

TABLE 2

<i>Species</i>	<i>Total records</i>	<i>Range of speed</i>	<i>Average speed</i>	<i>Median</i>
Turkey Vulture.....	1	34	—	—
Eastern Goshawk.....	1	38	—	—
Sharp-shinned Hawk.....	37	16-60	30.0	26
Cooper's Hawk.....	12	21-55	29.3	26
Eastern Red-tailed Hawk.....	54	20-40	29.0	28
Northern Red-shouldered Hawk.....	7	18-34	28.3	31
Broad-winged Hawk.....	8	20-40	31.7	32
American Golden Eagle.....	2	28-32	30.0	—
Bald Eagle.....	2	36-44	40.0	—
Marsh Hawk.....	4	21-38	28.7	—
Osprey.....	16	20-80	41.5	38
Duck Hawk.....	3	28-32	30.0	30
Pigeon Hawk.....	1	28	—	—
Eastern Sparrow Hawk.....	4	22-36	26.2	—
Eastern Crow.....	15	17-35	26.0	27

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NOTES ON THE BREEDING OF THE PINE SISKIN

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INTRODUCTION

AN unusual occurrence of Pine Siskins (*Spinus pinus pinus*) throughout New England during the winter and spring of 1941 was followed by the nesting of some of the birds south of, or at lower elevations than, their usual breeding range. This afforded an opportunity to make a detailed study of the breeding habits of the species at Hanover, New Hampshire, where one nest was observed by fifteen members of the Dartmouth Natural History Club from the time that the nest was being built until the young had departed from it.

Previous records of Siskins breeding in New England are relatively scarce and detailed observations made during the nesting period are rare. The general behavior pattern in regard to nesting is fairly well known from casual observations and by comparisons with re-

lated species, but many questions have remained to be answered concerning territory, incubation, fledging, and care of the young by the adults. This study will help to answer some of these questions and to verify suppositions made concerning the species.

Bagg and Eliot (1937) summarize very well what is known of the relationship of the Siskin to other finches and the characteristics which make this bird such an object of interest in regard to its movements and life history. They say:

"The Siskin's closest relatives are, we suppose, the American Goldfinch, now classed as Spini, too, but it is also very close to the Crossbills, and to the Redpolls, and its flocking, and feeding, and breeding habits are more like those birds than the Goldfinches. Like both, it prefers to keep in sociable flocks, restlessly bounding with wheezy little chatterings all over the countryside. Reproduction necessities require less than a month and may be satisfied at almost any season, this pair or that dropping out of the flock-life, wherever they happen to be, but the flock appears to have a continuous existence and almost limitless range. This freedom from dietary, seasonal, territorial, or geographical restrictions makes the Siskin even more than the Crossbill, who after all must have cones—errant par excellence; now absent for months at a time, now abundant and tame, now a wild barely pausing transient and anon a sporadic breeder!"

Todd (1940) also points out that not all birds breed every year, which probably explains their presence at unexpected times and out of their ordinary breeding range.

BREEDING RECORDS IN THE NORTHEAST

The Pine Siskin is a common but somewhat irregular resident in Maine, New Hampshire, and Vermont, breeding usually above 3,000 feet, and is a bird of the Canadian Zone. It is a casual breeder in New England south of these states, having a very discontinuous range (Forbush 1929). Glover M. Allen (1903) says that the Siskin is a common permanent resident of the Canadian region, and occurs also throughout the lower part of New Hampshire as a fall and winter visitant. He also points out that a few are almost always to be found in the lowland valleys of the White Mountains. Wright (1911), in writing of the bird life of the Jefferson region of New Hampshire, says that the distribution of the species in the forests of the Presidential Range throughout the summer also indicates that it nests sparingly there.

Siskins have been known to breed sporadically south of New England, with records from the Catskills, the Hudson Valley, and the Alleghenies in western Pennsylvania. They have also been known to summer occasionally in the southern Appalachians which might mean that they breed there.

