

A STUDY OF A NEST
OF THE
RUBY-THROATED HUMMINGBIRD
Archilochus colubris (Linnaeus)



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INTRODUCTION

Scope and purposes of study. This is a report of a study of the parental care of nestling Ruby-throated Hummingbirds, Archilochus colubria (Linnaeus), made at the University of Michigan Biological Station, Cheboygan County, Michigan during the summer of 1947. Observations were made beginning July 17, at which time there were two eggs in the nest, and ended August 17 when the young left the nest.

Methods of study. Pershing B. Hofslund, an ornithology student making a similar study of hummingbirds, observed another nest at the Biological Station during the same time. With his permission comparisons of the two nests will be made.

Nearly all of the observation time was spent in a blind mounted on a twenty-five-foot tower three feet from the nest. Some time was spent observing the nest from a near-by position on the ground with the aid of eight-power field binoculars. The total amount of time spent in observing the nest was sixty-two hours. Although most of the periods of observation were in the forenoon and afternoon, some were spent in the early morning and the evening hours.

An attempt has been made to add to the very limited knowledge of the parental care of young hummingbirds. A complete story of these activities can not be obtained from such limited observations on one or two nests, as indicated by the differences noted in some of the activities of the nest which I observed and the one which Mr. Hofslund observed. It will require much more information.

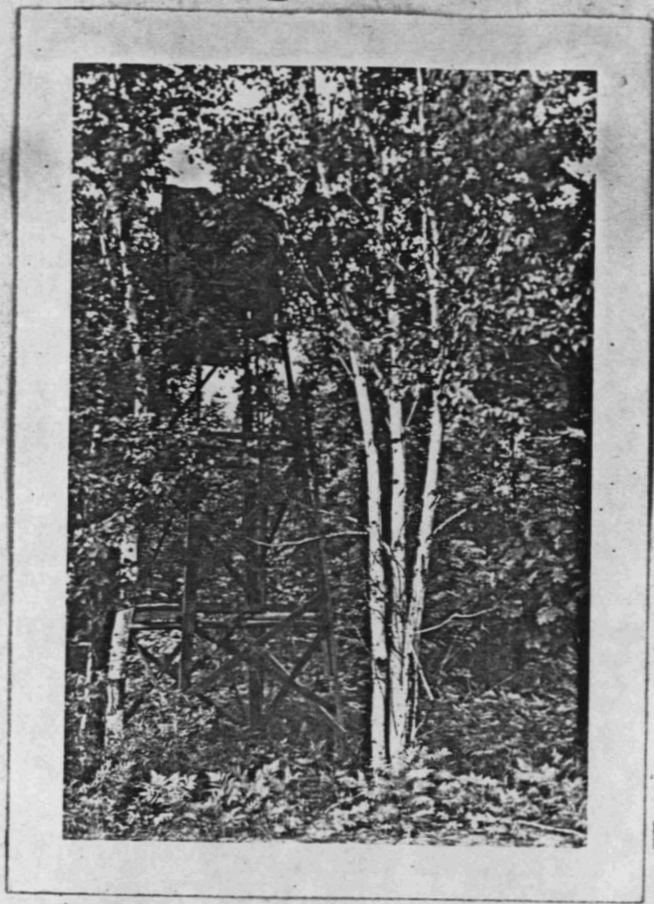


plate 1. The Nesting Site and Blind



Plate 2. The Nest

Acknowledgments. I wish to express my appreciation for the guidance offered me by Dr. Olin Sewall Pettingill, Jr. and to Dr. Theodora Nelson for many helpful suggestions. I also wish to thank Russel L. Burget for discovering the nest, and Pershing B. Hofslund for information which he generously gave of the nest which he was studying, and my wife for assisting with some of the observations.

DISCOVERY OF THE NEST

To look from tree to tree and limb to limb for a hummingbird nest would be an endless task, since the nest is so small and so well camouflaged with lichens. Both of the nests which were discovered at the Biological Station this summer were discovered by first seeing a female hummingbird and then observing her activities. In each case she revealed the location of the nest.

