South Carolina Woodcock Wing Survey (1982–85)

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Abstract: The 1982–85 South Carolina woodcock (*Scolopax minor*) wing survey yielded 683 wings with varying amounts of information on date and county of collection, type of hunting being done, and habitat where the bird was found. Age and sex information was obtained from the U.S. Department of the Interior Fish and Wildlife Service on another 176 woodcock harvested in South Carolina as well as the total harvest in the eastern region for the 1982–85 period. The 1982–85 South Carolina harvests were composed of 19.7% adult males, 29.8% adult females, 23.5% immature males, and 27.0% immature females. Age and sex characteristics of the woodcock harvest in South Carolina were similar to those for the entire eastern region although significant differences were found between the Coastal Plain and Piedmont regions within the state. Apparently, about 24% of the South Carolina woodcock harvest occurs in the first 20 days of the season and about 37% occurs in the last 20 days. These data give insight for predicting the consequences of reducing the woodcock season length from 65 to 45 days.

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U.S. Department of the Interior, Fish and Wildlife Service (USFWS) records have indicated substantial declines in the American woodcock (*Scolopax minor*) population during the past 2 decades in the eastern region management area (coincides with Atlantic Flyway) (Tautin 1984). These changes have been sufficiently adverse to cause the Service to propose lowering the daily bag limit from 5 to 3 birds and decreasing the season length from 65 to 45 days throughout the region (Sparrowe and Tautin 1985). Justification for the changes was unchallenged by any state in the region, and the plan is being implemented for the 1985–86 hunting season (J. Tautin, pers. commun.).

Wood et al. (1985) reviewed available research and management information and evaluated the status of the woodcock as a game bird in the southern United States. They hypothesized that while woodcock hunting had not been an important sport in the South, either historically or in recent years, the southern harvest conceivably could increase in the future due to increased awareness of woodcock abundance in certain habitats, demographic changes in human populations, and dramatic

declines in quail hunting opportunities. They recommended that closer attention be given woodcock on the wintering grounds where in the past, it virtually has been ignored by both federal and state management agencies.

The purposes for the work reported here were to determine the age and sex characteristics of the South Carolina woodcock harvest, the chronology of the harvest, and if the age and sex data might be biased by type of hunting or habitat type. In addition, hopefully, this survey can be a prototype for future woodcock wing survey efforts in the South.

Methods

South Carolina encompasses 77,400 km^2 of land which is 65% forested. The Coastal Plain physiographic province accounts for 65% of the state's land area and 66% of the state's forest land. The remainder is in the Piedmont (Sheffield 1979). Ingram and Wood (1982) estimated that about 906,000 ha of wetland forest was suitable habitat for woodcock in coastal South Carolina.

Cooperators from the hunting public were solicited for the 1982–83 and 1983–84 seasons through news releases by Clemson University that were sent to all South Carolina newspapers in late September, announcements in publications of the South Carolina Wildlife and Marine Resources Department in early November, and articles in the South Carolina Wildlife Federation's monthly newspaper. In addition, at the end of each season, each cooperator was asked if he would be willing to participate the next year and would supply names of prospective cooperators. For the 1984–85 season, only cooperators from previous years who had indicated a willingness to continue their assistance were contacted.

In mid-November cooperators were sent packages containing the following materials: 1.) instruction sheet for selecting, detaching, and labeling 1 wing from each harvested woodcock, recording data pertinent to the harvest, storage, and mailing procedures; 2.) diagram of woodcock wing showing proper position for label placement and indicating which feathers were critical for age and sex determination; 3.) 3 data sheets (10 lines per sheet) which provided labeled columns to indicate date and county of collection, habitat type (wetland woods, dryland woods, open land, or edge), and type of hunting being done (woodcock, quail, waterfowl, other); 4.) an indelible ink, felt-tipped pen for labeling wings, 5.) 30 blank, adhesive wing labels, 6.) 3 self-addressed, stamped 15 × 30 cm manila envelopes for mailing wings and data.

To increase sample size, data collected by the USFWS in their woodcock wing survey made up of waterfowl stamp buyers were obtained. Appropriate adjustments were made in instances where a cooperator participated in both surveys.

