

SOME PATTERNS OF WOODCOCK ACTIVITIES ON MAINE SUMMER FIELDS

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AMERICAN Woodcock (*Philohela minor*) wintering in Louisiana have long been known to concentrate at night in certain fields (Glasgow, 1958). During the fall, Pettingill (1936) noted woodcock flying at dusk into fields at Cape May, New Jersey. Not until the studies of Sheldon (1961) in Massachusetts were woodcock reported entering fields after sunset during summer months. Summer utilization of fields has since been found to occur over much of the species' breeding range, including West Virginia (Kletzly and Rieffenberger, 1967), New Brunswick (J. C. Baird and T. G. Dilworth, pers. comm.), and Wisconsin (L. E. Gregg, pers. comm.). Such widespread observations suggest that usage of clearings during summer nights is a characteristic behavior pattern of the species.

The activities of woodcock using these fields have not been well documented, although Sheldon (1961, 1967) presented some relevant information. The present paper results from a study undertaken in Maine during the summers of 1968 and 1969. Specifically, it documents the initiation, magnitude, and termination of summer field usage; timing of crepuscular flights; movements of birds between fields; and the age and sex composition of woodcock captured on Maine summer fields. While this paper does not specifically describe what woodcock do on fields at night, the data presented should be useful to persons desiring to locate and band woodcock on nocturnal fields.

METHODS

The fields studied were located in, or near, southern Penobscot County in central Maine. I made observations in 14 fields, with two of these, Rebel Hill and Sunkhaze, selected for intensive investigation. The areas studied were abandoned farm fields having a vegetative cover of grasses, hawkweeds (*Hieracium* spp.), and various species of woody plants, including meadow-sweet (*Spiraea latifolia*) and sweet-fern (*Comptonia peregrina*).

Rebel Hill and Sunkhaze, 5.0 and 4.5 hectares in size, were each visited at least two evenings a week during the spring of 1968 to determine when woodcock first remained on the fields throughout the night. Both fields were systematically searched after dusk at least once a week throughout the summer and fall by one to four, but generally two, observers walking parallel transects 4 to 7 meters apart. The locations of woodcock flushed were plotted on maps to document the distribution and number of birds found. Each observer carried a spotlight and 12 volt battery; some woodcock were captured with a long-handle net. Although only a small percentage of the woodcock found were captured and banded, these birds provided information on movements between fields. An account of the night-lighting technique is given by Rieffenberger and Kletzly (1967). Some birds were also captured in mist-nets while flying into fields, a method described by Sheldon (1960).

Observations of woodcock flying into fields during evenings were made in 1968 and 1969; morning observations of birds leaving fields were made in 1969. Crepuscular flights were observed at least once a week from July through October. The majority of these observations were made at Sunkhaze although evening flights were watched at 13 other fields; data on morning flights were recorded at four fields. The midpoint of an evening or morning flight was defined as the median between the time when woodcock were first and last seen flying over, alighting on, or departing from a field. Seasonal changes in the timing of crepuscular flights were studied by plotting midpoints of evening flights against time of sunset (EST) and midpoints of morning flights against time of sunrise. Midpoints were used in order to reduce the effect of an exceptionally late or early bird on the timing of an individual flight. Sunset and sunrise times came from the 1968 and 1969 editions of "The World Almanac."

In this paper, repeats are defined as woodcock recaptured between one and 150 days after initial banding (the length of the summer banding period); returns are banded birds that survived at least one winter before being recaptured by the same bander.

The age and sex composition of woodcock captured by personnel of the U. S. Bureau of Sport Fisheries and Wildlife was examined for the years 1968, 1969, and 1970. The age-sex information from central and southern Maine consisted of woodcock caught for the first time. However, as a relatively large percentage of the adults captured on the Moosehorn National Wildlife Refuge were banded in previous summers, it was necessary to include returns in the eastern Maine data. This paper includes only known age woodcock caught on Maine summer fields during June through September. The age and sex of these birds were determined by the methods described by Martin (1964). When age data were tabulated, subadults (second year birds) and adults (after second year) were combined as adults (after hatching year).

