NOCTURNAL USE OF FOREST CLEARINGS DURING SUMMER BY AN INSULAR WOODCOCK POPULATION

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ABSTRACT

NOCTURNAL USE OF FOREST CLEARINGS DURING SUMMER BY AN INSULAR WOODCOCK POPULATION

By

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Crepuscular activities of American woodcock (Philohela minor) were observed and birds were captured in abandoned farm fields on High Island, Michigan between sunset and sunrise from June through mid-September during 1968, 1969, and 1970. The general behavioral pattern of the insular population did not vary from that reported for birds from other areas. The initiation of field use at night in summer was found to be related to the nesting period. Utilization of fields was similar during June and July and lower during August. Immature woodcock comprised 58 percent of the population but made up 79 percent of the captured sample. Immature males were three times, and immature females two times, more likely to be caught than adults of either sex. Management implications are presented.

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INTRODUCTION

Sheldon (1961) was first to report that clearings within forests are a regular nocturnal habitat of woodcock on the northern breeding grounds. He observed woodcock congregating in four openings at twilight in central Massachusetts. Since then, biologists have made similar observations throughout the northern breeding range of the woodcock (Krohn 1970). The reasons for this behavior and its adaptive significance for the species are not readily apparent. Yet knowledge of the extent to which woodcock populations utilize clearings as nocturnal habitat may be important in successfully managing the species.

Clearings used by woodcock on summer nights have been described by Sheldon (1960, 1961), Clark (1966), and Krohn (1970, 1971). Physical characteristics of these sites, such as size, soil types, and vegetation were variable. Fields used during the summer in Massachusetts, however, were all located in or close to areas having high woodcock densities during the spring breeding season (Sheldon 1960).

Based on an analysis of 15 stomachs from woodcock which were collected while entering or shortly after alighting on fields, Sheldon (1960, 1967) suggested that

woodcock visited the dry fields in summer to obtain animal food other than earthworms. In contrast, Krohn (1970) examined the stomach contents of 60 woodcock collected at night on fields in central Maine and concluded that woodcock do not use fields in summer primarily for feeding. In Louisiana, use of fields at night by wintering woodcock, presumably for feeding, has been well documented (Glasgow 1958).

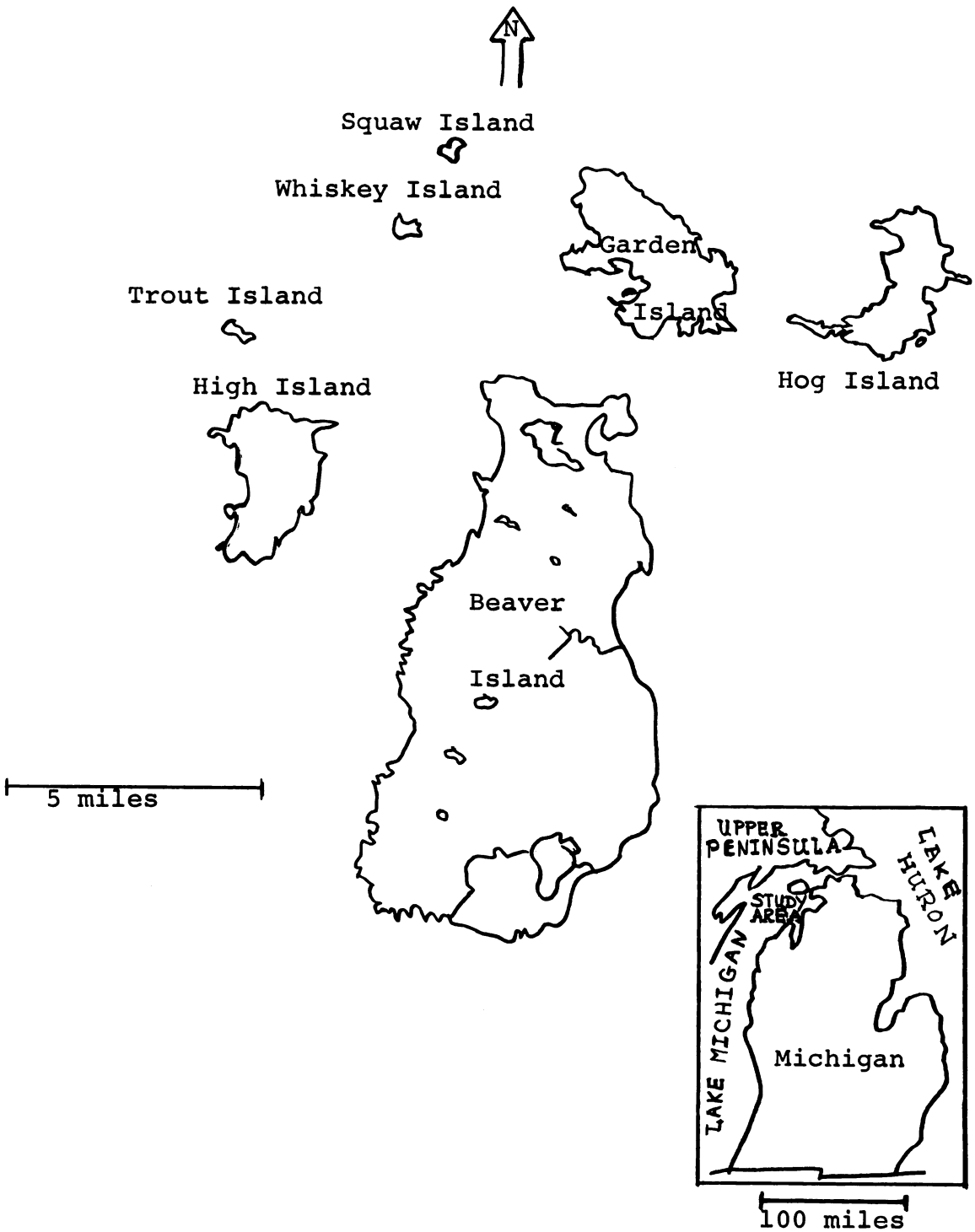
This paper presents observations on the utilization of clearings as nocturnal habitat during summer by a woodcock population on High Island, Michigan.

