

SOME OBSERVATIONS ON THE LIFE CYCLE
OF THE EASTERN GOLDFINCH

By Jean M. Batts
and
H. Lewis Batts, Jr.
Ypsilanti, Michigan

A report of a joint field study conducted as a requirement
for Zoology 119 and Zoology 297 (Advanced Ornithology)

University of Michigan
Biological Station

Submitted September 1, 1947

TABLE OF CONTENTS

| | |
|-------------------------------------|----|
| Introduction | 1 |
| Environment. | 2 |
| Territory | 4 |
| Nests and Nest-building. | 7 |
| Egg-laying and Incubation | 13 |
| Brooding | 15 |
| Summary | 16 |
| Bibliography | 17 |

INTRODUCTION

The Eastern Goldfinch (Spinus tristis tristis) has been the subject of several studies, so that a great deal is known about its life cycle. However, certain phases have been passed over hastily, and others have been the subject of argument among investigators. At the risk of being repetitious along some lines, we have studied the early stages of the nesting cycle, with emphasis on nest-building and territorial behavior.

The study was conducted in the summer of 1947 at the University of Michigan Biological Station, Douglas Lake, Cheboygan County. Besides a month spent in looking for nests, and many brief visits to nests at odd times of the day and night, we spent 27 days in observation, with a total of 64 hours. The activities associated with four nests were followed.

Nest-building was observed from the ground with a 19-power Bausch and Lomb telescope and eight-power binoculars. To inspect the nest closely and to see inside we used an adjustable mirror on a jointed bamboo pole which had a maximum length of 21 feet. Later the activities and behavior during the egg-laying, incubation and brooding periods were observed from tall wooden towers covered with olive-drab canvas blinds.

We wish to express appreciation to all who helped us by locating nests, constructing blinds, lending equipment, etc.

TIME SPENT IN OBSERVATION

| Date | Period | | Total Time | |
|----------|--------------------|-------------|------------|---------|
| | A.M. | P.M. | Hours | Minutes |
| July 22 | | 2:20-3:45 | 1 | 25 |
| 23 | 4:45-10:45 | 5:12-6:07 | | 55 |
| 24 | 7:58-11:45 | 1:45-3:20 | 7 | 35 |
| 25 | 4:45-6:45 | 1:05-3:22 | 6 | 57 |
| 26 | 7:20-11:30 | 7:08-8:00 | | |
| 27 | | 1:30-3:00 | 7 | 30 |
| 28 | | 5:15-6:15 | | |
| 29 | | 7:00-7:30 | 1 | 30 |
| 30 | | 12:55-1:45 | | |
| 31 | | 7:00-7:45 | 1 | 35 |
| | 7:00-10:10 | | | |
| | 10:35-11:40 | 3:01-4:40 | 5 | 54 |
| | 7:15-7:56 | 10:15-10:45 | 1 | 11 |
| | 7:10-11:35 | 2:30-4:30 | | |
| | | 11:00-11:05 | 6 | 30 |
| | 7:20-9:35 | 1:15-1:45 | | |
| | | 6:10-6:13 | 2 | 48 |
| August 1 | Many trips to nest | | | |
| 2 | Many trips to nest | | | |
| 3 | | | | |
| 4 | 8:00-8:10 | 1:30-3:30 | 2 | |
| | 7:00-7:05 | 1:00-2:55 | | |
| | 11:42-11:55 | | | |
| 5 | 7:40-8:48 | 7:00-7:26 | 2 | 49 |
| 6 | 9:28-11:00 | 2:30-3:28 | | |
| | | 4:15-4:30 | 1 | 13 |
| | | 2:05-2:30 | | |
| | | 2:45-4:10 | 1 | 50 |
| 7 | 7:15-7:30 | | | |
| | 8:05-8:15 | 1:30-2:30 | 1 | 25 |
| 10 | | 1:30-5:20 | 3 | 50 |
| 11 | 6:45-6:50 | | | |
| | 7:45-8:00 | | | |
| | 8:20-10:00 | | 2 | |
| 12 | 7:10-7:45 | | | |
| 17 | 9:00-11:00 | 1:00-3:00 | 4 | 35 |
| 18 | 8:00-9:00 | | 1 | |
| | | | | |
| | | TOTAL | 64 | 53 |

ENVIRONMENT

Nests 1, 2, 3, and 4 were located in the campus area of the Biological Station and each was within 20 feet of an occupied cabin.

