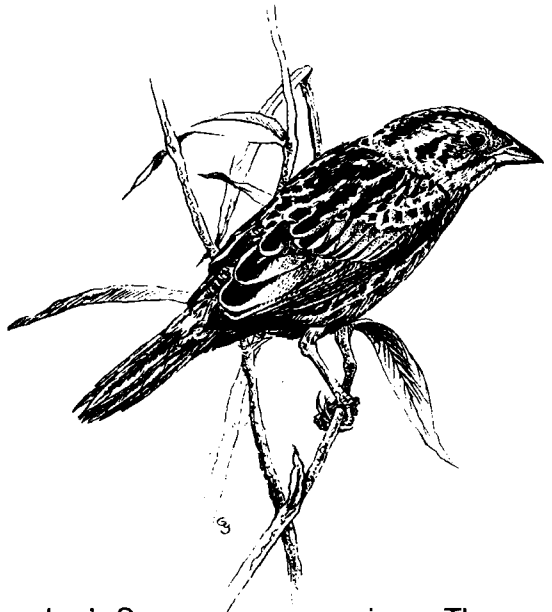
Eighty-seven breeding Henslow's Sparrows were banded over a period of four years. The objectives of this study were to determine whether adults return to previous year's breeding sites, whether juveniles return to natal areas as adults, and to determine the number of broods produced each season in Maryland. Five adult males returned to their banding site, making this the first documentation of nest site fidelity in Henslow's Sparrows. Evidence is inconclusive regarding juveniles returning to natal areas, as well as regarding how many broods are produced.

Thirty-seven Grasshopper Sparrows and 29 Savannah Sparrows were also banded. Means and ranges in weight and wing chord measurements are presented for all three species.

INTRODUCTION

The Breeding Bird Survey has shown significant declines in many grassland birds from 1966 through 1991 over most of the United States (Peterjohn and Sauer 1993). One of these grassland species is the Henslow's Sparrow *(Ammodramus henslowii)* (Figure 1). It is now a Maryland threatened species. Habitat loss is a major contributing factor to the decline in Henslow's Sparrows in Maryland (Robbins and Boone 1984). Hands et al. (1989) list many research needs concerning this species. Before appropriate habitat conservation or management can be initiated, some basic information on the Henslow's Sparrow's reproductive ecology must be learned.

Figure 1. Henslow's Sparrow (Illustration by Gary Yoder)



Henslow's Sparrows are an enigma. They occur in loose colonies found in scattered concentrations, while apparently identical habitat nearby remains unoccupied (Hyde 1939). They have fairly rigid nesting habitat requirements. Standing dead residual vegetation (Zimmerman 1988), litter depth and density of the vegetation (Robins 1967, Wiens 1969), and tall, dense vegetation (Herkert 1994) are all important components of this sparrow's habitat. Wiens (1969) found fields with extensive brush or shrubby vegetation were not occupied by Henslow's Sparrows. Furthermore, grassland size appears crucial to Henslow's Sparrow habitat selection. Herkert (1994) rarely found them on grassland fragments less than 100 ha in Illinois. In the east, Smith (1991) found they require about 28 ha. Individual territories range from 0.4 to 0.9 ha (Terres 1987).

Whether Henslow's Sparrows return to previous nest sites or natal areas is unknown. Mark and recapture studies could provide this information. I found two references to banding Henslow's Sparrows. Robins (1967) marked 44 birds in 1966 in Michigan. None of these birds was among the breeding birds observed on the study site or in the immediate area in 1967. Hands et al. (1989) stated

that none of the 39 Henslow's Sparrows banded by Zimmerman in Kansas returned to the study site the following year. Zimmerman, in personal communication with them, suggested that Henslow's Sparrows may not be site faithful because of the unpredictable nature of their preferred habitat (Hands et al. 1989). One 1949 record from the Bird Banding Laboratory shows that a juvenile Henslow's Sparrow was recovered two years after banding in the same 10-minute block in early May. This could have been a juvenile returning to its natal area.