Study Area

High Island is a 5.5 square mile portion of the Beaver Archipelago which lies in northeastern Lake Michigan (Figure 1). It is located 33 miles northwest of Charlevoix in the Lower Peninsula and 25 miles southwest of Naubinway in the Upper Peninsula of Michigan. It is 4 miles west of Beaver Island and within 10 miles of several smaller islands. Politically, the island is part of Charlevoix County.

The history of land use on High Island is similar to that of other northern areas in the Great Lakes States: logging, burning, clearing, farming, and abandonment have occurred in sequence. By 1920, about 400 acres were under cultivation. High Island was deserted by 1928, except for

Figure 1. The study area, High Island, and some surrounding Islands of the Beaver Archipelago.


N
Squaw Island
Whiskey Island
Garden
Island
Trout Island
Hog Island
High Island
Beaver
Island
5 miles
UPPER
PENINSULA
LAKE
HURON
STUDY
AREA
LAKE MICHIGAN
Michigan
100 miles

a few commercial fishermen who remained until the late 1930s. During the mid-1950s a beef cattle business was started but proved to be unsuccessful. The State of Michigan purchased the island in 1957 and it has not been permanently inhabited since then.

About 185 acres in the north-central part of the island still remain as old fields (Figure 2). These openings and the surrounding 1100 acres of second-growth hardwoods and conifers comprise most of the present-day woodcock habitat. Woody vegetation which is invading all fields includes: staghorn sumac (Rhus typhina), pin cherry (Prunus pensylvanica), hazelnut (Corylus cornuta), red-osier dogwood (Cornus stolonifera), willow (Salix spp.), domestic apple (Pyrus malus), white birch (Betula papyrifera), and sugar maple (Acer saccharum). Principle herbaceous ground cover includes several grasses (Poaceae), wild strawberry (Fragaria spp.), St. John's-wort (Hypericum perforatum), milkweed (Asclepias spp.), common yarrow (Achillea millefolium) and daisy (Chrysanthemum leucanthemum). Soils in the fields are predominantly sands and calcareous sandy loams.

About 240 acres of sugar maple, up to 20 inches in diameter, comprise one portion of the study area. There, ground cover consists of hardwood reproduction (primarily sugar maple) and patches of American yew (Taxus canadensis). Vegetation on the remaining 860 acres

Figure 2. The north half of High Island showing the study fields in light gray.

N

.5 miles

considered to be woodcock habitat is a mixture of white birch, aspen (Populus spp.), balsam fir (Abies balsamea), red maple (Acer rubrum) and hazelnut.