RESULTS

Seasonal activity pattern.—Woodcock established two singing grounds on Rebel Hill and five on Sunkhaze in the spring of 1968. The break between courtship activities and nighttime usage of fields by numbers of non-performing woodcock was indistinct. During the transition period, non-performing woodcock were associated with some of the courting birds but the significance of these associations is unknown. In 1968, numbers of woodcock first remained on fields throughout the night in the second week of June, when evening courtship flights were sporadic and nearly over for the season.

The number of woodcock flushed from the study fields varied between nights (Fig. 1). The average number of woodcock flushed per search from Rebel Hill was 8.4 (range: 3–16) in 1968 and 3.6 (1–9) in 1969; the corresponding figures for Sunkhaze were 10.5 (0–34) and 5.7 (1–13).

The number of woodcock found on nocturnal fields decreased in late October and birds were absent during the first week of November (Fig. 1).

Crepuscular activity pattern.—Although the majority of woodcock entered fields by flying, it is believed that a few birds walked from adjacent covers. Woodcock were found on fields throughout the night regardless of weather. Both early and late in the season a few woodcock left fields immediately, or

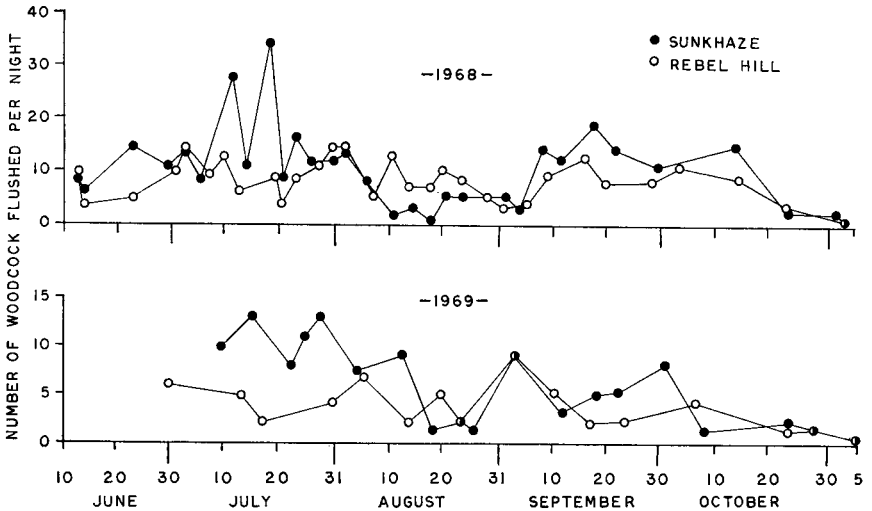


FIG. 1. Seasonal usage of summer fields by woodcock, 1968 and 1969.

within a few minutes after alighting. It could not be determined whether these birds landed in another section of the field, a different field, or returned to their diurnal covers. Woodcock commonly performed "courtship" flights over fields, both when entering in the evening and leaving in the morning (see Sheldon, 1961). During 47 evenings, semi-courtship flights were heard during six evenings (13 per cent); "courtship" flights were also noted during two of 18 mornings (11 per cent). In addition, woodcock sometimes gave the *peent* call after alighting or just prior to leaving fields. During 47 evenings and 18 mornings, *peents* were heard during six evenings and two mornings (13 per cent and 11 per cent). *Peents* and semi-courtship flights did not necessarily occur during the same flight periods. However, both types of behavior appeared to occur with approximately the same frequency during the crepuscular periods throughout the summer. One morning, calls resembling distorted *peents* were also heard. These may have been the "cat wheeze" call believed to be made by females (Sheldon, 1961).

The timing of crepuscular flights at Sunkhaze appeared identical to that on other, less intensively studied, fields and thus flight data taken at all 14 summer fields were combined. Forty-seven evening flights, each involving more than one woodcock, averaged 13.6 ± 0.9 ($\bar{X} \pm \text{S.E.}$) minutes in length, while 18 morning flights averaged 14.5 ± 1.2 minutes in duration (Table 1). Thus, when entering and leaving summer fields, woodcock were active for relatively short and similar periods of time.

