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(Inland)

Characteristics of American Woodcock Wintering in Eastern North Carolina

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Introduction

The American Woodcock (*Scolopax minor*) is a migratory bird that breeds in eastern North America and winters in the southeastern United States (Sheldon 1971). Beginning in 1975, studies surveyed the sex and age structure, and determined the migratory habits, of North Carolina's wintering population of woodcock (Stamps and Doerr 1976, Connors and Doerr 1982). Connors and Doerr (1982) found (1) that juvenile males made up the largest percentage of the winter population and (2) that these wintering birds came from numerous places in the Atlantic flyway throughout the northeastern U.S. and southeastern Canada.

This paper expands on the results of earlier studies which reported results from 1975 to 1978. We report additional information on the population structure and migratory habits of birds banded in Hyde County, North Carolina, during the period 1975-1982. The changes in the age and sex structure of a wintering population over time and how this population structure differs from that revealed by South Carolina data are discussed. We also present new information on the migrational habits of woodcock wintering in North Carolina. Finally, this paper presents infor-

mation, based on band recoveries and radiotelemetry data, showing daily and annual site fidelity demonstrated by this wintering population. A cautionary note on the radio-transmitter harness is also included.

Methods

Woodcock detected by eyeshine in soybean fields at night using a 6-volt headlamp were captured with long-handled nets (Glasgow 1958). Fields were systematically searched by a pair of workers moving perpendicular to the cultivation rows. The sex and age of each captured woodcock were determined by wing plumage characteristics (Martin 1964) and its weight and field location were also recorded. Each bird was banded with a U.S. Fish and Wildlife Service band and released.

Woodcock weights were analyzed as an index body condition using Analysis of Variance and Duncan's Multiple Range procedures. Sex and age structures of the population between years were analyzed using a chi-square contingency table. All analyses were conducted at the 0.05 level of significance using the Statistical Analysis System (Helwig and Council 1979).

Five woodcock were outfitted with radio-transmitters to determine the distance woodcock traveled when moving between nocturnal and diurnal habitat and to determine the daily regularity of these movements on the study area. The location of each bird was determined before and after crepuscular periods each day and at midpoints between these periods. Woodcock locations were plotted on large-scale aerial photographs and later surveyed on the ground.

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Results and Discussion

During 39 banding attempts covering 5 seasons (December through March, 1978-83) 577 woodcock were captured on the study area near New Holland, North Carolina (Table 1). Of these, 476 were banded and released. In previous studies (1975-78) 1184 birds had been banded (Stamps and Doerr 1976, Connors and Doerr 1982); therefore, 1660 woodcock were banded and released on the study area from 1975 to 1983.

Age and Sex Composition

The age and sex composition of populations of woodcock captured during the years 1978-83 remained relatively constant from year to year. Juvenile males were the predominant group in the wintering population on the study area (Table 1). The large percentage of juvenile males (42%) is consistent with reports from other studies conducted on migration routes in New Jersey (Riefenberger and Ferrigno 1970) and on wintering areas in Louisiana (Martin et al. 1969, Britt 1971) and North Carolina (Connors and Doerr 1982). We found approximately equal numbers of adult males, adult females, and juvenile females (Table 1).

Table 1. Age and sex distribution of woodcock captured near New Holland, Hyde County, North Carolina.

Season	Adult Females	Juvenile Females	Adult Males	Juvenile Males	Total (%)
1978-79					
Number	9	8	17	15	49
Percent	18.4	16.3	34.7	30.6	(8.5)
1979-80					
Number	34	68	41	115	258
Percent	13.2	26.4	15.9	44.6	(44.7)
1980-81					
Number	39	42	57	92	230
Percent	17.0	18.3	24.8	40.0	(39.9)
1981-83					
Number	4	8	6	22	40
Percent	10.0	20.0	15.0	55.0	(6.9)
Total (%)	86 (15.0)	126 (21.8)	121 (21.0)	244 (42.3)	577 (100)

In two South Carolina coastal studies, however, a predominance of female birds was found by Pace and Wood (1979) and Ingram and Wood (1983) (66% and 71%, respectively). This high percentage of females may reflect the fact that the South Carolina birds were from a diurnal hunting sample, whereas the North Carolina birds were live trapped at night in agricultural fields. Differences in collection methods, habitats, and time of collection could account for these variations in sex ratios. Sexually differential migrational rates could also explain the differences between the North and South Carolina studies. Male woodcock may winter farther north than females in order to be closer to the breeding grounds when migration occurs, thus enabling them to arrive on the breeding grounds earlier than females. Males could then compete for singing grounds and establish territories so that when the females arrive, breeding can proceed. This phenomenon has been observed in many species of passerine in North America and Europe, such as the Red-winged Blackbird (*Agelaius phoeniceus*), Ortolan Bunting (*Emberiza hortulana*) (Welty 1975), and Lapland Longspur (*Calcarius lapponicus*) (West et al. 1968).