The remainder of the island consists of sand dunes, sandy or rocky beaches, white cedar (Thuja occidentalis) swamps and stands of conifers, mostly balsam fir and red pine (Pinus resinosa), on dry uplands. It is generally unattractive to woodcock.

MATERIALS AND METHODS

Woodcock activities were observed and birds were captured in the study fields between sunset and sunrise from June through mid-September during 1968, 1969, and 1970. Two capture techniques were used--mist-netting and night-lighting.

Netting operations were carried on regularly during all three summers and accounted for 92 percent of the 1500 hours spent attempting to capture woodcock. Eight percent of the capture effort was expended in night-lighting during 1969 and 1970 only, when equipment and additional help was available.

Mist-netting techniques were adapted from those described by Sheldon (1967). The nets were 12-meter, 4-tier nylon thrush nets obtained from the Northeastern Bird-Banding Association, Inc., West Hartford, Connecticut. Each net was suspended between two 3-meter uprights of aluminum conduit which were slipped over the ends of one-meter steel pipes driven into the ground. When unfurled one net presented a vertical web of 36 square meters. Nets were placed within those portions of fields where observations had revealed woodcock activity to be greatest. The number of nets used in a particular location varied

according to the size of the area and the number of woodcock flying through or landing there.

Mist nets were unfurled at sunset. Those that failed to catch birds after several nights were moved to a different spot. For the most part, netting locations remained the same throughout the investigation. Immediately after the evening flight, captured woodcock were removed from the nets, weighed, aged and sexed, banded and released. The nets were then collapsed for the night but left at the site. One 12-meter mist net operated during the evening flight period constituted a net-night, and nets were operated 166 evenings during the study for a total of 2,033 net-nights.

It was found that by leaving nets up overnight woodcock could also be caught when they left the fields at dawn. On such occasions, trapped birds were removed from the nets at sunrise and the nets furled for the day. Mist nets were operated 39 mornings during the investigation for a total of 671 net-mornings. Mist-netting data were recorded by periods ending on the 15th and final day of each month (Figure 3).

Procedures and equipment used in night-lighting were similar to those reported by Rieffenberger and Kletzly (1967). Night-lighting efforts began one to two hours after sunset and lasted from one to five hours. Teams, consisting of 2 or 3 men, walked through the

fields searching for woodcock. One member of each team carried a light while the others each carried a long-handled net. The light, composed of an automobile headlight for scanning the area and an aircraft landing light for spotlighting a bird once it was located, was powered by a 12-volt motorcycle battery carried in a backpack. Woodcock spotlighted on the ground were approached quietly and caught with the hand-net. Flushed birds were kept in the spotlight beam until they became disoriented and returned to the ground. Then they were netted. If it became evident that a bird was not going to return to the ground in the immediate vicinity, the light was switched from spot to scan and the banding team walked on.

Captured birds were immediately weighed, aged and sexed, banded and released. The age and sex of each woodcock examined were determined by characteristics of the primaries and secondaries (Martin 1964). Young of the year were called immatures; all birds one year or older were called adults.

The number of woodcock in each sex and age category on the island was estimated separately by the Lincoln Index Method (Overton 1969). The marked sample was accepted as those birds banded between June 1 and September 14. Woodcock shot on the island between September 15 and October 30 comprised the recapture sample. It was assumed that no immigration occurred during the recapture period

and that the other conditions implicit in the method also prevailed.

Occasionally, woodcock were accidentally killed during banding operations. The crops of these birds were immediately slit open and examined to determine if food had been recently ingested.

RESULTS

Behavior

Evening flights of woodcock into the fields began a half hour after sunset and lasted about 15 minutes. Another flight period took place 30 to 60 minutes before sunrise. In 70 hours of observing fields at night between sunset and sunrise no woodcock were seen or heard flying except during the regular crepuscular flight periods. During night-lighting operations birds were flushed from the clearings until dawn. Thus, at least some woodcock remained on the fields throughout the night.