The Station is on the south shore of South Fishtail Bay of Douglas Lake in an open birch-maple association, with most of the trees 30-40 feet in height, but with concentrated areas of trees 12-40 feet in height with a notable absence of low, thickly foliaged brush, which is the chosen habitat in southern Michigan. (Walkinshaw, 1938-1939). The campus is protected from the full blasts of the predominant northwest winds, but receives those from the north. All nests were located on the lake-side of their respective trees, where least protection was offered.

When the Station opened the latter part of June the trees and shrubs were in full leaf and the birch catkins, sumac berries and pin cherries were small and green. The composites were in bloom.

The chief mammals in the area are the Thirteen-striped Ground Squirrel (Citellis tridecemlineatus) and the Chipmunk (Tamias striatus). These latter were seen high in some trees but not in any in which Goldfinch nests were located. Other birds nesting in the area were the Flicker (Colaptes auratus), Eastern Kingbird (Tyrannus tyrannus), Least Flycatcher (Empidonax minimus), Wood Pewee (Myiochanes virens), Purple Martin (Progne subis), Eastern Robin (Turdus migratorius), Cedar Waxwing (Bombicilla cedrorum), Red-eyed Vireo (Vireo olivaceus), Baltimore Oriole (Icterus galbula), and Chipping Sparrow (Spizella passerina).

A Least Flycatcher nest was ten feet away and on the same limb with Nest 1. However, the flycatcher young had left the nest but were lingering in the same tree when the Goldfinch began building. The female Goldfinch chased the adult flycatcher from the tree several times and the family soon moved to another tree.

Nests 1 and 2 were located in trees on the level of the lake at the edge of the main thoroughfare, State Street, which is lined with Sugar Maples (Acer saccharum), White Birch (Betula alba papyrifera), Quaking Aspen (Populus tremuloides), along with some Pincherry (Prunus pennsylvanica), Apple (Pyrus malus) and sumac (Rhus glabra borealis).

Nests 3 and 4 were on Upper Drive West, about one third of the way up a steep hill, 20-25 feet above lake-level and surrounded by the same species of trees and shrubs. All four nests were in maple trees (three Acer saccharum, one Acer rubrum) less than fifteen feet from inhabited cabins. Covering much of the hillside are Bracken (Pteris aquilina) and Wintergreen (Gaultheria procumbens). On top of the hill and south is an open area containing many composites, such as Devil's Paintbrush (Hieracium aurantiacum), White Daisy (Chrysanthemum leucanthemum pinnatifidum), Yarrow (Achillea millifolia), and Ragwort (Senecio balsamitae).

TERRITORY

Territorialism in the Goldfinch is open to question. Nice (1941) in speaking of mating and nesting territory, says: "The Eastern Goldfinch - - - sometimes comes under this category according to Drum (1939), but other observers can find no evidence of territory." Walkinshaw found none.

Homer Roberts (1942) put a caged male Goldfinch at varying distances from a nest, and found that neither of the pair paid any attention until it was placed six feet from the nest. Then they showed only curiosity. At two feet the female flew at the cage, but the free male did not appear. Later a stuffed specimen of a male Goldfinch was placed ten feet from the nest. The female acted uneasy on the nest, while her mate tore the specimen to pieces.

Our observations on the defense of territory were contradictory. Negative results were obtained by tying the skin of a male Goldfinch to a favorite perch of the nesting male, about 15 feet from the nest. It seemed to provoke no excitement—perhaps due to the fact that it was merely a skin and had no behavior.

On three occasions the male of the territory was seen to chase out another male. Once at Nest 1 they engaged in physical combat. The nesting male was sitting in its feeding tree (Birch) near the nest when another male flew directly over the nesting tree, making no sound. The former flew into the latter, knocking him to the ground. They tumbled in the dust for several seconds, continuously moving eastward nearer to Nest 2. Then the intruder went on his way toward Nest 2, and the ruler of the territory flew to a high branch and sang. Drum reports three combats similar to this.

On one occasion the nesting male gave an intruding male a poke with his bill while chasing him. The other times he merely chased him away.

On the other hand, near Nest 4, two males were seen sitting ten feet apart on a wire for several seconds one minute after one of these chases, as though a truce had been called. Finally they flew away, one after the other, in the same direction, but there was no scolding or fighting.