ENVIRONMENT

The Douglas Lake Region was originally forested with Red Pine (Pinus resinosa) and White Pine (Pinus strobus). These pines were decimated, first by lumbering operations almost sixty years ago, and then by fire in 1909. Since then the high land of the area has been covered by an Aspen-Birch Association of plants.

The trees and shrubs common to the vicinity of the nest were:

- White Birch (Betula alba)
- Large-toothed Aspen (Populus grandidentata)
- Northern Red Oak (Quercus rubra var. borealis)
- Pin Cherry (Prunus pennsylvanica)
- Sumac (Rhus glabra var. borealis)
- Round-leaved Osier Dogwood (Cornus circinata)

Among the herbaceous plants which were common were:

Bush Honeysuckle (Diervilla Lonicera)
 Wintergreen (Gaultheria procumbens)
 Bracken Fern (Pteris aquilina)

Birds which were seen and heard in the area were:

Black-billed Cuckoo (Coccyzus erythrophthalmus)
 Nighthawk (Chordeiles minor)
~~Red-shouldered Hawk (Buteo lineatus)~~
~~Red-shouldered Hawk (Buteo lineatus)~~
 Eastern Kingbird (Tyrannus tyrannus)
 Least Flycatcher (Empidonax minimus)
 Wood Pewee (Myiochanes virens)
 Tree Swallow (Iridoprocne bicolor)
 Purple Martin (Progne subis)
 Black-capped Chickadee (Penthestes atricapillus)
 Robin (Turdus migratorius)
 Cedar Waxwing (Bombycilla cedrorum)
 Red-eyed Vireo (Vireo olivaceus)
 Oven-bird (Seiurus aurocapillus)
 American Redstart (Setophaga ruticilla)
 Purple Finch (Carpodacus purpureus)
 Eastern Goldfinch (Spinus tristis)
 Chipping Sparrow (Spizella passerina)

NEST LOCATION

The nest was located on the north side of a clump of White Birches which were on the border of a small clearing, an area of about one-half acre. It was "saddled" near the end of a small branch which was three-fourths of an inch in diameter and twenty-six feet from the ground. (See Plates 1 and 2) Other nests, ~~Smith (1937:2)~~, ~~Smith (1937:2)~~, which have been found in this region averaged twelve to twenty-two feet above the ground. This one nest was attached to a smooth portion of the branch just beyond a vertical crotch where it sloped downward slightly. Since the tree was about 50 feet high, there was ample leaf cover above. These requirements of the nesting site, namely, (1). near an open area, (2). on a small branch, and (3), with leaf cover, are in agreement with observations made by Saunders (1936:153-154). Apparently the latter two are means of protection. Predators from the ground would find it difficult to reach the nest on such small branches

aerial predators cannot see the nest well from above due to the leaf cover. The leaves also afford shelter from rain and the sun. The nest was never in patches of sunlight for over fifteen minutes at any time during the day. The significance of choosing a site near an open area was not determined.

THE NEST

Appearance. From the ground the nest was very difficult to see because of its size and protective coloration. It looked like an enlargement of the branch such as a knot or gall. Closer examination revealed a tiny cupped nest "saddled" to the upper surface of a small branch. (See Plate 2.). The outer surface was neatly covered with flakes of lichen, producing a nearly perfect camouflage!

Size. The nest dimensions were as follows:

Outside height on side toward end of the branch	31 mm.
Outside height on side toward the trunk	15 mm.
Outside diameter	44 mm.
Inside diameter	27 mm.
Inside depth	21 mm.

To compensate for the slight downward slope the nest was necessarily built higher on the side away from the trunk to make it level.