On 13 occasions a woodcock was observed for 15 to 30 minutes just after it had landed in a field. Ten of these birds began probing and exhibiting characteristic feeding behavior after alighting and the other 3 remained still throughout the periods that they were observed. Among the ten birds the length of time spent feeding ranged from 30 seconds to 10 minutes and averaged approximately 3 minutes. Of seven woodcock observed for 10 to 40 minutes prior to the time that they left the fields at dawn, 5 moved about and probed for about two minutes each just before they flew while the other two left with no

preliminary activity. The type or quantity of food items ingested during the periods that birds were observed was not determined. Many of the woodcock netted during the evening had damp soil on their bills suggesting that they had fed just prior to leaving their diurnal coverts. The crops of four birds killed during night-lighting operations between 10 P.M. and 2 A.M. were empty.

It was estimated that 85 to 90 percent of approximately 3000 woodcock observed making crepuscular flights during the investigation flew alone. The remaining birds flew in groups of two or three. The relationship between birds flying together was not discovered.

Nearly 87 percent of a sample of 175 woodcock flushed from the clearings at night were determined to be alone, i.e., there were no other birds within an arbitrary distance of 5 meters.

All through the summer, vocalizations resembling feeble peent-calls were emitted and aerial flights similar to those of courting males in spring were performed, although the musical chirping song was not given.

Five birds descending from such flights were caught in nets and all were immature males. These displays, both at dusk and at dawn, took place during the regular flight periods. Such activity was most prevalent from mid-June to mid-July.

Seasonal Activity

On High Island, by early June, courtship activities had ceased and about 90 percent of the broods had hatched. Evening flights of woodcock into the fields were observed to begin during the first week of June.

Evening netting data (Figure 3) revealed that the use of fields was relatively high during June and July. Woodcock utilization of fields declined during August but increased to pre-August levels in September. Evening capture rates were higher than morning rates (Figure 3) but seasonal trends in capture rates were similar.

One immature woodcock from each of four different known-age broods were captured in mist nets when they were between 31 and 33 days of age. Although woodcock can fly well when 18 days old, broods were found to remain together at least during the day, until 29 days of age. Based on sample hatching dates plus 32 days for development (Figure 4) nearly 11 percent of woodcock broods dispersed prior to June 2. During the period June 2-8, 31 percent of the broods disbanded and 42 percent of the islands' immature woodcock probably had begun visiting fields at night (Figure 4). By July 7, during the period of highest activity (Figure 3), 89 percent of broods had dispersed (Figure 4), leaving only late-nesting hens with