During nesting the male flies in a high, wide circle above the nest, undulating, and saying "Per-che-che" or "Per-chic-oree." Occasionally the female accompanies him. According to Drum (1939) this flight pretty well outlines the territory which the male defends.

She also reports that the male's territorial instincts wane as the breeding season progresses, and he seldom drives away intruders after the young hatch.

We observed no further combats between Goldfinches, which may be due to the fact that no others came near the nests, or that the blinds obscured our vision.

Following are charts outlining possible territorial activities at two nests.

Our estimates of size of territory are very rough, since we could not be sure with how many pairs we were dealing. Nests 1 and 2 were about 250 yards apart, and definitely represented different pairs, since both were in progress at the same time. Nest 3 was started after Nest 1 was deserted and was located about 125 yards from it. Nest 3 was deserted before completion, and the next day we found Nest 4 being started 27 yards away. The day before Nest 4 was started two male and two female Goldfinches were seen

in a tree near the nests. No fighting was observed, but it is to be guessed that the birds of Nest 4 chased out the birds of Nest 3. It may have been Male 3 that Male 4 was seen chasing so often.

Several times after Nest 1 was abandoned, a pair of Goldfinches were observed drinking from the lake almost even with Nesting Tree 1, and then were seen to fly in the direction of Nest 4, though they were lost sight of before they got that far. The behavior of Females 1 and 4 was similar enough that they could have been the same bird. They were both quite fearless, allowing us to be very close. Female 4 was more aggressive, flying against the mirror when it was raised to the nest; but this additional forwardness may have arisen from the desperation of arriving at such a late date and having no family as yet. Female 2, on the other hand, was most shy, and stayed away from the nest for long periods when we were near.

If Nests 1 and 4 were in the same territory, the approximate diameter was 225 yards, with the nests about 50 yards from the boundary and 125 yards apart. From drawings made by Margaret Drum (Unpublished, 1938) on territories of eight pairs, I have found the average diameter to be about 215 yards. Thus Territories 1 and 4 together are about equal in size to her average territory.

We never saw more than one pair feeding together, as Drum did. This may be due to the fact that there were fewer Goldfinches in camp this year, and there was no need for doubling up on feeding ground. Pair 1 fed chiefly in a clump of White Birches about 100 feet from their nest. In 1937 and 1938 there were eight pairs of Goldfinches nesting in the campus area, whereas this year we could find only three or four pairs.

TERRITORIAL BEHAVIOR
NEST 1

| Date | Day | Time | Activity |
|----------|---------------------------|------------------|---|
| July 23 | 1 | 6:19 A.M. | Male flying, undulating, in high, wide circle above nest, uttering "Per-chic-oree." (This several times each day, throughout period of observations) |
| 23 | 2 | 5:57 A.M. | Female lunged at Robin on limb next to nest. |
| 23 | 2 | 7:47 A.M. | Female hit Least Flycatcher on limb of nesting tree |
| 24 | 3 | 8:08 A.M. | Female chased Least Flycatcher from nesting tree. |
| 24 | 3 | 10:13 A.M. | Male singing in oak tree across road toward lake, about 60 feet from nest. |
| 24 | 3 | 10:14 A.M. | Male circled by nest several times, calling. |
| 24 | 3 | 10:20 A.M. | Male in feeding tree (birch) 75 feet from nest. Another male flew near nest. Nesting male knocked intruder to ground, fought on ground and in air. |
| 24 | 3 | 10:21-10:40 A.M. | Male of nesting pair sang in nearby oak tree, occasionally flying over nest ("Per-chic-oree.") |
| 25 | 4 | 7:30-8:00 A.M. | Male flying around nesting tree, "Per-chic-oree." |
| 26-31 | 5-10 | | No evidences seen, but difficult to observe from blind. |
| 31 | 10(after female deserted) | 1:15 P.M. | Male flying around tree, singing. |
| 31 | 10 | 6:10 P.M. | Male singing loudly in feeding Birch. |
| August 1 | 11 | 12:30 P.M. | Male singing near nesting tree. |

NEST 4

| | | | |
|----------|---|---------------------------|---|
| August 4 | 1 | 2:04 P.M. | Male singing canary-like song near nest. |
| 4 | 1 | 2:11 and many other times | Male flying in wide circle above nest, "Per-chic-oree." |
| 5 | 2 | 8:02 A.M. | Male flew at another male flying near, poked him with bill, chased him away. |
| 5 | 2 | 8:27 A.M. | Male sings canary-like song near nest. |
| 5 | 2 | 8:29 A.M. | Male chases another male west. |
| 5 | 2 | 8:30 A.M. | Two males sit on wire ten feet from nest for several seconds. Both fly north, making no sound. No fighting or scolding evident. |
| 5 | 2 | 8:41 AM | Male flies high overhead, singing canary-like song. |
| 6-12 | | | No such activity observed. |