Material. The lining was composed of plant down. The framework which gave the nest a certain amount of rigidity and to which the down and lichens were fastened was made up of bud scales. They made up the bulk of the nest. They were bound together by spider webbing. The outer surface of the nest was covered with lichen, giving a greenish-gray appearance. Here and there the black under-surface of a piece of lichen showed. Spider webbing was used to fasten the nest

to the branch. It was seen on the branch about the base of the nest.

The nest changed very much in appearance by the time the young left ^{it} ~~the nest~~. Since it was necessary for the female parent to clutch the side of the nest while feeding the young, this began to remove some of the lichen and fray the down at the edge of the nest. As the young grew in size, they caused the sides of the nest to push out and turn back, exposing the lining around the top like a turned mitten. During the last week the nestlings had flattened the nest so that it looked more like a platform. The outside diameter increased from 44 millimeters to 65 millimeters, about one-third larger.

PARENTAL CARE

Incubation. Since the nest was discovered after the eggs were laid and since one hatched on the first day of observation, the information about incubation is very limited. However, one author, Forbush (1927:319) states that the incubation period is 13 to 14 days. Mr. Hofslund[✓] made the following observations on incubation over a period of 11 days beginning on July 9. All but one of these observations were made in the forenoon. The female alone carried on incubation. No male bird was observed at any time during the period, although the hum of another hummingbird was heard near the blind once during the early part of the observations. Near the beginning of incubation the female was off the nest about as much as she was on it, and the intervals of attentiveness and inattentiveness were short. As the time for hatching approached,

✓ Pershing B. Hofslund was studying another Ruby-throated Hummingbird nest at the same time located about one-fourth of a mile from the nest described in this paper. Hereafter the latter nest will be referred to as Nest A and Mr. Hofslund's nest will be referred to as Nest B.

she became more attentive, spending about three times as much time on the nest as off. For data, see Table 1. Mr. Hofs-lund noted that during the last day of incubation the female was more nervous than usual.

Hatching. There were two tiny white eggs in the nest. I did not measure them; however, Bent (1940:339) after measuring 52 eggs found the average size to be 12.9 by 8.5 millimeters.

The first egg hatched between 7:00 and 8:00 P.M. on July 17. When the female was incubating during this time, I was aware of her squirming and shuffling more than usual in the nest. Then she suddenly flew from the nest to about two feet away, hovered for a moment and then darted toward the nest. She removed one portion of the egg shell of the newly-hatched young. The second egg hatched twenty-four hours later. At this time my observation was brief. I saw the young bird still in the smaller end of the egg shell, the larger end having been pushed free.

It is interesting to note that the eggs hatched at an interval of one day. Because this was observed, and because, according to Bent (1940:339), "an interval of one day is said by Bendire (1895) to occur between the laying of the two eggs", it appears that incubation begins immediately after the laying of the first egg.

Appearance of the young at hatching: The newly-hatched hummingbird was about three-fourths of an inch long. Lying prone it was equal in length to the diameter of the bottom of the nest. It was very thin and weak. The general color was a slate gray. Except for two rows of light tan down on the dorsal area of the spinal tract the body was naked. The head

TABLE 1. INCUBATION ATTENTIVENESS FOR NEST B BEGINNING JULY 9

Day	Time	Length of Observation		Temp. (F.)		Average Time Interval		Percent	
		Hrs.	Min.	Max.	Min.	Att.	Inatt.	Att.	Inatt.
2	AM	3	26	75	61	4.3	3.6	54.1	45.9
6	AM	2	40	90	59	7.1	2.6	62.5	37.5
8	AM	1	50	80	63	9.1	4.4	66.3	33.6
9	AM	2	13	83	66	20.0	6.0	75.1	24.8
	PM	1	31			10.0	6.0	58.2	41.8
13	AM	3	45	69	54	11.5	3.6	76.6	23.2
14	AM	1	10	64	51	13.4	7.6	95.2	4.8

Explanation of Table 1.