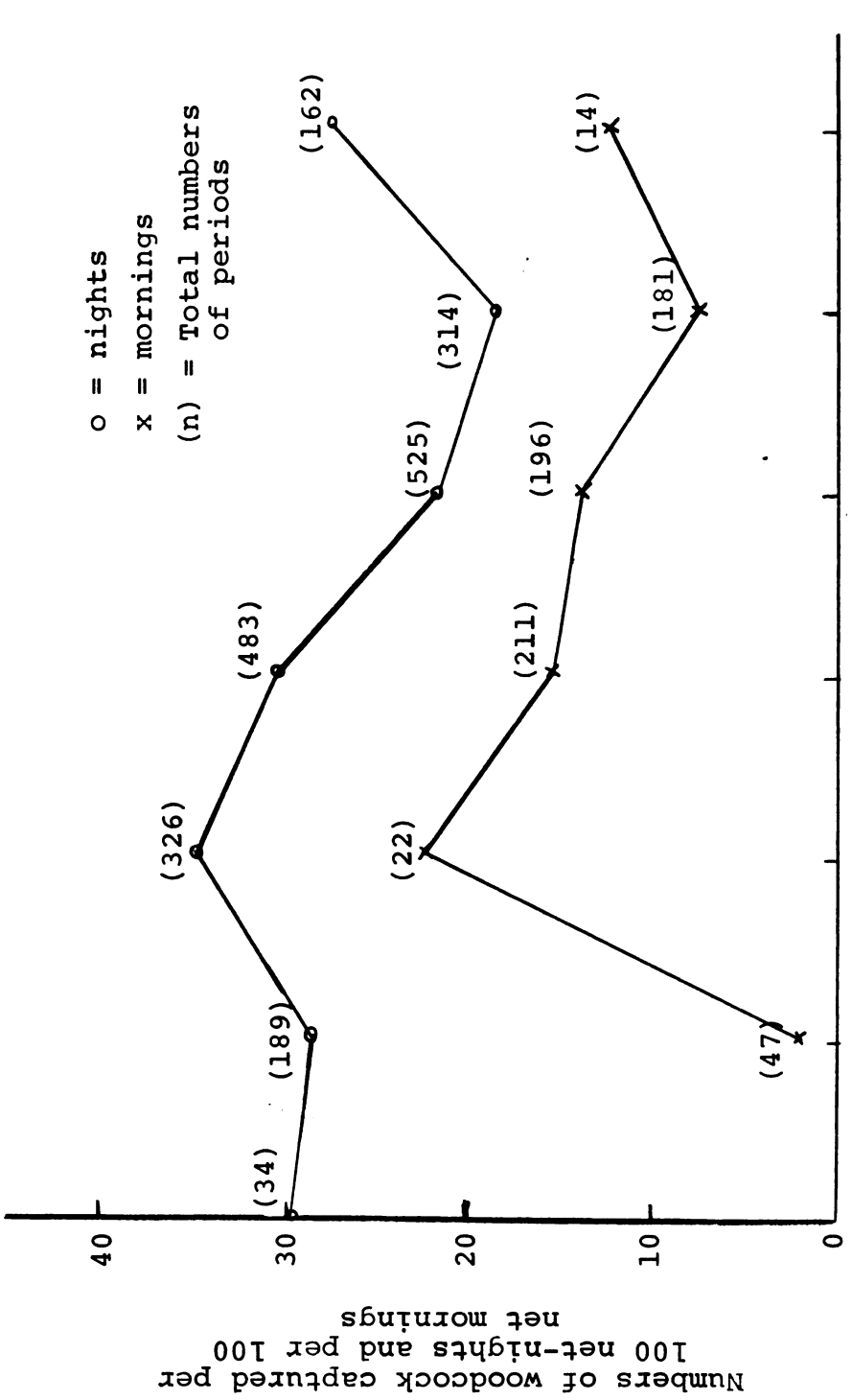


Figure 3. Summer mist-netting capture rates by dates, High Island, Michigan, 1968-1970.