NESTS AND NEST-BUILDING

The Eastern Goldfinch builds a directly adaptive, elevated, cupped, statant nest, usually in a horizontal or vertical crotch. Of nests studied at the Station in former years by Margaret Drum (1937, 1938), Homer Roberts (1942), Marcus Erickson (1945), 16 were in maples, six in oak, one in beech, two in birch, one in Quaking Aspen, and one (off Station grounds) in an apple tree. As was said before, our four (all that were found this summer) were in maples. Drum's nests ranged from seven to 40 feet off the ground, averaging 21 feet. Our heights were as follows:

| | |
|----------------|---------|
| Nest 1 | 27 feet |
| Nest 2 | 20 feet |
| Nest 3 | 35 feet |
| Nest 4 | 21 feet |
| Average, about | 26 feet |

Drum quotes Frances M. Root (source not found) as reporting the average height between six and ten feet. Walkinshaw reports a four-foot average in southern Michigan, with extremes of two feet and 14 feet, chiefly in Cornus bushes. A. A. Allen says Goldfinches prefer maple trees in New York State. Thomas D. Burleigh, in a report for Center County, Pennsylvania, says they range from six to 40 feet, with no particular preference for certain trees, except they like hard woods much better than conifers. But he found that in Georgia they prefer pines.

All of our nests were found after construction began, so the selection of the nesting site was not observed. In 1938 Margaret Drum saw the male and female, alone and together, hop from branch to branch, crouching in various crotches, as if trying them out for size. The female seemed to make the final choice, but the male checked it before building began.

Delayed development of vegetation may put off nest-building. Vegetation was about three weeks late this year, and the Goldfinches began nesting about two weeks late, on the average, though they

have been reported building here as late as September 15. Our nests were started as follows:

| | |
|--------|--|
| Nest 1 | July 22 |
| Nest 2 | July 11 (computed as nearly as possible) |
| Nest 3 | August 2 |
| Nest 4 | August 5 |

Mean date July 25

Beginning dates for other years are as follows:

| | | |
|------|------------------|---------------|
| 1937 | July 5-22 | Mean, July 10 |
| 1938 | July 3-26 | July 10 |
| 1942 | July 5-20 | ? |
| 1947 | July 11-August 5 | July 25 |

All four of the nests were built near an opening (two over a road), and were readily visible from at least one direction, though in each case a leaf or two (sometimes with nest built around the petiole) kept part of the nest from being seen. They were all well shaded by leaves, only occasionally getting a little direct sunlight. All were rather open to the wind. Nests 2, 3, and 4 were on branches one-half to one inch in diameter, and swayed very little. Nest 1 was on a branch one-fourth inch in diameter, and moved as much as two feet each way with a strong wind.

Nest 2 was discovered when it contained six eggs. Nest 3 was found partially completed, and was too high to observe. But Nests 1 and 4 were found soon after they were begun, and most of the building process was observed. Drum saw the very beginning of one nest, which consisted of a platform of spider webbing, woven around a crotch.

Nest 1 was found Tuesday noon, July 22, and was estimated to be a few hours old. If work began this day, as on ensuing days, at about 5:15 A.M., the construction took four days, with an approximate total of 50 hours, and an average of $12\frac{1}{2}$ hours per day.

| <u>Day</u> | <u>Period</u> | <u>Hours</u> |
|---------------|-------------------------|--------------|
| 1 | 5:15 A.M. ? - 7:15 P.M. | 14 |
| 2 | 5:15 A.M. - 8:00 P.M. | 13-3/4 |
| 3 | 5:15 A.M. ? - 7:15 P.M. | 14 |
| 4 | 5:15 A.M. - 2:15 P.M. | 9 |
| Total | | 50-3/4 |
| Daily Average | | 12.7 |

Nest 4 was begun Monday, August 4, and was finished in three days. Since second nests ordinarily are built faster than first ones, this gives further evidence that Pair 1 and Pair 4 may have been the same. At Nest 1 minimum temperatures, early in the morning, ranged from 48° - 56° F, while at Nest 4 they were 60° - 68° F. Maximum temperatures, reached at midafternoon, were 96° - 102° F, whereas at Nest 1 they were only 70° - 85° F. Thus greater temperature may have been a factor in speed of building. Many more data would be necessary before making this generalization.