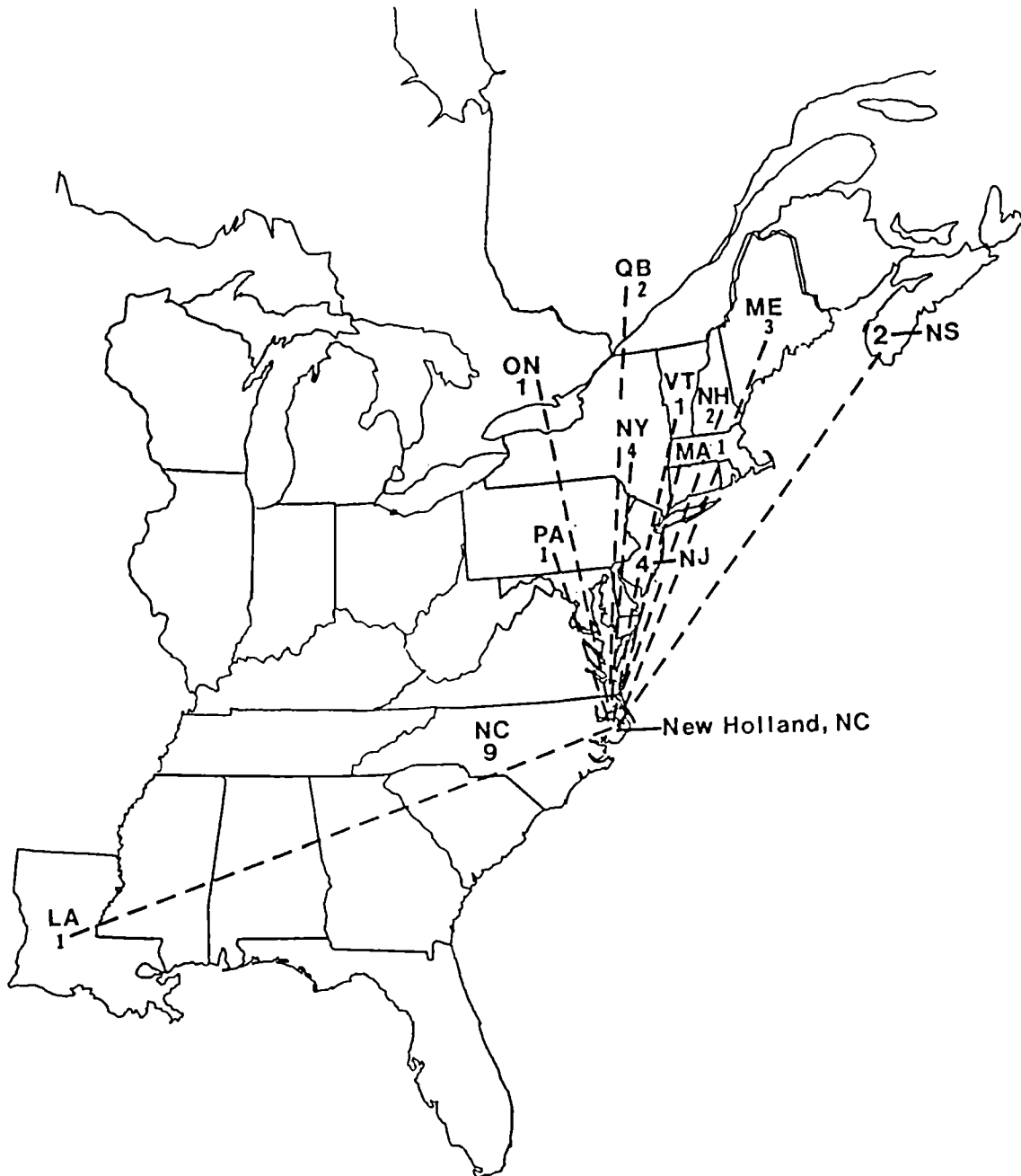
Band Recoveries

Returns of 17 bands during the period 1975-78 were reported by Connors and Doerr (1982). Since 1978, 14 more returns have been received for a total of 31 of 1660 birds banded and a return rate of 1.9%.

This low rate of recovery is somewhat disappointing but can be partially explained by the ages of the woodcock banded in North Carolina. The age distribution of birds banded and released on the North Carolina study area was approximately 64% juvenile and 36% adult (Table 1). However, our band recovery data indicated that the most band recoveries (82%) were from birds banded as adults. Since only 36% of all birds banded on the North Carolina study area were adults, a high percentage of adult recoveries would explain the low overall recovery rate (1.9%) we experienced. Without additional data we cannot determine reasons for the low recovery rate for birds banded as juveniles. However, the most likely explanations would seem to be low survival of North Carolina juvenile birds moving into northern breeding areas or dilution of North Carolina juvenile birds after reaching northern breeding areas with a large number of adults from other southern states.