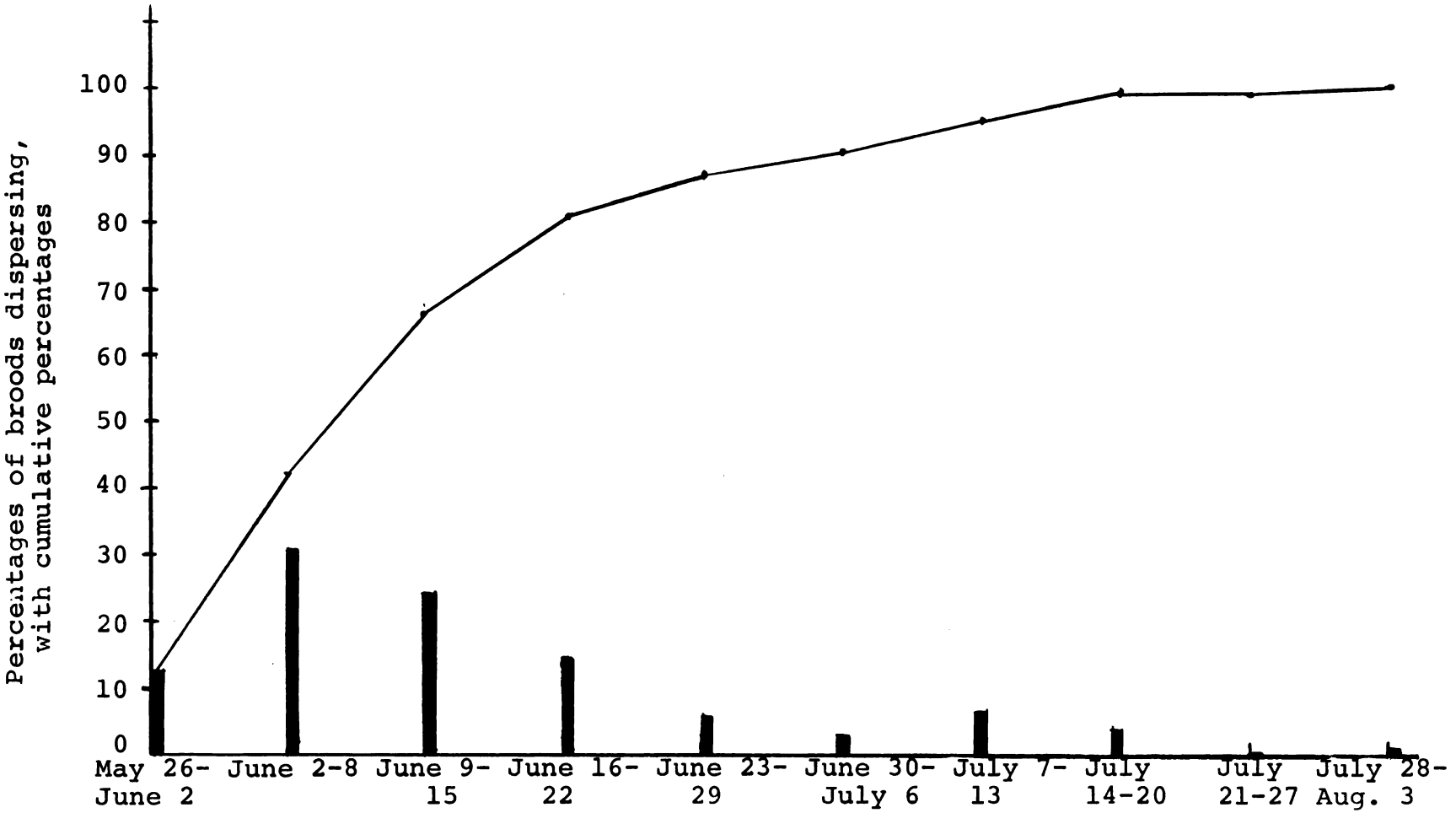


Figure 4. Hatching dates plus 32 day developmental period for 74 broods, indicating dates that immature woodcock begin summer flights, High Island, Michigan, 1968-1971.

broods. None of the broods on High Island remained together after August 3.

The number of woodcock using the fields on a given night was not determined accurately. Counts obtained by tallying birds seen during night-lighting operations did indicate, however, that the number varied greatly. Flush rates varied from a high of 25 birds per hour to a low of less than one bird per hour.

Population Composition

During the investigation, 540 different woodcock were captured at night on summer fields. The age-sex composition of woodcock caught by mist-netting and by night-lighting was not significantly different from each other ($P > .05$, Chi-square) and the data are combined (Table 1).

There was a marked disparity between the age-sex composition of the captured sample and that of the islands' computed woodcock population (Table 2). On the average, immature males comprised 30 percent of the population but provided 47 percent of the camptured sample. Immature females averaged 28 percent of the population and 32 percent of the captured birds. Adult males and females were estimated to average 19 and 23 percent of the woodcock population but only 9 and 12 percent respectively of those birds caught in the fields. There was no significant

Table 1. Numbers of woodcock[a] of each age and sex category captured on summer fields on High Island, Michigan, 1968-1970.

Year	Adult Males		Adult Females		Immature Males		Immature Females		Totals	
	Mist-netting	Night-lighting	Mist-netting	Night-lighting	Mist-netting	Night-lighting	Mist-netting	Night-lighting	Mist-netting	Night-lighting
1968[b]	18	0	24	0	105	0	68	0	215	0
1969[c]	12	2	17	4	70	12	53	6	152	24
1970[c]	13	4	10	8	55	10	40	9	118	31
Totals	43	6	51	12	230	22	161	15	485	55

[a]Repeats are excluded.

[b]No night-lighting was done

[c]No significant difference ($P > .05$, Chi-square) in age-sex composition between those captured by mist-netting and by night-lighting either year.

Table 2. Sex and age proportions for birds captured on summer fields compared with the total woodcock population, High Island, Michigan, 1968-1970.

Year	Estimated total woodcock population	Total number of woodcock captured	Adult Males	
			Estimated proportion of population	Proportion of summer captures
1968	440	215	.21	.08
1969	432	176	.19	.08
1970	372	149	.16	.11
Averages	415	180	.19	.09
Ratios			1	.48

Adult Females		Immature Males		Immature Females	
Estimated proportion of population	Proportion of summer captures	Estimated proportion of population	Proportion of summer captures	Estimated proportion of population	Proportion of summer captures
.22	.11	.29	.49	.27	.31
.22	.12	.32	.47	.27	.33
.24	.12	.28	.44	.32	.33
.23	.12	.30	.47	.28	.32
1	.51	1	1.6	1	1.1

difference ($P > .05$, Chi-square) between the age-sex composition of woodcock caught in June and July and those caught in August and September. The age-sex composition of birds captured was not significantly different ($P > .05$, Chi-square) between years either (Table 1).