| <u>Nest 1</u> | <u>Day</u> | <u>Minimum temp.</u> | <u>Maximum temp.</u> |
|---------------|------------|----------------------|----------------------|
| | 1 | 48 | 70 |
| | 2 | 48 | 77 |
| | 3 | 53 | 84 |
| | 4 | 56 | 85 |
| Nest 4 | 1 | 60 | 96 |
| | 2 | 67 | 100 |
| | 3 | 68 | 102 |

At Nest 1 more trips were made per hour in the afternoon than in the morning. At Nest 4 this was reversed. The differences seem too small to be significant. Nor do Drum's figures show much difference here.

Margaret Drum found that in 1937 nest-building took an average of nine days, with a range of six to 17 days. The summer was rainy, and the Goldfinches worked only when the nest was dry. She also reports that the birds were seldom seen around the nest for three days before the first egg was laid. Walkinshaw says at least one day always intervened between building and laying. But in both of our nests, the first egg appeared the morning after building was completed.

By the time the birds started building, the birch catkins were ripe, and these were used for both food and nest material. A few of the composites were in seed, but all thistles seen were still blooming.

The male takes no direct part in nest-building. While the female collected material, wove it into the nest, and shaped the growing structure, the male either fed in a nearby tree, sang his canary-like song, or flew overhead, uttering his characteristic "Per-che-che" or "Per-chic-oree." Occasionally he came to the nesting tree and fed his busy mate with a regurgitated white, shiny substance. A few times the male hopped into the nest, moved around inside as though shaping it. It seemed as if he was checking up on her progress.

At Nest 1 the pair were seen in copulation in the nesting tree four times, always in the morning-- three times on the second day, and once on the third day.

The male was heard singing on several occasions before nesting began. During the building process we heard him a few times -- usually just before or after another male Goldfinch was seen in the vicinity. Probably we missed many of his songs, since Tree 1, in Blissville, had several noisy persons, mostly small children,

around it most of the time. Following is a small chart giving times of songs heard.

| <u>Nest</u> | <u>Day</u> | <u>Time</u> | <u>Circumstances</u> |
|-------------|------------|-------------|---|
| 1 | 3 | 10:13 A.M. | Another male in vicinity |
| 1 | 3 | 10:21 A.M. | Immediately after fight with another male |
| 1 | 10 | 6:10 P.M.) | After desertion of nest by female |
| 1 | 11 | 12:30 P.M.) | |
| 4 | 1 | 2:04 P.M. | Female building |
| 4 | 2 | 8:27 A.M. | Two minutes before chasing another male |
| 4 | 2 | 8:41 A.M. | Flying overhead, ten minutes after chasing another male from vicinity |

The male bird fed the female several times during the building period, though Drum never observed such a feeding until after the fourth egg was laid. Nearly every time either bird entered or left the tree, it uttered a faint che-che-che-che-, so visits were easy to keep track of. Before coming to the tree to feed her, the male usually flew nearby, giving a rather loud "Per-che-che". She responded by showing general nervousness, then fluttering her wings and tail till they were just a blur, and uttering a faint "Tee-tee-tee-tee-tee", before he came, while he fed her, and usually for half a minute after he left. After she answered his call, he flew to the tree. Before the nest was well along, she hopped to the branch where he was. Sometimes they hopped to several other spots before he fed her. At first, sometimes the male's bill was lower, and she reached down inside for the food, but later he poked it down her throat, just as in feeding the young. After the nest was completed, all feedings observed were on the nest, the male standing either on the edge of the nest or on a twig beside it. On a few occasions the "dinner call" of the male was not heard, and it seemed that the female initiated the activity with her twittering and fluttering.

Only two or three times did one of the birds give the feeding call without an immediate response from its mate. Following is a chart giving times of feedings during the building period. There was no significant difference in number of feedings in morning or afternoon. It is interesting to note the progress in coordination of activities here. Both the feeding and nest-going reactions were present in the male from the beginning of building, but they were not combined into feeding the female on the nest until the fourth day. Where possible to calculate, the feedings averaged about 40 minutes apart.