I have been doing field surveys to monitor known colonies of Henslow's Sparrows and to search for new ones since 1990 in western Maryland. Here, there are very few sites with suitable nesting habitat. It seemed unlikely that a new colony of Henslow's Sparrows was finding these few suitable sites each year. The Grasshopper Sparrow *(Ammodramus savannarum)* is a close relative of the Henslow's Sparrow. Nearly half of the male Grasshopper Sparrows banded in Florida were observed on territories within 100 m of their capture locations in succeeding years (Delaney et al. 1992), and it seemed reasonable that Henslow's Sparrows do the same.

A banding study was begun in 1994 with the following objectives: (1) determine whether adults return to previous year's nesting sites, (2) determine whether juveniles return to natal areas as adults, and (3) determine the number of broods per year in western Maryland's Henslow's Sparrow population.

The banding site (Figure 2) was a 197-acre reclaimed strip mine near McHenry, Maryland. This site had been mined, and reclaimed, in stages over a 12-year period from 1976 to 1987. A mile long, narrow pond is on the north side of the reclamation, which itself is two miles long. Much of this site is lush vegetation completely undisturbed except by wildlife. Sections of the reclamation are planted in grasses and legumes, while other sections are planted in grasses and small trees. The grasses and legumes include tall fescue *(Festuca arundinacea)*, rye *(Lolium perenne)*, orchard grass *(Dactylis glomerata)*, red clover *(Trifolium pratense)*, and birdsfoot trefoil *(Lotus corniculatus)*. The trees include western larch *(Larix occidentalis)*, white pine *(Pinus strobus)*, red pine *(Pinus resinosa)*, black locust *(Robinia pseudo-acacia)*, and black alder *(Ilex verticillata)*.

Figure 2. The study site is a 197-acre reclaimed strip mine supporting a large colony of Henslow's Sparrows. (Photograph by Connie S. Skipper)

METHODS

During the breeding season, singing male territories were located. When two singing perches for one male were located, three nets were erected within this territory. Poles were 10-foot sections of ½" galvanized electrical conduit. Two types of nets were used: HTX 30 mm mesh, black nylon, 2.6 x 12 m and green 50d/2 ply, 30 mm mesh nets .9 x 12 m. Nets were set up in a new location after each morning's banding activities and tied shut. Vegetation was trimmed under the nets to a length of six to twelve inches. This helped eliminate birds ducking under the net. (Before I started trimming under the nets, net damage sometimes occurred from the grass heads tenaciously clinging to the net during the put-up and take-down process.) At dawn on the subsequent morning, these nets were opened. Birds were captured from dawn until sunup, or as late as 10:00 a.m. if the day was overcast and calm. A wind speed of "2" (wind felt on face, leaves rustle) or less on the Beaufort scale was necessary to capture birds. Higher wind speeds precluded bird captures. Optimum conditions included low light, fog, and very little wind.

Each captured bird was marked with a numbered, aluminum butt-end USFWS band. The following information was recorded for each bird: age, sex, date, time, net number, wing chord, tail length, fat deposits, skull ossification, weight, tarsus length, and length difference between the central and outer retrices. Age was determined as juvenile or adult by plumage and skull ossification. Sex was determined on adults by the presence of a brood patch (female) or cloacal protuberance (male). Nets were numbered in consecutive order as they were erected and their location was mapped. Wing chord (unflattened) was measured to the nearest 0.5 mm using a rule with an end stop. The difference between the central and outer retrices was measured with dividers.

During the course of the banding period, I mapped the territory of each singing male in relation to habitat landmarks and other males. This identified the breeding male population on the site.

RESULTS

The capture data of 87 Henslow's Sparrows are summarized in Table 1. Though my target species was the Henslow's Sparrow, I also banded Grasshopper and Savannah sparrows that were captured incidentally. See Tables 2 and 3 for age and sex data on these two species.

Table 1. Age and sex of Henslow's Sparrows banded from 1994 through 1997.