Computed rates of vulnerability to capture (Petrides 1959) showed that on the average immature males were 3 times, and immature females 2 time, more likely to be captured than adults of either sex (Table 3).

Table 3. Vulnerability to capture for woodcock of different age and sex, High Island, Michigan, 1968-1970.

Age and Sex Category	Number[a] of Woodcock Captured (C)	Estimated Population[a] (P)	Absolute vulnerability[b] Rating (V)
Adult Male	49	234	.21
Adult Female	63	282	.22
Immature Male	252	372	.68
Immature Female	176	356	.49

[a]Total for three years.

[b]V = C/P (Petrides unpublished).

Immature woodcock were also recaptured more times than were adults (Table 4). Almost one-third of immature males but only one-fourth of the immature females were recaught one or more times. Only 6 percent of the adult females were retaken compared to 18 percent of the adult males. A high percentage (61-90%) of recaptures took place in a field different from that of the previous capture (Table 4).

Table 4. Vulnerability to recapture of various age and sex categories of woodcock and the proportion of recaptures[a] that took place in fields different than that of the previous capture, High Island, Michigan, 1968-1970.

Age and Sex Category	Total number of individuals		Number of times recaptured			Total Recaptures	Proportion of total individuals recaptured at least one time	Proportion of recaptures in fields other than previous capture
	Captured	Recaptured	1	2	3			
Adult male	49	9	8	1	0	10	.18	.90
Adult Female	63	4	3	1	0	5	.06	.60
Immature Male	252	80	64	12	4	100	.32	.61
Immature Female	176	46	40	5	1	53	.26	.66
Totals	540	139	115	19	5	168	.26	.64

[a]Defined as a bird recaught during the same summer it was originally captured.

DISCUSSION

Behavior

The starting-time and the duration of crepuscular activity periods during summer on High Island did not vary from those reported by Sheldon (1967) and Krohn (1971) for birds in Massachusetts and Maine, respectively. Sheldon (1961) found that both the male courtship flight in spring and the summer flight of woodcock began 30 minutes after sunset. Glasgow (1958) also found in Louisiana that wintering birds arrived on fields about a half hour after sunset. Pettingill (1936), Mendall and Aldous (1943), and other workers noted that a specific light intensity is correlated with the beginning and ending of male courtship performances in spring. It seems likely that similar intensities also prompt woodcock to take flight and to cease flight during the summer crepuscular periods.

Reports from the northern breeding range of the woodcock have shown that courtship-like performances during the summer are common. Birds netted after completing such flights both on High Island and in Massachusetts (Sheldon 1967) proved to be immature males. Sheldon (1967) also described observations made by William Nutting where,

on a summer field in Massachusetts, a pair judged to be male and female engaged in antics similar to pre-copulatory behavior. It is speculated that the urge to participate in semi-courtship activities may be an important reason why immature woodcock, especially males, visit fields at night during the summer.

The importance of feeding in attracting woodcock to fields in summer is not clear. Quantitative data were not obtained in this study but most of the locations used as nocturnal habitat by woodcock appeared to have a dearth of invertebrate animal life. Krohn (1970) reported that few woodcock foods were found in soil samples located randomly and at sites on Maine summer fields where woodcock were flushed. He also stated that birds had not selected sites where soil invertebrates were concentrated and that no substantial amount of food was found to have been eaten by woodcock that remained on the fields throughout the night. Krohn (1970) concluded that food was not an important consideration for woodcock using fields during summer.

Few data on the diurnal feeding pattern of woodcock are available. Captive woodcock were seen to feed at dawn, or just before, at mid-day, and late in the evening (Sheldon 1967). Damp soil found on the mandibles of birds netted as they entered fields both during the present study and by Krohn (1970) indicated that woodcock

may feed prior to leaving their diurnal coverts. The short periods in which woodcock were observed to feed on High Island suggest that this activity may be somewhat unimportant as a reason for visiting fields at night. Since the majority of birds, however, did exhibit feeding behavior it may be possible to concentrate birds by providing an abundant food source.