One of the earliest nesting records of the Siskin was made at Cambridge, Massachusetts, in May, 1859. It was reported by Baird, Brewer and Ridgway (1874). J. A. Allen (1870) reported a record made by William Brewster at Gorham, New Hampshire, in August, 1869. Brewster also recorded the bird as nesting at Lake Umbagog in Maine and New Hampshire (Griscom 1938). Brewster further said in his diary that they were often found breeding or wintering and were sometimes entirely absent at one season or another. He gave the year of 1873 as one when nesting occurred in great numbers in two definite periods—June–July and July–August.

Gilman and Edwin B. Frost found two nests with eggs in the Dartmouth College Park at Hanover, New Hampshire, April 17 and 18, 1878, which were reported by Glover M. Allen (1903). That same year C. Hart Merriam (1878) observed large flocks and nesting occurrences in northern New York.

In May, 1883, at Newton, Massachusetts, a nest, two eggs, and a female were collected by Dean W. Park, reported by Brewster (1906). At the same time, nesting occurred at Ossining, New York, as was observed by Fisher (1883). J. A. Allen (1887) witnessed nesting at Cornwall-on-Hudson, New York, May 3, 1887. Nesting was observed at Remsen, New York, April 4, 1889, and in Essex County, New York, in 1905, reported by Eaton (1914). Faxon and Hoffman saw adults on Mt. Greylock, Massachusetts, on July 16, 1888, which were thought to be nesting (Bagg and Eliot 1937).

Since 1900, numerous other records of nesting have been made in New England and nests have been found as far south as Warren, Pennsylvania. Bagg and Eliot (1937) report nests or obviously breeding adults at Brattleboro, Vermont, in 1907; Bethel, Vermont, in 1908; Woodstock, Vermont, April 19, 1925, by Richard Marble; Southampton, Massachusetts, April, 1927, by Cross and Woods.

The Siskin was found nesting at Warren, Pennsylvania, in 1912 by R. B. Simpson (1912) who found ten nests during April and May. He found two nests at Warren again in 1925, the same year that George Sutton (1928) located a nest with young at Hull, Potter County, Pennsylvania, and several old nests in Pymatuning Swamp, near Hartstown, Crawford County, Pennsylvania.

OCURRENCE IN NEW ENGLAND IN 1941

Thousands of Siskins were present during the winter and spring of 1941 throughout New England. Flocks of 250 to 1,000 birds were reported in Massachusetts during March and a general increase was noted in New England during April. There was a general tendency

to nest shown by small portions of these spring flocks, with definite evidence of nesting noted at Springfield and Northampton, Massachusetts, and Hanover, New Hampshire. There was a general movement northward during May, but individuals remained scattered throughout New England during the entire month, with some birds present during the first part of June. Nest building was seen at Springfield and two juveniles were observed at Northampton. Thus Siskins remained south of their normal breeding range throughout the spring of 1941 and some nested (Bull. New Eng. Bird Life, Jan.-June, 1941).

At Hanover, New Hampshire, 429 Siskins were counted on the 1940 Christmas Bird Count, and flocks of 15 to 20 could be seen throughout February and early March. By the end of March and the beginning weeks of April, the flocks increased in size, having 50 to 100 birds in them. The peak of abundance was reached about mid-April. By the end of the month and throughout early May, as many as 200 to 800 birds were counted in flocks moving northward. Many of the birds present during March had remained until May; some of them had been marked with colored tail plumes and could be seen throughout the period. Nesting occurred during April and May and some individuals remained through June and into July, supposedly the breeding birds and their young.

NESTING

As a result of this large influx of birds throughout the spring, a few birds were found to be nesting at Hanover and numerous others were suspected of nesting. This verifies Glover M. Allen's statement (1903) in regard to their distribution and abundance in New Hampshire. He says: "After a winter in which they have been plenty, stray birds seem to drop out as the main flight receded northward and these may sometimes breed at lower elevations." It was also true that nesting followed periods of large concentrations throughout the winter and spring at Cambridge, Massachusetts, in 1859; Lake Umbagog, Maine, in 1878; northern New York, in 1878; Ossining, New York, in 1883; and at Warren, Pennsylvania, in 1912.