Using 14 days as the length of the incubation period, these observations are considered to have begun on the second day after the egg was laid. The percent of attentiveness is the relationship of the total amount of time spent on the nest during an observation to the total time of the observation. The percent of inattentiveness is computed similarly. The maximum and minimum temperatures were recorded at 7:00 A.M. and 7:00 P.M. E.S.T. The time interval is in minutes.

and eyes were large and way out of proportion to the body. The bill was not at all hummingbird-like, but a broad flat triangle, like most young birds. It was blind.

Brooding. As it was observed during incubation, the male did not assist with brooding. In fact, there have been no reports of anyone seeing a male hummingbird at the Biological Station during the months of July and August, although females have been seen frequently among the flower beds at various places.

The female of Nest A followed a regular brooding schedule (See Table 2) which terminated on about the ninth day after the first young hatched. In general, the percent of attentiveness was highest at the beginning of brooding and gradually decreased until the morning of the eighth day, after which time it dropped abruptly. However, Mr. Hofslund reports that the female of Nest B brooded one day only, and was 63% attentive during that day. I cannot account for this marked difference in brooding habits of these two birds.

The weather during the last part of July was cool and windy. There were weekly periods of rainy weather which lasted about two days followed by four or five days of good weather. During the night of July 31 there was frost in this region. The first two weeks of August were hot and dry. According to Forbush (1927:320) hummingbirds are very susceptible to cold and therefore the female broods her young almost constantly during cool, wet weather until they are well feathered. I did not observe similar consideration for the young except on one occasion during a thunderstorm when the female of Nest A remained on the nest almost all of the time during

TABLE 2. BROODING ATTENTIVENESS FOR NEST A BEGINNING JULY 18,
THE FIRST DAY AFTER THE FIRST YOUNG WAS HATCHED

Day	Time	Length of Observation		Sky	Weather Temp. (F.)		Average Time Interval		Percent	
		Hrs.	Min.		Max.	Min.	Att.	Inatt.	Att.	Inatt.
1	AM	2	25	cloudy	75	56	23.0	3.7	86.0	14.0
	PM	1	37	clear			22.0	3.2	87.0	13.0
3	AM	2	31	cloudy	69	54	15.0	6.1	71.0	29.0
	PM	1	15	cloudy			10.0	7.7	56.0	44.0
5	AM	1	05	clear	70	49	9.5	3.3	74.0	26.0
6	AM	2	58	clear	77	50	10.5	7.4	58.0	42.0
	PM	2	38	clear			12.0	8.8	42.0	58.0
8	AM	3	20	clear	85	63	12.0	20.0	37.0	63.0
	PM	1	21	clear			3.0	38.0	7.0	93.0
10	PM	2	00	clear	76	64	0	0	0	100.0

(For explanation of percent of attentiveness and inattentiveness see explanation of Table 1.)

the storm. She left the nest for one interval of three minutes. Otherwise the wind, rain and cold did not appear to affect her brooding schedule. During the very cold nights of July 31 and August 1 when frost occurred in near-by localities, I visited the nest at 10:30 P.M. and did not find her brooding. (The young were covered with pin feathers.) I remained in the blind for twenty minutes. Had I flushed her, she would have returned within that time, since it was her habit to return within ten minutes. So far as was observed, the weather had no effect with the brooding of the female of Nest B, since she was seen on the nest during the first day only.

Brooding at Nest A ended July 26, nine days after the first was hatched. Both nestlings had a good growth of pin feathers and the eyes of both opened on the same day. Apparently the brooding period ended as the second stage of development of the young began.

FEEDING. 1. Frequency. I observed the first young of Nest A being fed eleven hours after it hatched. It may have been fed sooner than this, since my observations began at 7:25 A.M. Feeding on the average was at about one-hour intervals for the first two days. After that it averaged 45 minutes. There were variations according to the time of day, being a little more frequent during the morning and late afternoon and less frequent during the in-between-periods. Interference caused by passers-by also interrupted the feeding rhythm. If someone stayed within the vicinity of the nest outside of the blind, the female often would not return until the intruder had left. Sometimes the interval between feedings under these circumstances was as long as one and one-

half hours to over two hours. Aside from these interruptions this hourly rhythm was maintained throughout the nesting stage.