Comparisons were made between age and sex class data from the South Carolina survey with the USFWS data for the entire eastern region and the southern portion of the eastern region. The latter was defined as including Virginia, North Carolina, South Carolina, Georgia, and Florida. All comparisons of proportions of the

harvest in various age and sex classes between physiographic provinces and regions were made using 2-celled, chi-square tests (Steel and Torrie 1960). Significance for all tests was set at $P < 0.05$.

Results

Considering the relative paucity of woodcock hunters in South Carolina, the response to solicitation for wing survey cooperators appeared to be good (Table 1). Interestingly, in 1983–84 the numbers of cooperators increased by 17%, but the numbers of counties in the state dropped by 18% and number of wings collected declined by 9%. In 1984–85, numbers of participants declined by 53%, number of counties declined by 29%, and number of wings by 20%. The sharp annual changes in numbers of cooperators accompanied by more modest changes in numbers of wings collected suggested that the hunters who were constant in continuing their cooperation were the ones who generally harvested most of the woodcock.

Data on 859 wings suggested that about 66% of the 1982–85 woodcock harvest occurred in the Coastal Plain (Table 2). Comparisons of age and sex class proportions between physiographic provinces indicated that the Coastal Plain harvest contained significantly lower proportions of adult males and adult females and higher proportions of immature males and immature females than the Piedmont. Proportions by sex class alone were not significantly different.

Age and sex class values varied to a minor extent among years in the Coastal Plain. In the Piedmont, variation in the adult female and immature male values were large, although relatively small changes occurred in the other classes. Variation in these values for the state followed a pattern similar to that of the Piedmont. This variation may have been influenced by the notably different temperature regimes in December (National Climatic Data Center 1982, 1983, 1984). Mean reported tem-

Table 1. Numbers of cooperators, counties represented, and wings collected in the South Carolina woodcock wing survey, 1982–85.

Season	Number Cooperators	Number Counties	Number Wings
	Coastal Plain		
1982–83	13	13	173
1983–84	14	9	156
1984–85	8	6	145
	Piedmont		
1982–83	10	9	86
1983–84	13	8	79
1984–85	5	6	44
	State		
1982–83	23	22	259
1983–84	27	17	235
1984–85	13	12	189

Table 2. Estimated age and sex distribution among woodcock harvest in South Carolina, 1982–1985.

Season	Sample Size	Percentage			
		Adult Male	Adult Female	Immature Male	Immature Female
		Coastal Plain			
1982–83	217	17.1	24.4	27.6	30.9
1983–84	185	18.4	28.6	21.6	31.4
1984–85	169	16.6	25.4	26.0	32.0
1982–85	571	17.3	26.2	25.2	31.3
		Piedmont			
1982–83	97	24.7	27.8	32.0	15.5
1983–84	128	23.4	45.4	10.9	20.3
1984–85	63	25.4	34.9	20.6	19.1
1982–85	288	24.3	37.2	20.1	18.4
		State			
1982–83	314	19.4	25.5	29.0	26.1
1983–84	313	20.4	35.5	17.3	26.8
1984–85	232	19.0	28.0	24.6	28.4
1982–85	859	19.7	29.8	23.5	27.0

peratures from 72 weather stations across the state where 3.19° C and 4.01° C above normal for December 1982 and 1984, respectively, but 1.18° C below normal in 1983.

USFWS 1982–85 surveys for the entire eastern region estimated percentages of adult males, adult females, immature males, and immature females in the harvest to be 20.5% 29.0%, 26.8%, and 23.7%, respectively. In the southern portion of the eastern region these values were 18.2%, 28.4%, 30.8%, and 22.6%, respectively. South Carolina's harvest differed from that of the eastern region and the southern portion of the eastern region by having a significantly higher proportion of immature females and lower proportion of immature males.

Estimated age and sex ratios in the South Carolina survey revealed both substantial variation among years and between physiographic provinces (Table 3). Comparisons between the Coastal Plain and Piedmont areas for 1982–85 showed no significant difference in sex ratios among adults. All other comparisons between these areas resulted in significant differences. Of particular note were the sizes of the differences in the immature-to-adult, immature-to-adult female, and immature female-to-adult female ratios. Coastal Plain values for these characteristics were more than double the Piedmont values.