Nesting at Hanover has undoubtedly occurred between 1878 and 1941 unobserved, as an old nest was discovered in the College Park in 1941 that was being dismantled by one of the Siskins which was building a new nest nearby. Three nests, containing eggs, were found in April, 1941, and another one was found being visited by a pair of birds but situated in such a position that examination was impossible. It probably never was used, for the activity did not con-

tinue long enough for a normal nesting. All of the nests were situated in the Dartmouth College Park in close proximity to each other and near the sites of the nests found there by the Frosts in 1878. The first nest found was the only one to be completed; the other two with eggs were destroyed, presumably by red squirrels. Dr. and Mrs. Frederic P. Lord of Hanover were responsible for the discovery of the first nest, finding it in their yard, which is situated on the western side of the Park. In the spring of 1943 Dr. and Mrs. Lord discovered another pair of Siskins nesting in their yard. The nest was completed March 31, but was situated so that close observation of the nest contents was impossible. All nesting activity ceased abruptly April 22, without the cause of desertion being determined.

METHODS OF STUDY

Upon the discovery of nest building by Dr. and Mrs. Lord, a party of fifteen observers of the Dartmouth Natural History Club began a program of observation which lasted until the young left the nest. Dr. and Mrs. Lord, Richard Weaver, Louise Forsyth, Wesley Lanyon, and Sally and Susan Neidlinger of Hanover, and the following students of Dartmouth College assisted with the observations: A. Flag Southerland, Franklin H. West, Raymond Wattles, John Earle, Robert Blair, Edward Porter, Gilbert Anthony, Robert Thorne, and Robert Hamill. Observations covered as few as three and as many as ten hours each day for thirty-seven days.

At first, observations were made from a chair at a distance of fifteen yards by the use of binoculars, so that nest building and egg laying would not be interrupted. After the eggs were laid, a blind eighteen feet high was constructed ten feet from the nest and the observations were continued from there. The eggs and young were never handled for measurements or descriptions, nor were the adults banded—in fact, nothing was done which might interrupt the nesting as we were very anxious to check the incubation period and the time spent in the nest by the young after hatching. All observations of nest contents were made with a mirror on a long pole.

NEST BUILDING AND EGG LAYING

The first signs of nesting were observed on April 8 and 9 when two birds were seen continuously in each other's company making attempts to dismantle an old oriole's nest, followed by repeated trips to a Norway Spruce nearby. The nest was found April 9, having the outer ring formed and a thin layer across the bottom. Some

strips of cloth placed under the tree on April 8 had been utilized in the nest construction.

Three days were required to complete the outer layers and bottom of the nest. On the fourth day, lining materials were added. Several attempts to break off small dead twigs from the nest branch were observed. After the fifth day, materials were added to the nest sporadically until the eggs were laid. On the seventh day, the female began making trips to the nest without materials and sitting on it for short periods. This procedure continued with the trips to the nest becoming more frequent and the time spent on the nest increasing to as much as fifty minutes before the tenth day, April 18, when the first of the two eggs was laid. The second egg was laid the following day.

The female did all of the work of building the nest. The male accompanied her on most of the trips to and from the nest during the building and was very attentive to her during the entire period prior to the laying of the eggs. This was also observed by Fisher (1883), J. A. Allen (1887), and Simpson (1912). Fisher also observed the male following the female about, "but the male usually stopped on nearby perches to sing and to await the return of the female with nesting materials." The male, from perches near the nest, often sang a very melodious song which had somewhat the quality of that of a Canary, Goldfinch, or Purple Finch. This rather pretty song is in contrast to the statement by Roberts (1936) that the only song is a squeaky performance, and it bears out his assumption that "it seems possible his greater vocal powers are not discovered."