The accompanying chart shows attentive and inattentive periods during building. For both Nests 1 and 4 attentiveness took a sharp drop after the second day. This drop was during the lining of the nest and may have been due to the fact that lining material was located farther away or was more difficult to find. At Nest 1 more grips were made per hour in the afternoon than in the morning, but this was reversed at Nest 4. The differences were small.

Nice (1937) reported that the Song Sparrow spent almost four times as much time at the nest on the third day as it did on the first and second days. Since weather conditions were very similar during the construction of any one nest, they could scarcely be considered a factor in the difference.

An analysis of materials used in Nest 1 showed the greater part to consist of weed bark, birch catkins, and sumac twigs, while the outside was partially covered with spider webbing. Some small grass stems, green grass leaves, an occasional piece of string, and rootlets made up the rest of the bulk. The lining was sparse and contained wads of composite pappus and a few fine rootlets.

The completed nest had these dimensions:

| | | | |
|-----------------|-----------|------------------|-----------|
| Inside diameter | 2 inches | Outside diameter | 3½ inches |
| Inside depth | 1½ inches | Outside depth | 3 inches |

FEEDINGS BY MALE DURING BUILDING PERIOD
NEST 1

| <u>Day</u> | <u>Time</u> | <u>Place</u> | <u>Circumstances</u> |
|------------|--------------------------|------------------------|--|
| 1 | 5:53 P.M. | Limb of nest-tree | Before male sits in nest |
| 2 | 8:30 A.M. | Ten feet from nest | Immediately after copulation |
| 2 | 8:59 A.M. | Limb | Immediately after copulation |
| 2 | 9:00 A.M. | Limb | Before male sits in nest |
| 2 | 9:37 A.M. | Various branches | Just after male leaves nest |
| 3 | 9:13 A.M. | Four feet from nest | Just after both ate in birches |
| 3 | 10:03A. M. | Several feet from nest | Seven minutes after copulation |
| 3 | 10:03 $\frac{1}{2}$ A.M. | One foot from nest | |
| 3 | 10:50 A.M. | Several feet from nest | After calling female from nest and chasing her from branch to branch |
| 3 | 3:07 P.M. | | |
| 4 | 5:40 A.M. | Nearby tree | After male called female from |
| 4 | 11:05 A.M. | Branch below nest | After male called female from nest. |
| 4 | 2:14 P.M. | On nest | |

TIMES MALE SEEN ON THE NEST

Nest 1

| <u>Day</u> | <u>Time</u> | <u>Circumstances</u> |
|------------|-------------|--|
| 1 | 2:40 P.M. | Female gone, collecting material |
| 1 | 5:54 P.M. | Immediately after feeding female on branch |
| 2 | 6:20 A.M. | After flying back and forth high over nest several times, calling "Per-che-che." (Female gone) |
| 4 | 10:29 A.M. | Female gone one half hour. |
| 4 | 2:00 P.M. | Female gone three minutes. |

Nest 4

| | | |
|---|-----------|-------------------------|
| 1 | 2:11 P.M. | Female gone one minute |
| 1 | 2:48 P.M. | Female gone two minutes |

ATTENTIVENESS DURING BUILDING PERIOD
NEST 1

| Day | Observation Time (Minutes) | Periods (Minutes) | | | | |
|-----|-------------------------------|-------------------|------|------|-------------|------|
| | | Attentive | | % | Inattentive | |
| | | Actual | Mean | | Actual | Mean |
| 1 | 46 | 0.25-3 | 1.2 | 33 | 0.75-7 | 2.6 |
| 2 | 372 | 0.5-6 | 2.0 | 31.2 | 0.5-19 | 4.3 |
| 3 | 339 | 0.25-4 | 1.9 | 13.6 | 1-37 | 12.2 |
| 4 | 284 | 0.5-12 | 2.6 | 16.8 | 1.5-33.3 | 11.7 |

EGG-LAYING AND INCUBATION

In Nest 1 and Nest 4 the first egg was laid the morning after construction was finished, although, according to Drum and Walkinshaw the birds usually wait two or three days before this stage. The eggs were laid in the morning, very close to 7:15 o'clock. Following is a chart showing the times between which the eggs were laid. Just before leaving the nest after laying (probably during the laying process) the female was extremely nervous, uttered a loud, whining "Tee-tee-tee", not like her hunger cry, and fluttered and moved around on the nest.