The 1982–85 South Carolina survey age and sex ratios were compared with those for the entire eastern region and the southern portion of the eastern region for the same period (Table 4). In comparison with the entire eastern region, the higher ratio of immature males-to-immature females for the region was the only significant difference. In comparison with the southern portion of the eastern region, South Carolina values were significantly higher for the immature male-to-immature female; and immature female-to-adult female ratios.

Table 3. Estimated age and sex ratios among woodcock harvested in South Carolina, 1982–1985.

	Ratios			
	1982–83	1983–84	1984–85	1982–85
	Coastal Plain			
Adult male : adult female	0.70	0.64	0.65	0.66
Immature male : immature female	0.90	0.69	0.81	0.80
Immature : adult	1.41	1.13	1.38	1.30
Immature : adult female	2.40	1.85	2.28	2.17
Immature female : adult female	1.26	1.09	1.26	1.20
	Piedmont			
Adult male : adult female	0.89	0.52	0.73	0.65
Immature male : immature female	2.07	0.54	1.08	1.09
Immature : adult	0.90	0.45	0.66	0.63
Immature : adult female	1.70	0.69	1.14	1.04
Immature female : adult female	0.56	0.45	0.55	0.50
	State			
Adult male : adult female	0.76	0.58	0.68	0.66
Immature male : immature female	1.11	0.64	0.86	0.87
Immature : adult	1.23	0.79	1.13	1.02
Immature : adult female	2.16	1.24	1.89	1.70
Immature female : adult female	1.02	0.76	1.02	0.91

In the 1982–85 period, the exact date of collection was reported for 495 wings; 359 were from the Coastal Plain and 136 from the Piedmont. Examination of the harvest in the first 20 days and the last 20 days of the season gave insight into some possible consequences of reducing the season length from 65 to 45 days. Although there were substantial differences between physiographic regions, the first 20 days accounted for 14.8% and 47.1% of the Coastal Plain and Piedmont harvests, respectively, the last 20 days accounted for 43.7% and 20.6% of the harvests

Table 4. Estimated age and sex ratios among woodcock harvested in the eastern region management area, 1982–1985. (Data courtesy J. Tautin, U.S. Department of the Interior, Fish and Wildlife Service, Office for Migratory Bird Management, Laurel, Md.).

	Ratios			
	1982–83	1983–84	1984–85	1982–85
	Entire Eastern Region			
Adult male : adult female	0.64	0.77	0.72	0.71
Immature male : immature female	1.10	1.13	1.17	1.13
Immature : adult	1.12	0.99	0.95	1.02
Immature : adult female	1.83	1.76	1.63	1.74
Immature female : adult female	0.87	0.83	0.75	0.82
	Southern Eastern Region			
Adult male : adult female	0.56	0.55	0.80	0.64
Immature male : immature female	1.58	0.98	1.50	1.36
Immature : adult	1.74	0.78	1.14	1.14
Immature : adult female	2.71	1.21	2.05	1.88
Immature female : adult female	0.95	0.61	0.82	1.26

in these respective regions. Also, January was important in the state harvests because January accounted for only 41.4% of the hunting days, but it accounted for 55.8% of the harvest.

In the 3-year survey, 76.0% of the wings collected were obtained when the cooperator primarily was hunting woodcock. Another 21.1% was collected by quail hunters. The significantly lower harvest rates for immatures, particularly immature females, collected during woodcock hunts was notable. Also, the contributions of quail hunters declined with each suceeding year of the study. Quail hunters contributed 28.1%, 25.0%, and 4.8% of the wings in the 1982–83, 1983–84, and 1984–85, respectively.

Finally, a check was made to detect the possibility of differential habitat utilization. If disproportionate occurrence of age and sex classes among habitats was present, it did not appear to influence the harvest data to any notable extent. All age and sex classes were harvested in all habitats in about the same proportion as they existed in the total harvest.

Discussion and Conclusions

Approximately 5% of the wings collected in the USFWS woodcock wing survey for the 1982–85 period in the eastern region came from southern states. Sparrowe and Tautin (1985) presented data collected by wildlife management agencies indicating that about 5.3% of the woodcock hunters and 8.4% of the eastern region harvest occurred in its southern portion. This relative paucity of woodcock hunters in the South has made the collection of harvest information very difficult. The USFWS has felt that the South was not harvesting enough woodcock to warrant increasing sampling effort. State wildlife management agencies have not considered the bird sufficiently important as a game species to warrant any more than incidental treatment in game harvest surveys.