POSITION AND CHARACTER OF THE NESTS

All four nests found in 1941 at Hanover were in Norway spruces as was one of those found in 1878. The other one found in 1878 was in a small pine. The four nests found in 1941 were in trees sixty to eighty feet tall, while those found in 1878 were in small trees five to seven feet tall, even though there were some sizable conifers in the park at that time. The four 1941 nests were in similar situations, being on branches extending well out from the trunks of the trees where the diameters of the branches were less than one inch. The nests were placed immediately under the shelter of a smaller branch overhanging them, so that they received protection from snow and ice. All four nests were situated more than fifteen feet above the ground; three were below twenty feet and the fourth one was at about thirty-five feet.

The nest found by Marble in April, 1925, at Woodstock, Vermont,

was destroyed by a severe ice storm soon after incubation began. Swenk (1929) reports a nest found in March in Nebraska which had been built and then filled with snow before the eggs were laid. The female returned two days later after the snow had melted and laid her eggs, but the nest subsequently fell to the ground, either as a result of the snow or faulty nest construction.

Of the ten nests found in 1912 by Simpson (1912), three were in white pines, three in hemlocks, one in a yellow pine, and three in spruces. These ten nests varied in elevation from six to thirty-five feet and averaged 17.4 feet, and most of them were placed near the ends of the branches. Sutton's (1928) nests were in hemlocks; Fisher's (1883) in a red cedar; and J. A. Allen's (1887) was in a Norway spruce.

The outer structures were composed of coniferous twigs, strips of cloth, string, and shredded bark, while the inner linings contained fine rootlets, twigs, moss, and some wool obtained from a sheep yard nearby. The nests were very compact, having walls one and one-half inches thick. They measured four inches across and one and one-half inches high on the outside, and the nest cavities averaged two inches across and one and one-quarter inches deep. These measurements correspond closely with those given by J. A. Allen (1887) and Fisher (1883).

The nest described by J. A. Allen was very similar in construction to those found in 1941, having string, thread, tape, and rootlets as a base, with a cup-shaped structure of coarse and fine rootlets and soft vegetable fibre, lined with black horsehair. Fisher described the outer part of the nest he found as containing fine twigs from Norway spruce, loosely placed together with a few rootlets, and with pieces of string interwoven. He also said the lining was very compact, made up of hemp-like material, horsehair, bits of thread, feathers, rootlets, and like substances. All of these descriptions adhere closely to that given originally by Baird, Brewer, and Ridgway (1874) of the nest found in 1859. This nest also contained some wool, as in the nests found in 1941 at Hanover. Swenk (1929) portrays the nest of the Siskin in two excellent photographs, showing top and side views.

COPULATION

Two attempted copulations were witnessed. Near the site of the second nest, a male was observed to mount a female as she sat on a branch fluttering her wings and tail in a begging posture. At the site of the third nest, a female flew from one branch to another with a male in pursuit. She also was fluttering her wings and uttering soft calls. In one instance, the male hovered over her in a 'sparrow-

hawk' fashion as she crouched on the branch. Before contact, she left the branch and flew into the air, seemingly toward him, as Robins do when mating, and then flew off, the male again in pursuit.

TERRITORIAL BEHAVIOR

During the two or three days just prior to egg laying, both adults began to protect a small area immediately surrounding the nest, about three to six feet in diameter, from Chickadees, a Cowbird, and other Siskins. The female would leave the nest to chase any bird venturing that near. During nest building the male had been quite attentive to the female and never left the nesting area for very long periods, and he did not seem to be very closely associated with any of the other Siskins or flocks which fed near the nest tree. After the eggs were laid, he would leave the area for short periods, which became longer as incubation progressed. He frequently returned in company with one of several other Siskins. The female would chase these birds, as would the male, if they came too close to the nest. On several occasions, he flew off with these birds after feeding her on the nest. Other birds would enter the general nesting area and feed with one or both of the mated birds, unmolested.

One of the most unusual occurrences of the entire study happened just prior to egg laying. The first nest was situated about sixty yards from the second nest, and both pairs soon learned the position of the other nest. They began making raids on each other's nest, the pair from nest number one being the more aggressive, visiting nest number two repeatedly. The female would sit on the nest a few minutes and the male would sing from a perch in the tree, then both birds would return to their own nest. They often made quick trips from their own nest to number two and back again. This continued until the eggs were laid in nest number one. Pair number two was never observed to attack pair number one, but whenever pair number two approached nest number one, as they did on occasion, they were immediately driven off. Nest number one was three days ahead of number two, probably explaining the dominance of pair number one.