2. Method. Hummingbirds use a direct method of feeding by regurgitation. Food is disgorged by the parent directly into the throats of the young. The technique used in placing the food in the young's mouths is a startling one to observe for the first time. The general pattern is something like this: (see Plates 3,4,5,6) the female flies directly to the nest, grasping the edge of it, and braces her tail on the side, woodpecker fashion. She then arches her neck so that the bill is pointing nearly straight down. With a thrust which would seem to force the needle-like bill through the young, she drives it into the mouth, and down to the stomach. The bill nearly disappears into the nestling. At this time the bill of the parent vibrates up and down rapidly for a few seconds. Then she withdraws it to about one-half the length of her bill and they both vibrate their heads rapidly as she "pumps" the regurgitated food into its throat. The parent throat vibrates as she disgorges the food while the nestling's throat vibrates as it swallows the food. Just before the female withdraws her bill, to feed the next one, the young grasps it and rotates its head back and forth as though it did not want the parent to withdraw. Perhaps this might be a reaction to having enough food for the moment and the parent recognizes this as a signal to withdraw. At any rate, she withdraws and proceeds to feed the next one in the same manner. Usually this is repeated two or three times for each bird. Mr. Hofslund observed at Nest B, where there was only one young that the parent repeated this six or seven times per feeding. The total time required to feed both young in Nest A averaged about one and one-half minutes.



Plate 3. Position of Female Prior to Feeding



Plate 4. The Deep Probe



Plate 5. Regurgitation Following Deep Probe



Plate 6. Female Using Wing for Lateral Support

During the first day the young was very weak and could barely raise its head. At this stage of development the female assisted it by lifting up the young's bill with hers and putting her bill in at the corner of its mouth. Then its neck would stretch as the parent's bill went into the region of the stomach. Apparently this initial probe of the bill down to the stomach is a necessary step of the feeding process. It probably acts as a stimulus for swallowing. However, the initial deep probe is gradually dispensed with during the last few days on the nest.

In the earlier phases of the nestling's life while its bill is only a flattened triangle, receiving food is not a problem. The female can feed it from most any position it chooses at the edge of the nest. But by the eighteenth day, when the nestling's bill has become elongated to a length equal to the ~~length equal to~~ the length of its head (about one-half inch), receiving food from the parent is not as easy. Often the young were arranged in the nest so that they were facing opposite directions. Although it was possible for her to feed them when they were in this arrangement, she sometimes found it easy to feed one facing her and almost impossible to feed the other. When she placed her bill into its mouth, it would be at an acute angle. Sometimes the unfortunate one would have to wait until the next feeding, even though the parent had attempted to feed it from the same position three or four times. A few times she would change her position so that she could feed both.

Feeding Problems. During the last week of the nestling phase another problem of feeding arises. By this time the

two young birds, which are much too large for the nest, have broken it down so that it is nearly a platform. The upper edge of the nest projects beyond the base of it, thus removing the surface against which the female had propped her tail. She grasped the edge of the nest as usual and then, having nothing to prop her tail against, her back would be at an angle away from the young with her tail under the nest. As she probed into the young's mouth, her back would straighten up. But during the rapid vibrations of feeding it was necessary for her to flutter her wings to maintain balance. On one occasion I saw her lose her balance from this position while she was regurgitating food. She continued this feeding process without removing her bill, but keeping it there by hovering in front of the young.

On windy days she usually chose the side of the nest which placed her in a position facing the wind while feeding. On several occasions when the wind was gusty I have seen her blown from this position. When this happened, she hovered at a distance of three or four feet from the nest, facing the wind until the gust subsided, and then returned to the nest to continue feeding.