On the other hand, Wood et al. (1985) using data from Tautin (1984) showed that in the eastern region both the mean adjusted average seasonal bag and mean annual breeding population indices for 1975–84 were each 26% below the respective values for 1965–74. The data base on woodcock harvest characteristics in northern areas is very large and appears to be sound. But if managers are to adequately address the problem of dramatic population declines in this species, then its biology throughout its geographic range must be understood, irrespective of level of importance as a game species.

The hunter survey has the particular strength of sampling over wide areas as opposed to sampling 1 primary location and designating it as representative. For instance, Ingram and Wood (1983) used the Francis Marion National Forest as a study area representing coastal South Carolina. Their most significant finding was the unusually high proportion of females in the woodcock population. A review of those data and more recent observations showed the following percentages of females: 1977–79, 66%; 1979–84, 71%; 1982–83, 59%; 1983–84, 53%; 1984–85, 45%. Percentages of females in hunter survey data for the Coastal Plain (Table 2)

were: 1982–83, 55%; 1983–84, 60%; and 1984–85, 58%. The latter is probably more representative of the true situation for the area because of the broader distribution of sampling points.

From the standpoint of immediate management needs, probably the most important result of this study was to approximate the chronology of the South Carolina woodcock harvest. The state has had a 65-day season for some years but is now being limited to 45 days by Federal restrictions. This study suggests that in the average season, about 78% of the woodcock harvest in the state occurs after December 15. About 56% occurs in January. Opening the season 20 days later than normal might reduce the harvest due to time restriction by about 20–25%. Closing the season 20 days earlier than normal might reduce the harvest by 30–40%.

Wood (1985) summarized hunting-effort data among woodcock hunter survey cooperators for 1983–85. In the first 20 days of the season, the percentages of total season man-hours expended and percentages of season flushes, respectively, were: 24.6% and 10.2%, 55.1% and 51.5%, and 32.5% and 19.9% for the Coastal Plain, Piedmont, and state, respectively. In the last 20 days these respective values were 26.9% and 40.0%, 17.4% and 16.7%, and 24.5% and 34.4%. In addition, 2.9 times more season man-hours of effort was expended and 3.2 times more season flushes were made in the Coastal Plain than in the Piedmont. South Carolina has elected to open the season 20 days later than normal. While the total state harvest may be reduced by 20–25%, it may be at the expense of reducing the Piedmont hunting effort and kill by 50–55% and 45–50%, respectively.

The disproportionate share of immature females collected by quail hunters was noteworthy in the study. While 21% of the overall harvest was accounted for by quail hunters, they accounted for 34% of the immature females. The primary reason for the situation appears to be that most of the woodcock shot by quail hunters were shot in the Coastal Plain where 31% of the population is composed of immature females.

Previous studies of woodcock populations in South Carolina (Pace and Wood 1979, Ingram and Wood 1983) have been criticized because they represented primarily wetland forest habitat. The information obtained in this study does not suggest any differential habitat utilization based on the location of the birds when they were first flushed. Based on the amount of information gathered on this aspect of the ecology of woodcock wintering in South Carolina, requests for habitat information could be deleted from future surveys.

Suggestions

An annual woodcock wing survey should be continued in South Carolina for the purpose of monitoring wintering population characteristics. In addition, the survey should undertake the identification of hunters who are sufficiently concerned about the resource to maintain records on flushing rates and daily bags.

It is unlikely that a practical method will be developed to estimate woodcock harvests in the state within reasonable confidence limits. On the other hand, trends

in wintering populations may be adequately reflected if a core of dependable cooperators among the hunting public can be developed. I suggest that information as to date, county of kill, and type of hunting being done accompany each wing collected in South Carolina in the future.

Other southern states, particularly those in the eastern region, should begin woodcock wing surveys. The current southern data base is so small that it does not lend itself to meaningful examination. Once instituted, wing surveys are simple, practical ways of obtaining valuable information.

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