TABLE I
BEGINNING AND ENDING OF CREPUSCULAR FLIGHTS OF WOODCOCK AS RELATED TO SUNSET, SUNRISE, AND CLOUD COVER

	Total Overcast $\bar{X} \pm S.E. (n)$	Clear $\bar{X} \pm S.E. (n)$	All Cloud Conditions $\bar{X} \pm S.E. (n)$
<i>Evening Flights (1968 & 1969)</i>			
Minutes Between Sunset and Start of Flight	22.9 \pm 1.8 (10)	26.8 \pm 1.0 (27)	26.0 \pm 0.8 (47)
Minutes Between Sunset and End of Flight	36.3 \pm 2.5 (10)	40.2 \pm 1.7 (27)	39.6 \pm 1.3 (47)
Total Length of Evening Flight	13.4 \pm 2.2 (10)	13.4 \pm 1.2 (27)	13.6 \pm 0.9 (47)
<i>Morning Flights (1969)</i>			
Minutes Between Start of Flight and Sunrise	47.2 \pm 5.6 (5)	50.7 \pm 3.4 (10)	47.9 \pm 2.5 (18)
Minutes Between End of Flight and Sunrise	33.0 \pm 4.6 (5)	35.4 \pm 2.3 (10)	33.4 \pm 1.9 (18)
Total Length of Morning Flight	14.2 \pm 3.3 (5)	15.3 \pm 1.5 (10)	14.5 \pm 1.2 (18)

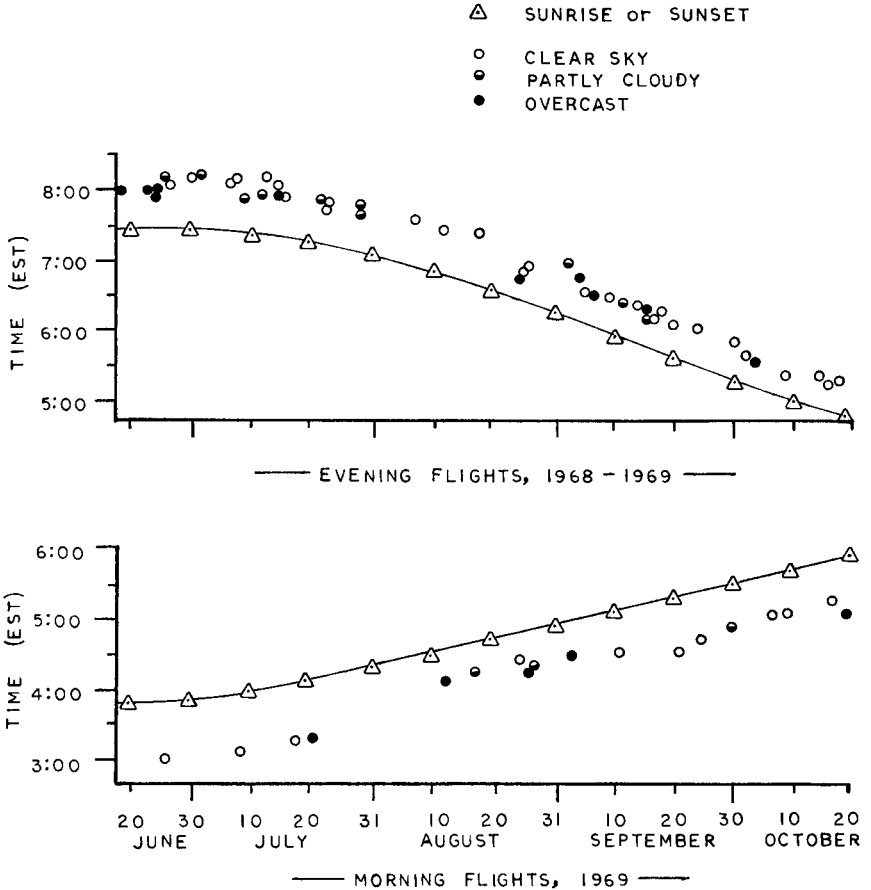


FIG. 2. Midpoints of woodcock crepuscular flights as related to sunset and sunrise.

The relationship between evening flights and sunset, and morning flights and sunrise, suggests that light intensity is the triggering stimulus (Fig. 2). The average times that flights into fields began and ended were later on clear than on totally overcast evenings (Table 1). Similarly, average times that flights from fields commenced and terminated were earlier on clear than on totally overcast mornings (Table 1). However, neither of these differences was statistically significant (t -test, $p > 0.05$).