| Egg Number | Nest 1 | | Nest 4 | |
|------------|-----------|-----------|-----------|-----------|
| | After | Before | After | Before |
| 1 | | | | 7:21 A.M. |
| 2 | | | | 7:30 A.M. |
| 3 | 7:14 A.M. | 7:30 A.M. | | |
| 4 | | 7:24 A.M. | | |
| 5 | 7:10 A.M. | 7:35 A.M. | 6:45 A.M. | 7:45 A.M. |
| 6 | | 7:20 A.M. | 7:10 A.M. | 7:38 A.M. |

Drum's Goldfinches spent very little time near the nest until after the fourth egg was laid. Ours were much more attentive during this period, as shown by the following chart.

| Day | Nest 1 | |
|-----|------------------------|---|
| | Minutes of Observation | %Attentiveness |
| 5 | | |
| 6 | 45 | 48.9 |
| 7 | 342 | 63.9 |
| 8 | 45 | 83.3 |
| 9 | 295 | 100.0 |
| 10 | | Left for good immediately after laying egg. |

This shows a sharp increase in attentiveness for each succeeding day. During this time the male fed the female on the nest, on an average of once every forty minutes, though during the hot hours of mid-afternoon he often stayed away for two hours at a time. The female spent many

minutes turning the eggs, and often just looked at them. After the fourth egg fell out, leaving only three, she seemed to notice no difference in the number. But after returning to lay her sixth, and finding the nest empty, she just laid her egg, and left, and never came back.

During the hottest weather she sat with her wings spread out and her bill open.

There was one Cowbird egg in Nest 2. It was hidden beneath the six Goldfinch eggs, and did not hatch. This was only the second Cowbird egg found in a Goldfinch nest in the history of the Biological Station. Walkinshaw, in a twenty-year study of Goldfinches in southern Michigan, never found a Cowbird egg.

BROODING

Brooding was observed at Nest 2. The attentiveness of the female was almost 100% except when we frightened her away by climbing into the blind. As time progressed, she left more readily, and stayed longer.

In hot weather the female sat with wings spread, and moved as the wind changed, to deflect every available breeze onto the young.

The young birds were fed by regurgitation of a milky substance.

When the female was on the nest, the male fed her, and she in turn fed the young. Sometimes she left the nest to eat, and returned and fed them. A few times when she was gone, the male fed the young, himself. He did not seem to mind our presence so much as the female did.

The feedings usually consisted of about twenty-five rapid pokings of the parent's bill into the highest little bill. Then the parent usually removed feces from two or three young, sometimes swallowing them, sometimes flying away with them. They never removed the fecal sacs from all the young, and before long the sides of the nest were extremely dirty. As they grew older the young voided over the edge of the nest, but often they did not reach far enough out to miss the nest.

One week after hatching, the young were heard to make a very faint twittering sound in response to the parent's "Per-che-che", or in response to nothing in particular.

The first young left the nest an hour before we left the Station, just fourteen days after the first egg hatched.

SUMMARY

1. The Eastern Goldfinch actively defends at least a nesting territory, at least during the building period.
2. The four nests observed were in maple trees, at a height of 21-35 feet in either a vertical or horizontal crotch, on a branch one-quarter inch to one inch in diameter.
3. The nest was built entirely by the female, who was often fed by the male during the process.
4. Attentive periods for the first two days of nest-construction averaged 31.4%, but only 13.6% on the third day and 16.8% on the fourth day.
5. Incubation began after the laying of the first egg.
6. Feeding of the young was accomplished by regurgitation by both male and female.
7. The brooding period was approximately two weeks in length.

BIBLIOGRAPHY

Drum, Margaret

- 1939 Territorial Studies on the Eastern Goldfinch. Wilson Bulletin, Volume 51.

Erickson, Marcus

- 1945 Some Observations on the Life Cycle of the Eastern Goldfinch. (Unpublished)

Nice, Margaret Morse

- 1937 Studies in the Life History of the Song Sparrow. Transactions of the Linnaean Society of New York. Volume 4.

- 1941 The Role of Territory in Bird Life. American Midland Naturalist, Volume 26.

- 1943 Studies in the Life History of the Song Sparrow. Transactions of the Linnaean Society of New York.

Roberts, Homer

- 1942 Some Observations on the Nesting Activities of the Eastern Goldfinch. (Unpublished)

Walkinshaw, Lawrence H.

- 1938, 1939 Life History Studies of the Eastern Goldfinch. Jack-Pine Warbler, Volumes 16, 17.