INCUBATION

The first egg was laid in nest number one on April 18 and the second and final one on the 19th. Both eggs were laid before nine o'clock in the morning. Incubation began upon the laying of the first egg and the young hatched thirteen days later, one day apart. Roberts (1936) reported the incubation period as 13-14 days with Evans as the authority. The danger from freezing of the eggs would

appear to be lessened with incubation beginning upon the laying of the eggs.

Nest number one had two eggs, while each of the other two nests found in 1941 had three eggs. Two to four eggs are commonly laid, with three as the usual complement. Simpson (1912) found five nests with three eggs each and one with two eggs in 1912 and two nests with three eggs each in 1925. Fisher (1883) reported four eggs in the nest at Ossining, as did J. A. Allen (1887) for the nest at Cornwall-on-Hudson. The nest found at Cambridge in 1859 had four eggs, but that found by Park in 1883 at Newton had but two eggs. One of the nests found at Hanover in 1878 had four eggs and the other had three.

During incubation, the female stayed very close to the nest. The longest observed period that the female was off the nest for the entire period of incubation was eight minutes. She was fed by the male during incubation, and this permitted long uninterrupted periods on the nest; in fact, he began feeding her on the nest the day before the first egg was laid and in one instance was observed to feed her while she was off the nest before the eggs were laid.

Feeding followed a definite pattern. The female would utter a low, twittering call whereupon the male would appear, at times from quite a distance, and feed her. Possibly he had called first and she was answering him, but his call, if given first, was never heard. As he approached the nest tree he would give a *spee* call. Frequently, the female would leave the nest after being fed but would return in a few minutes. It was thought that she went for water, although this was not definitely established. She always went in the same direction, which was toward the two most available water supplies.

The female always fluttered her wings excitedly and made little noises while being fed. The male would regurgitate large lumps of sticky yellow food and push them down her throat. Later he was observed to offer her small seeds and buds, one at a time. The feeding process reminded one of a young Cowbird begging and receiving food from a host. The male fed the female approximately once every hour, increasing the number of feedings slightly in the early morning and in the late afternoon. The adults of the flocks were seen to eat large quantities of hemlock seeds from the ground and elm buds from the trees.

The female turned the eggs frequently, increasing this activity as the time approached for them to hatch. It was thought that at times she used only her feet in turning them. The nest was heavily in-

fested with lice and she spent much time in picking them from it and from herself.

HATCHING

Just prior to hatching, the female stood up on the edge of the nest and looked at the eggs a great many times. Hatching occurred early in the morning, before 7:30 A. M., or possibly during the night. There was no sign of the egg shell in the nest, but later a small piece was found under the tree. Feeding of the young began very soon after hatching, possibly within the hour.

BROODING AND REARING THE YOUNG

During the first days after hatching, the female fed the young frequently about every ten to fifteen minutes, but near the end of the period, feedings were spaced about an hour apart. The young were fed by regurgitation. The male continued to feed the female on the nest during the first part of the fledging period and she, in turn, fed the young. He now increased his trips to the nest with food to two every hour, and to three or even four toward evening. She often left the nest after being fed and before feeding the young. The male continued to feed her solely only until the seventh and eighth days; then he began to give food directly to the young ones. After the tenth day, the male was not observed to feed the female and she began to forage for herself and for the young.

The young were never left unprotected for longer than eleven minutes. The usual interval that the female was away from the nest during the first week after hatching was three minutes. Before the female began to help with the feeding of the young, she kept the nest very clean by eating all of the excrement, but after she began to help with the feeding, the outer part of the nest became fouled, because neither of the adults removed the material.