Year	AHY Male	AHY Female	AHY U	HY U	Total	Banding Dates	# of Days Banding	Net Hours
1994	6	1	1	8	16	7/14-8/03	14	353
1995	7	3	0	8	18	6/14-7/21	13	143
1996	14	3	0	14	31	7/10-8/09	15	278
1997	10	6	0	6	22	7/11-8/06	15	376

AHY = After-hatching-year or adult
HY = Hatching-year or juvenile
U = Unknown sex

Table 2. Age and sex of Grasshopper Sparrows banded from 1994 through 1997.

Year	AHY Male	AHY Female	HY U	Total
1994	4	3	7	**14**
1995	2	0	3	**5**
1996	2	1	7	**10**
1997	3	0	5	**8**

AHY = After-hatching-year or adult
HY = Hatching-year or juvenile
U = Unknown sex

Table 3. Age and sex of Savannah Sparrows banded from 1994 through 1997.

Year	AHY Male	AHY Female	AHY U	HY U	Total
1994	1	1	2	2	**6**
1995	1	0	0	1	**2**
1996	3	1	0	7	**11**
1997	0	0	0	10	**10**

AHY = After-hatching-year or adult
HY = Hatching-year or juvenile
U = Unknown sex

Five adult male Henslow's Sparrows returned to their banding site. These data are presented in Table 4.

Table 4. Adult male Henslow's Sparrows return to banding site.

USFWS Band No.	Banding Date	Recapture Date	Approx. Distance from Prior Year's Banding Location
#1710-81329	7/17/95	7/30/96	165m
#1710-81342	7/18/96	7/12/97	56m
#1710-81346	7/23/96	7/16/97	60m
#1710-81347	7/24/96	7/22/97	100m
#1710-81326	7/13/95	8/06/97	86m

The breeding male population was 15 in 1994, 15 in 1995, 21 in 1996, and 19 in 1997.

An adult male Grasshopper Sparrow was captured on 1 June 1995, that had been banded on 26 July 1994 as an adult bird. A different male Grasshopper Sparrow was captured on 17 July 1996 that had been banded also on 1 June 1995 as an adult bird. In addition, on 20 June 1996 I spotted three Grasshopper Sparrows with bands.

See Table 5 for a comparison of weights and wing chord measurements between Henslow's Sparrows, Grasshopper Sparrows, and Savannah Sparrows.

Table 5. Comparison of weight and wing chord measurements for Henslow's Sparrows (HESP), Grasshopper Sparrows (GRSP), and Savannah Sparrows (SAVS).

	Weight				Wing Chord				
Species	Range, mm	Average	Stand. Dev.	N	Range, mm	Average	Stand. Dev.	N	Age
HESP	11-14	12.6	0.7	35	49.5-55	52.4	1.31	37	**AHY M**
	11-15	12.8	1.25	13	47.5-53	50.6	1.63	13	**AHY F**
	-	-	-	-	-	51.0	-	1	**AHY U**
	10-13	11.3	0.67	36	47-54	50.7	1.58	36	**HY U**
GRSP	16-18	17.1	0.68	9	59-63.5	60.9	1.16	11	**AHY M**
	11-18	14.5	4.95	2	50-60	56.6	4.53	4	**AHY F**
	14-17	15.3	1.04	20	52-61	58.0	1.96	22	**HY U**
SAVS	17-19	18.3	0.96	4	66-69	67.2	1.10	5	**AHY M**
	16-16	16.0	0	2	62-62.4	62.2	0.28	2	**AHY F**
	16-17	16.5	0.71	2	64-66	65.0	1.41	2	**AHY U**
	14-20	17.1	1.38	18	62-70	66.2	2.37	19	**HY U**

AHY = After-hatching-year or adult
F = Female
HY = Hatching-year or juvenile
M = Male
U = Unknown

I measured the difference between the outer retrix and the central retrix on all individuals. This average measurement for Henslow's Sparrows was 8.7 mm on adults and 10.8 mm on juveniles. On the Grasshopper Sparrow, the central retrix often equaled the outer retrix in length, but at most measured 6 mm difference. This measurement on the Grasshopper Sparrow averaged 1.8 mm difference.