Movements and distribution.—During 1968 banding operations in central Maine, one return and 28 repeats were caught. Of these, only four birds were recaptured as repeats on a field other than where banded. The distance between fields of initial and subsequent capture averaged 2.2 (0.8–4.8) kilome-

TABLE 2
PERCENTAGE (SAMPLE SIZE) AGE-SEX COMPOSITION OF WOODCOCK CAPTURED ON MAINE SUMMER FIELDS ACCORDING TO LOCATIONS AND YEARS, 1968-1970

Geographic Location	Year of Capture	Age-Sex Classes ¹						Totals
		HY		AHY		Male	Female	
		Male	Female	Male	Female			
<i>Eastern Maine</i> ²	1968	49 (61)	23 (29)	13 (16)	15 (18)		100 (124)	
(Moosehorn National Wildlife Refuge)	1969	44 (98)	29 (65)	14 (32)	13 (28)		100 (223)	
	1970	37 (40)	33 (36)	12 (13)	18 (20)		100 (109)	
<i>Central Maine</i>	1968	—	—	—	—		—	
(Penobscot River Valley)	1969	39 (101)	28 (74)	11 (29)	22 (58)		100 (262)	
	1970	40 (109)	30 (79)	12 (33)	18 (47)		100 (268)	
<i>Southern Maine</i>	1968	—	—	—	—		—	
(Sheepscot Lake Region)	1969	—	—	—	—		—	
	1970	29 (72)	30 (74)	18 (44)	23 (56)		100 (246)	
Combined:	1968-70	39 (481)	29 (357)	14 (167)	18 (227)		100 (1,232)	

¹ HY = hatching year; AHY = after hatching year (includes SY and ASY birds).
² Includes returns.

ters. In 1970, five returns and eight repeats were captured in central Maine. All returns were recaptured on the same fields of initial banding; although these data are limited, they are significant since they indicate migrational homing tendencies. Of the eight repeats, one was retaken on a field adjacent to where the bird was caught. Although movements of woodcock between summer fields did occur, the majority of repeats were taken on the same field where originally banded. Thus, these data suggest that flights to and from summer fields were essentially local movements.

Woodcock were not flushed from all portions of summer fields with equal frequency. When used and unused parts of fields were compared, it became apparent that areas of low ground vegetation interspersed with taller cover were used more frequently and heavily than unbroken stands of tall, densely growing ground cover.

Age-sex composition.—The age-sex composition of 1,232 woodcock captured on Maine summer fields varied between locations, and between years within locations (Table 2). The overall age composition was 68 per cent immatures and 32 per cent adults. Hatching year males were caught more commonly on summer fields than hatching year females (39 vs. 29 per cent), while in the older class females were slightly more abundant than males (18 vs. 14 per cent) (Table 2).

The age-sex composition also varied between methods of capture (Table 3). Of the 296 birds mist-netted, 78 per cent were immatures while 22 per cent were adult; of the 936 woodcock which were captured by night-lighting, 64 per cent were immatures and 36 per cent were adults. On a percentage basis, both methods captured more immature males than immature females and more adult females than adult males (Table 3).

DISCUSSION

The hatching peak for woodcock in eastern Maine occurs in mid-May (Mendall and Aldous, 1943). At the age of three to four weeks, young woodcock apparently can fly as well as adults (Pettingill, 1936; Mendall and Aldous, 1943). Thus, the initiation of summer field usage in mid-June apparently coincides with the time most young birds would reach full flight capabilities.