The band recoveries indicated, as other authors have suggested (Krohn and Clark 1977, Wishart 1977, Coon et al. 1978, Connors and Doerr 1982), that birds on our study area generally use the Atlantic flyway (Fig. 1). It appears that the study area along the North Carolina coast is an important wintering area for breeding birds from the northeastern United States. Other locations along the southeastern coast of the United States may also serve as primary wintering areas.

Figure 1. Number and distribution of band recoveries in North America from woodcock banded near New Holland, North Carolina



Connors and Doerr (1982) received no returns from points farther south than North Carolina. In the current study one band was returned from Louisiana (Fig. 1), indicating some southward movement of birds banded in North Carolina. This bird, banded in the Piedmont region of North Carolina one year before it was shot, could have migrated north for one breeding season then returned to a different wintering area in Louisiana using the Atlantic or Mississippi flyway.

Recaptures

Data from birds recaptured in the same year they were originally banded suggest that they tended to stay in the same area where they were first captured (Table 2). In this study, encompassing 7 fields, 90% of same-season recaptures occurred in the same field where the bird was originally banded. This rate was significantly higher than those found in the earlier study (60-84%, Connors and Doerr 1982).

Daily Movements

Since the number of recaptures was low, additional information on site fidelity was achieved using radiotelemetry. The radio package allowed monitoring of daily movements. We fitted 5 woodcock with radio packages; of these, 2 were never contacted again, 2 died, and 1 provided data. This woodcock was monitored for 21 radio-days. Each day was spent within a 1.25-ha area in typical diurnal woodcock habitat: wet, thickly vegetated woodlands (Sheldon 1971). Each night was spent within a 4.0-ha area in the same cutover soybean field—the closest field to the diurnal habitat. The average distance the bird moved between nocturnal and diurnal habitat was 0.5 km, with a range of 0.075 to 0.75 km.

Table 2. Recaptures of woodcock in fields near New Holland, Hyde County, North Carolina.

	Same field	Distance		Original band location undetermined	Total
		<0.5 km	>0.5 km		
Same season	10	1	0	0	11
Next season	1	1	0	3	5
Total	11	2	0	3	16

While conducting the radiotelemetry portion of this study we encountered a problem with the harness system that should be documented. The system designed by Godfrey (1970) consisted of a surgical latex rubber "backpack" harness. In 3 of 5 cases, the latex straps split after about 10 days. This happened to 3 of our 5 telemetered birds. Usually, only one side of the harness broke, leaving the transmitter package attached to only one wing. This poor distribution of weight prevented flight. The basic design as described by Godfrey is sound, but a more durable lightweight material than surgical rubber should be used for harness construction.

Woodcock Weights

For all ages and both sexes combined, there was no significant year-to-year variation in woodcock weights (Table 3). The average weight was lowest during the 1978-79 season (166.7) and highest during the following season (180.4).

When woodcock weights were compared by year, sex, and age, however, females were always significantly heavier than males. Pettingill (1939) first documented that female woodcock are heavier than males. Weights of juvenile and adult female woodcock did not change significantly from one season to the next (Table 3). Among male birds, only juveniles differed significantly in weight between years. Juvenile males were significantly heavier in the 1979-80 season than in the 1980-81 season.

In summary, this study showed that for woodcock captured in the North Carolina coastal plain, juvenile males made up the largest percentage of the wintering population. Birds banded in North Carolina used the Atlantic Flyway to move from the breeding grounds in northeastern North America to wintering grounds in the southeastern United States. Woodcock wintering in North Carolina showed strong intraseason site fidelity.

Table 3. Woodcock weights by year, sex, and age.

Season	Adult Females	Juvenile Females	Adult Males	Juvenile Males
1978-79	193.3 ± 8.7 ¹ (6) ²	191.8 ± 3.6 (6)	154.6 ± 2.0 (15)	157.5 ± 7.3 (14)
1979-80	204.9 ± 3.6 (34)	203.9 ± 2.3 (68)	164.1 ± 2.7 (41)	165.5 ± 1.2 (115)
1980-81	203.1 ± 3.3 (32)	201.1 ± 3.7 (28)	166.7 ± 3.2 (47)	155.9 ± 2.2 (70)
1981-83 ²	197.3 ± 10.3 (4)	202.3 ± 4.4 (8)	162.0 ± 3.6 (5)	162.3 ± 2.5 (22)

¹Mean weights (g) ± standard error.

²Sample size.

Acknowledgments

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(Eastern)

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