Food. Hummingbirds choose nesting sights in the vicinity of flowers. There are flower beds of Batchelor Buttons and Sweet Peas at various places on the Biological Station Campus. Female hummingbirds have been observed to frequent them. Other wild flowers which are located in the vicinity of the nest, i.e., within one-fourth of a mile, are two patches of fireweed (Epilobium angustifolium) located along West State Street and Upper Drive, and Bush Honeysuckle

(Diervilla Lonicera) and Northern Sumac (Rhus glabra var. borealis) located in the Aspen-Birch Association. Although hummingbirds have not been observed feeding from the first two mentioned above, one was seen feeding at the flowers of Northern Sumac. During all of the observations which I have made, I have never seen the female bring objects such as worms, insects, etc. to the young. It has always been regurgitated food. Forbush (1927:321) states the following about the food of young hummingbirds, "During the last part of the nesting period the young are fed more or less with soft insects, not regurgitated, but held in the bill of the parent and passed to that of the young, but probably regurgitation is the rule until the day of flight."

The popular belief that hummingbirds live on a diet of nectar has been disproven by some. One observer, F. A. Lucas (cf. Bent, 1940:342), who examined the stomach of 20 hummingbirds, reveals the following facts about their food: "It would be safe to assume that the main food of hummingbirds is small insects, mainly Diptera and Hymenoptera. Homoptera are usually present and small spiders are an important article of food.....I am inclined to believe with Dr. Shulfeldt that hummingbirds first visited flowers for insects and that the taste for sweets has been incidentally acquired."

NEST SANITATION

Nest sanitation is not much of a problem for hummingbirds. After the first few days the young take care of their excretions by ejecting them over the edge of the nest. In the first few days of the nestlings' life I observed the female to probe her bill into the nest while she was brooding,

and pick up and swallow something too small to be seen from the blind. Since I did not see the young defecate over the side at this time, I assume she was removing feces from the nest. C. W. Schlag (cf. Bent, 1940:341) found this about nest sanitation: "In cleaning the nest the hummingbird placed the droppings of the young in a line on the same branch, just above the nest." I did not observe such orderliness. At first it would be physically impossible for the young to defecate over the side because of its size as compared with the depth of the nest. After a few days it was large enough so that it could work its posterior end up above the level of the nest and forcibly eject the feces a foot or two beyond it. Evidence of this type of "sanitation" was on the leaves and branches around and below the nest.

DEFENSE

Other Birds. Ruby-throated Hummingbirds are described as pugnacious and strong defenders of their nests. I saw the female of Nest A drive away a Least Flycatcher from near the nest. The flycatcher apparently perched by accident too near the nest. The hummingbird came from a near-by perch and chased it to another part of the same tree. I have heard Red-eyed Vireos, Least Flycatchers and Black-capped Chickadees in the same tree in her presence, and she did not appear to be disturbed by them. However, no other bird stayed in the tree any more than a few minutes. The hummingbird at Nest B chased away another female hummingbird once, but was not disturbed by Kingbirds which were nesting in a near-by oak.

Humans. The hummingbird at Nest A flushed easily during the entire brooding period. If anyone came into full view

within 50 to 80 feet of the nest, she would chipper and perch near-by for a few minutes, then disappear. She did not attack me at any time, although she scolded when I entered the blind. The hummingbird at Nest B flew at one person's face while he was entering the blind. Otherwise it reacted about the same as the one at Nest A.

FLEDGING

By the fourteenth day the head, neck, and body were covered with rows of white pin feathers, giving the nestling a black and white striped appearance. The wing feathers were about half-way out and the tail feathers were coming out. Twenty-four hours later (the fifteenth day) the young feathered out, changing their appearance completely. All of the head except the forehead had feathers.

Wing exercise began on about the tenth day. Following most feedings during the morning, early forenoon and late afternoon they were active for a period of fifteen to twenty minutes. Wing exercise was accomplished by one of the young standing up slightly and then fluttering the wings rapidly. By the twentieth day exercises were accompanied by chipping which resembled the parent's chip. Vibration of the wings was rapid enough to produce a low hum. On the twenty-fifth day one exercised so violently that its body was moved to the edge of the nest. Had it not been grasping the bottom of the nest with its feet, I believe it might have taken off from the nest.