Much of the information on seasonal patterns was based on the assumption that counts of flushed woodcock gave a reasonable estimate of the number of birds present. Many variables undoubtedly influenced the reliability of these estimates. On rainy nights, birds flushed less readily than on clear nights. Thus, fields had to be searched more thoroughly during or shortly after a rain. It was possible for flushed birds to alight in an unsearched section of the field and be counted a second time in that area. Thus, flushed woodcock

TABLE 3
PERCENTAGE (SAMPLE SIZE) AGE-SEX COMPOSITION OF WOODCOCK CAPTURED ON MAINE
SUMMER FIELDS ACCORDING TO CAPTURE METHODS AND LOCATIONS, 1968-1970

Method of Capture	Age-Sex Classes ¹				Totals
	HY		AHY		
	Male	Female	Male	Female	
<i>Mist-netted</i>					
Eastern ²	40 (65)	37 (61)	12 (20)	11 (17)	100 (163)
Central	48 (59)	31 (38)	8 (10)	13 (16)	100 (123)
Southern	60 (6)	10 (1)	10 (1)	20 (2)	100 (10)
Combined:	44 (130)	34 (100)	10 (31)	12 (35)	100 (296)
<i>Night-lighted</i>					
Eastern ²	46 (134)	23 (69)	14 (41)	17 (49)	100 (293)
Central	37 (151)	28 (115)	13 (52)	22 (89)	100 (407)
Southern	28 (66)	31 (73)	18 (43)	23 (54)	100 (236)
Combined:	37 (351)	27 (257)	15 (136)	21 (192)	100 (936)

¹HY = hatching year; AHY = after hatching year (includes SY and ASY birds).

²Includes returns.

were followed with spotlights, and each bird which appeared to have landed in an unsearched portion of a field was not counted when reflashed.

Disturbance caused by investigators searching a summer field probably influenced the number of woodcock using it. Sheldon (1961) believed that continuous mist-netting reduced the number of woodcock flying into summer fields. Glasgow (1958) noted a sharp decline in the number of birds using winter fields which were night-lighted more than twice a week. Weather, soil moisture, vegetative cover, and other unmeasured variables may also cause nightly and seasonal fluctuations in the number of woodcock using fields.

Sheldon (1961) reported that evening flights seldom exceeded 15 minutes. Glasgow (1958) observed that about 50 per cent of the birds arrived on winter fields within a 10 to 15 minute period. The present study, which found that the average length of evening flights was approximately 14 minutes, is in close agreement with these past investigations.

Sheldon (1961) found that woodcock began flying into summer fields one-half hour after sunset at the same light intensity that evening courtship commenced in the spring. Working on winter fields, Glasgow (1958) also found birds arriving about 30 minutes after sunset. In the present study the start of evening flights averaged approximately 26 minutes after sunset while the beginning of morning flights averaged about 48 minutes before sunrise. While illumination measurements were not taken, it is possible that the same

TABLE 4
PERCENTAGE (SAMPLE SIZE) AGE-SEX COMPOSITION OF WOODCOCK SHOT IN MAINE DURING
THE FALL AS INDICATED BY THE WING SURVEY, 1967-1969

Hunting Season	Age-Sex Classes ¹				Totals
	HY		AHY		
	Male	Female	Male	Female	
1967 ²	24.3 (536)	22.2 (491)	23.2 (513)	30.3 (668)	100 (2,208)
1968 ³	25.7 (836)	27.2 (886)	20.6 (671)	26.5 (860)	100 (3,253)
1969 ⁴	25.1 (823)	23.4 (767)	21.7 (710)	29.8 (975)	100 (3,275)
Combined:	25.1 (2,195)	24.5 (2,144)	21.7 (1,894)	28.7 (2,503)	100 (8,736)

¹ HY = hatching year; AHY = after hatching year.

² Data from Clark, 1969.

³ Data from Clark, 1970.

⁴ Data from Clark, 1971.

light intensity triggered both evening and morning flights. The actual illumination in a forested situation 26 minutes after sunset (evening flight) could be equivalent to that of an open field 48 minutes before sunrise (morning flight). However, this is only speculation and further study is suggested.

Glasgow (1958) found that woodcock frequented particular areas on many Louisiana winter fields. Ensminger (1954) concluded that the vegetation on winter fields, and not the abundance of earthworms, controlled the choice of feeding sites. Sheldon (1961) noted "favorite alighting places" on three of four summer fields in Massachusetts. Similar observations made during the present study indicated that woodcock preferred small pockets of short vegetation surrounded by taller cover. Areas of fields with many such pockets were generally the most heavily utilized portions of fields.