Vegetative cover may be the most important factor governing the distribution of woodcock on summer fields. Krohn (1971) reported that, "woodcock preferred small pockets of short vegetation surrounded by taller cover." Woodcock utilizing clearings during summer in West Virginia were evidently attracted to strips of short cover which biologists had created by mowing (Rieffenberger, personal communication). In Louisiana, Ensminger (1954) concluded that vegetative cover was more important in the selection of feeding sites by wintering woodcock than the abundance of earthworms. On the study area, the fact that birds were frequently flushed from near puddles in the roads but not from naturally-occurring wet areas suggests that the profuse vegetation growing in the latter areas restricted their use as nocturnal habitat. To clarify the situation, data on the vegetative cover of sites utilized as nocturnal habitat by woodcock on High Island were

collected during the 1970 and 1971 field seasons. An analysis of these data will be provided in a later publication.

Seasonal Activity

Sheldon (1967) reported that evening flights to summer fields began after breeding activities had ceased and Krohn (1971) stated that, "the initiation of summer field usage in mid-June apparently coincides with the time most young birds would reach full flight capabilities." Evidence found during this investigation indicated that woodcock broods dispersed about 30 days after hatching. The use of summer fields by these immatures then began. Thus, the initiation of summer crepuscular flights in a particular area is directly related to the time and length of that areas' nesting season. On High Island, about two months elapsed between the time that immatures from the earliest and the latest hatching broods, first began making crepuscular flights (Figure 4). The majority of young birds, however, began the use of clearings during June. This coincided with the peak of the hatch plus one month. Apparently, almost 11 percent of the immature woodcock began flying into the fields before summer crepuscular flights were noted and prior to capture efforts being made (Figure 4). Presumably all adult males and most adult females also begin using clearings in June.

Evidently, a declining use of fields in late summer occurs throughout the range of the woodcock. Sheldon (1967) found that the most successful netting was during June and early July, and that evening flights were erratic after that. Two fields in Maine, censused regularly during the summers of 1968 and 1969, generally contained fewest birds during August (Krohn 1971).

Sheldon (1961) and Clark (1966) believed that continuous mist netting caused a reduction in the number of woodcock flying into summer fields. Sheldon (1967) mentioned that several years of weather records failed to reveal any positive correlation between weather conditions and bird activity. He did state, however, that extremely hot days followed by late afternoon thundershowers and a windless, humid evening constituted consistently successful netting conditions. In Maine, use of blueberry fields and similar clearings by woodcock declined significantly when drouth conditions prevailed (Clark 1966). Gregg (1972) also noted a decrease in capture rates when rainfall was below normal. On High Island, precipitation seemed to stimulate flight activity particularly in the latter half of the summer, but no correlation was found between rainfall and mist-netting capture rates.

Population Composition

In Massachusetts, immature males were netted most frequently, followed in order by adult females, immature females and adult males (Sheldon 1967). Of 1232 woodcock captured by mist-netting and night-lighting in Maine between 1968 and 1970, 68 percent were immatures and 32 percent were adults (Krohn 1971). Although there were slight differences between techniques in the age-sex composition of captured birds, both methods resulted in the capture of more males than females among immatures and more females than males among adults (Krohn 1971). Neither author felt that the age-sex composition of birds captured in summer fields was representative of the population but no data were given to confirm or reject such beliefs.

On High Island it was determined that immature woodcock, especially males, were captured more readily than adults relative to their abundance (Table 3).

Management Implications

The basic question of why woodcock fly to fields at night and to what advantage is this behavioral pattern to species survival becomes complicated by the disparity in use by different age classes. No evidence was found to suggest that woodcock, except when startled, take flight at times other than twilight or dawn. Perhaps it

is important to species perpetuation that summer evenings be used especially by immature birds to begin development of courtship behavior patterns that will ultimately insure reproductive success.

Biologists faced with the responsibility of managing woodcock populations may ask whether clearings should be created specifically for use during summer. Sheldon (1961, 1967) and Krohn (1971) reported that fields used during summer were the same sites that adult males had occupied as singing grounds or breeding territories during spring. This was true also on High Island. Since forest openings are a prerequisite for a woodcock population to be propagated, it seems unlikely that clearings specifically for summer use would offer further value. Modification of some clearings with the intent of concentrating birds for banding purposes, however, might be desirable. Observations during this study suggest that woodcock could be attracted to damp areas where food may be abundant if the dense vegetation usually associated with such sites is arrested.

A sample of birds captured on fields during summer could provide information useful in setting annual hunting regulations. An immature to adult ratio significantly less than 70:30 in such a sample would probably indicate poor reproductive success for that year.

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