Before the female began to leave the nest for any length of time, the male would return in company with other birds, feed her and leave with them. When both birds began to feed the young, it became very difficult to tell the sexes apart. From their actions, however, it was believed that the male never sat on the nest or paid much attention to it, other than bringing food to the female or to the young. Once, when he appeared and found her absent, he uttered a call and she appeared very promptly.

The young developed their first signs of fear about the sixth day after hatching. During the last four days that the young were in the nest, they became very active and the female spent very little

time brooding them. The young would take turns exercising and stretching their wings or walking about the rim of the nest. They scrambled over each other when an adult would appear with food and often would fall over the side, grasping the outer structure and pulling themselves back again. The day before they left, one was observed to hop out of the nest, go a foot or more toward the trunk of the tree, and then return to the nest, settling down in it. The adults seemed to approach the nest rather deliberately during the last two days, seemingly coaxing the young to such daring feats.

Both of the young left the nest on May 15, fifteen days after the first had hatched. The older one showed a definite dominance over the second. The second one probably left the nest a half day earlier than was to be expected; it hopped out when an observer examined the nest too closely, thinking that both of the young had left. One of the birds was found in the nest tree an hour or so after they had left the nest, being fed by one of the adults. The birds were observed in the vicinity of the nest during the next several weeks and Siskins were about Dr. and Mrs. Lords' feeding shelves and bird baths during all of June and part of July. The young were easily distinguished from the adults, having buffy backs and being not nearly so dark.

COMPARISON WITH THE GOLDFINCH

There is such a similarity in the data collected for the Siskin in this study and that collected by Lawrence H. Walkinshaw (1939) for the Goldfinch, that the statement made in the introduction by Bagg and Eliot must be modified slightly. Although many of the habits of the Siskin may be similar to those of the Redpolls and Crossbills, the breeding habits alone would justify the placement of the Siskin and the Goldfinch in the same genus.

These similarities seem significant: (1) The females of both species did all of the work of building the nest, and were accompanied by the males as they searched for nest materials; (2) nest building required five days in both species; (3) incubation was performed by the females and it required thirteen days in both cases; the males fed the females on the nest during incubation; (4) the females brooded the young; the males fed the females by regurgitation, and they, in turn, fed the young until the latter part of the fledging period; the young were fed by regurgitation; (5) the young left the nest in fifteen days; (6) the rim of the nest became fouled at the end of the nesting period after the females began to help feed the young.

SUMMARY

1. Siskins are sporadic breeders in most of New England. There have been frequent records of nesting but relatively few observations on the habits during nesting.

2. Nesting of Siskins at Hanover, New Hampshire, followed a season in which their population was high, as is usually the case where nesting occurs out of the ordinary breeding range. Four nests, three with eggs, were discovered. Only one nest was successful.

3. The female built the nest and was accompanied by the male on her trips to and from the nest during the five days of nest construction.

4. Incubation required thirteen days. It was done solely by the female and was begun upon the laying of the first egg.

5. The male supplied food to the female on the nest during incubation and for eight days after the young hatched. The female received the food and fed the young by regurgitation during the early part of the fledging period. Both adults fed the young during the last days in the nest.

6. The territory of the pair of Siskins under observation was limited to a small area about the nest with a diameter of three to six feet.

7. The young left the nest on the fifteenth day after hatching, twenty-eight days after incubation began.

8. There is a great similarity between the breeding habits of the Pine Siskin and the American Goldfinch.

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NOTES ON THE BIRDS OF SOUTHAMPTON ISLAND,
BAFFIN ISLAND AND MELVILLE PENINSULA

BY REYNOLD BRAY

(WITH COMMENTS BY T. H. MANNING)

REYNOLD BRAY was drowned on September 14, 1938, when on his fourth visit to Arctic regions. His obituary was written for 'The Auk' by McAtee (Auk, 57: 139-140, 1940). The present summary of the results of Bray's ornithological work while a member of the British Canadian Arctic Expedition between May, 1936, and September, 1937, was originally intended for his own use in further work he had planned for the same regions rather than for publication; but since none of it has previously been published, it is here presented in full and unchanged except for minor editorial corrections.