DISCUSSION

The return of a previously banded adult male in 1996 to its banding site was the first documentation that at least some Henslow's Sparrows exhibit breeding site fidelity. This was further supported by the four birds recaptured in 1997 that had been banded in 1995 and 1996. Considering the small number (six) of Grasshopper Sparrows banded in 1994 and 1995 and the number of returns (two) and banded singing male sightings (three) in 1996, it seems that a substantial percentage of these birds are exhibiting site fidelity. Delaney et al. (1992) observed 45% of the male Grasshopper Sparrows banded in prior years on territory in succeeding years. The closely related Henslow's Sparrow, on the other hand, appears to have a lower percentage of birds returning to their breeding grounds.

Capturing these birds proved to be very difficult. I captured six out of 15 adult male Henslow's Sparrows the first year and seven out of 15 the second year. No previously banded bird was recaptured that year. Considering I had captured less than half the population of singing males, and that some mortality had surely occurred over the intervening year, it was inconclusive whether the sparrows exhibited breeding site fidelity based on those two years' efforts. In 1996 I refined my capture techniques to the point of capturing two-thirds of the male population, 14 out of 21. Of these, one was a returned bird. In 1997 I captured nearly three-fourths of the male population, 14 out of 19. Four of these were previously banded birds. Although the percentages are not overwhelming, at least some Henslow's Sparrows exhibit site fidelity.

I measured the difference between the central retrix and outer retrix because the description in Roberts (1955) states that the outer tail feather on each side is nearly one-half inch shorter than the central ones on the Henslow's Sparrow. This characteristic readily distinguished the Henslow's Sparrow from the Grasshopper Sparrow. For those who handle very few of either species, this is a good identification clue. These two species can appear quite similar when looking at an adult Grasshopper and a young Henslow's and vice versa.

I recaptured no juvenile bird that had returned to its natal site.

Although unable to reach a definite conclusion, some factors led me to believe that some Henslow's Sparrows raise two broods per breeding season. Males sing on territory from mid-May through mid-August. Their territories do not seem to move significantly, and they certainly have enough time to raise two broods. Hyde (1939) determined the incubation period of Henslow's Sparrows to be ten or eleven days. Maryland egg dates range from 10 May to 2 July (Robbins and Blom 1996). I captured one hatching-year (HY) bird with a yellow gape on 22 July 1997 and made the following journal note: "looks as if he's just out of the nest." Another HY bird captured on 22 July 1994 had its tail in sheath. These factors suggest double brooding, but do not constitute proof.

I was hoping to capture HY birds near the end of June, but was unable to do so. In fact, capturing any bird in June was nearly impossible. In 1995 I did open the nets five days in June. I captured only one bird, a female with a brood patch on 14 June. (On 20 July she was recaptured in the same location with the brood patch bare of feathers and skin wrinkled, but not swollen and red.) The earliest dates of capture for a HY bird were 22 July in 1994, 12 July in 1995, 18 July in 1996, and 16 July in 1997. More evidence must be collected before concluding that double brooding is occurring.

The behavior of the males regarding their territories changed throughout the breeding season. Attempts to capture birds during June caused the males to shift their territories. I soon discontinued my efforts as I wanted to disrupt the breeding birds as little as possible. During July the males were quite tenacious to their territory, seemingly unbothered by my presence and that of the nets. Early in August males began singing from locations that had not been occupied previously . They would sing for three or four days and then aban-

don that territory. Some males, though, did not seem to budge from their territories from early May through mid-August. Color banding these birds to observe territory shifts would be an interesting study.

So much yet needs to be known about this tiny, secretive bird. Do juveniles return to their natal sites? Are adults returning to their breeding grounds on a consistent basis and, if so, what percentage? Five Henslow's Sparrows showing nest site fidelity is not overwhelming evidence that the species as a whole does so, but I think it is a significant finding when contemplating habitat conservation.

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