Nest occupancy by the young began on July 17 when the

first was hatched. July 18 was considered the first day. Occupancy continued until August 15, a total of twenty-nine days by one and until August 17, a total of thirty-one days by the other. This appears to be an unusually long period for young hummingbirds to stay on the nest. According to Bent (1940:341) in reference to the length of time the young stay on the nest ".....my New England records of this period ran from 14 to 28 days." The young of Nest B left after a period of 21 days on the nest. Other records of Ruby-throated Hummingbirds at the Biological Station, Duer (1939: 11), Sandve (1943:7) and Prockiw (1940:14) show the nestlings stay to have been 19 to 21 days. Perhaps the slow development of the young was due to a shortage of food. The weather during the first two weeks of their life was cold and wet. This was an unfavorable condition for an abundance of insects. The weather during the remainder of their life was begun by two very cold days followed by a period of hot dry weather. Flowering plants which were visited by the parent bird during the early period were no longer in bloom during the last week of occupancy. A food shortage resulting from this combination of a late start and unfavorable weather conditions may be a cause for the long period on the nest.

NEST LEAVING

During the morning of August 15, the twenty-ninth day, one of the young left the nest. Following a feeding the young, as usual became active. One began its wing exercise in the usual manner. The lifting force of its wing beats was sufficient to lift it off the nest even though it was grasping

the bottom of the nest. I could see nest lining grasped in its clutches. It moved sidewise over its nest-mate and settled down on the latter's back. It attempted to settle down on the other side of the nest. During its attempt it lost its balance and used its wings to regain it. The force was so great that it left the nest as quickly as the parent bird. It flew to a near-by perch and began a peeping which sounded like a high squeak.

The second young was not observed during its leave-taking. Neither was the female observed caring for the young after they left the nest.

SUMMARY

A nest of the Ruby-throated Hummingbird was observed from July 17 to August 17, 1947, a period of thirty-two days. Comparisons were made with a second nest which was observed by Mr. Pershing B. Hofslund during the same season.

The nests were both located in an Aspen-Birch Association of plants. The nesting site was a clump of White Birches wherein the nest was attached to a down-sloping small branch at a distance of 26 feet from the ground.

Only the female carried on incubation, brooding and feeding of the young. No male was observed at any time during this study.

Incubation records were obtained from Mr. Hofslund whose observations of this extended over a period of 11 days. Near the beginning of incubation the female was off the nest about as much as she was on it and the intervals of attentiveness and inattentiveness were short. Near hatching

time the female spent about three times as much time on the nest as off. On the last day of incubation the female was more nervous. The exact length of incubation was not determined.

Two eggs hatched at an interval of 24 hours. The female was seen removing a portion of egg shell with her bill.

The female followed a regular brooding schedule which was regulated more by the time of day than by the weather conditions. Brooding was more continuous during a thunderstorm. Brooding ended nine days after the first egg hatched, at which time the nestlings had a growth of pin feathers and their eyes were open.

The first young was observed to be fed 11 hours after it hatched. The feeding interval was 45 to 60 minutes, being more frequent in the morning and late afternoon. The female regurgitated about three times for each bird during a feeding. The total time required to feed both young was one and one-half minutes.

Nest sanitation was first accomplished by the female's removing bits of material with her bill. After that the young defecated over the side of the nest.

The female was seen defending the nest from a Least Flycatcher.

By the fourteenth day white pin feathers on a slate-gray skin gave the young a striped appearance. They feathered out on the fifteenth day. Wing exercise began on the tenth day.

One of the young left the nest on the twenty-ninth day,

August 15.. The other left the nest on the thirty-first day, August 17. The long nestling stage may have been due to the late start and to food shortage.

The young flew directly from the nest.

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