While much remains to be learned about the distances woodcock move from diurnal covers to fields, data from recaptured birds indicated that these movements were local. A similar conclusion was reached by Sheldon (1961). The regularity with which individual woodcock use specific fields was not ascertained because of the disturbance caused by banding operations, and because only a small percentage of the birds present on fields were captured.

Is the age composition of woodcock using summer fields typical of the population as a whole? The answer to this question can be explored by comparing the age structure of woodcock caught on summer fields to that of the fall harvest. A sample of 8,736 woodcock shot in Maine during the 1967-69 hunting seasons consisted of 50 per cent immatures and 50 per cent adults (Table 4). The 1,232 woodcock captured during the summers of 1968-70 on nocturnal fields consisted of 68 per cent immatures and 32 per

cent adults (Table 2). In relation to the whole population, these percentages suggest that Maine summer fields were used by a higher proportion of immatures than adults. However, these figures must be viewed cautiously since the difference between summer and fall age compositions could be due to the banding and/or wing survey data not accurately reflecting the age structures of the populations sampled. For example, immatures might have been easier to capture on fields than adults; this would tend to inflate the percentage of hatching year birds caught in relation to adults. On the other hand, immatures of many game bird species are more vulnerable to shooting than adults. Thus, the age structure indicated by the wing survey probably consisted of more immatures than what actually existed in the total population. This bias would not be serious in that it would tend to increase the already apparent difference in the age structure of the summer and fall samples. In addition to the problem of representative sampling, there might also have been differential mortality between age classes which occurred between summer and fall. A major age related difference in the summer mortality rates, and/or differential vulnerability to capture or hunting, could account for the differences in Tables 2 and 4.

What of the sex structure of the population using summer fields? The ratio of immature males to immature females shot in the fall was 1.02:1 (Table 4). In contrast, Table 2 shows a ratio of 1.35:1 immature males to immature females captured on summer fields. Similar calculations indicated little difference existed in the ratio of adult males to adult females (captured = 0.74:1, Table 2; shot = 0.76:1, Table 4). Unfortunately, interpretation of these ratios is difficult since the limitations which applied to the age data may also apply here.

Sheldon (1961, 1967) believed that summer fields were used mainly for feeding. His conclusion was based on an analysis of 15 stomachs from woodcock which were captured while entering, or shortly after alighting on, summer fields in Massachusetts. In contrast, Krohn (1970) concluded that Maine summer fields were not used primarily for feeding. Comparisons between the weights of stomach contents from 16 birds mist-netted before landing on fields, to weights of stomach contents from 44 woodcock collected on fields at various times of the night, showed that woodcock fed heavily prior to entering fields. However, no evidence was found to indicate that substantial amounts of food were eaten by birds remaining on fields throughout the night.

This report describes general aspects of summer field usage, and makes no attempt to explain why woodcock use fields at night. Specific activities of individual birds, such as frequency of field usage or movements on fields, were not studied. Data such as these, being more explicit than those reported

here, might indicate why woodcock move at dusk from forest covers to various types of openings. Telemetry investigations presently being conducted in Maine and Minnesota will undoubtedly provide a more precise understanding of woodcock activities on summer fields. In turn, these data may help to clarify why woodcock spend summer and early fall nights in clearings.

SUMMARY

Certain aspects of woodcock usage of summer fields were studied in Maine. Findings were as follows:

1. On two study fields in 1968, numbers of woodcock first began spending nights in the fields during the second week of June. During 1968 and 1969, the number of birds flushed from the fields varied greatly between nights. Use of fields continued into the first week of November.

2. Woodcock started flying into summer fields approximately 26 minutes after sunset. Unless disturbed, birds remained on fields throughout the night and started departing for diurnal covers about 48 minutes before sunrise. The duration of evening and morning flight periods averaged 13 to 15 minutes.

3. Woodcock did not necessarily use the same field throughout the summer. Five of the 36 birds taken as repeats were caught on fields other than where originally banded. However, it was believed that flights to and from fields were essentially local movements.

4. Vegetation appeared to have been a critical factor influencing the distribution of woodcock in fields. Areas of low ground cover interspersed with taller and denser cover were used most frequently.

5. Immatures, especially immature males, were the predominant age-sex class captured on Maine summer fields. The question of whether the age-sex composition of birds using summer fields is atypical of the total woodcock population requires additional study.

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