

NESTING STUDY OF THE RUBY-THROATED HUMMINGBIRD

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## NESTING STUDY OF THE RUBY-THROATED HUMMINGBIRD

## INTRODUCTION

During the summer of 1948 the nesting activities of two nests of the Ruby-throated Hummingbird (Archilochus colubris) were observed near the University of Michigan Biological Station, Cheboygan County, Michigan. Between June 30 and July 20, 1948 observations totalling 60 hours were made at Nest A. This nest contained one nestling assumed to be one to two days old at the time of the first observation. Nest B was under observation for a total of 20 hours from July 7 to July 13, 1948. This nest contained two nestlings estimated to be 14 or 15 days old at the time of the first observation. These estimations were based on a 21 day nesting period arrived at by consulting nesting reports of the Ruby-throated Hummingbird in this region. These reports showed an average 19 to 21 day nesting period with extremes of 16 to 29 days. Forbush (1927) wrote that extremes of nestling life fell anywhere between 6 to 28 days in New England, but arrived at an average of 21 to 22 days. The nestling ages referred to in this paper will be an age of one day at the first observation for Nest A, and a 15 day age for the nestlings of Nest B.

In a study of the Douglas Lake Region between July 2 and August 14, 1941, White (1941) reported the Ruby-throated Hummingbird as ranking 3.3% in frequency. This low percentage may be accounted for by the difficulty of observation and the lack

of a conspicuous song.

Observations were conducted from canvas covered blinds of the tower type. In both cases the floors of these blinds were approximately 12 feet high, and were placed four to five feet from the nests. Binoculars (6 x 25) were used to follow the fledglings.

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#### ENVIRONMENT

The nesting area was situated in the Coniferous-deciduous forest ecotone. The original forest had been cut over and burned, and the succession was a second growth Aspen-red maple association. The dominant composition of this community was:

##### Trees

Large-toothed Aspen (Populus grandidentata)

Red Maple (Acer rubrum)

Quaking Aspen (Populus tremuloides)

Red Oak (Quercus borealis)

White Birch (Betula alba)

Red Pine (Pinus resinosa)

##### Shrubs

Smooth Sumac (Rhus glabra)

Shad Bush (Amelanchier canadensis)

Wild Red Cherry (Prunus pennsylvanica)

Ground cover

Common Brake (Pteris aquilina)

Cladonia sp.

Polytrichum sp.

Avifauna

Red-eyed Vireo (Vireo olivaceus)

Oven-bird (Seiurus aurocapillus)

Cedar Waxwing (Bombycilla cedrorum)

Chipping Sparrow (Spizella passerina)

Wood Pewee (Contopus virens)

Robin (Turdus migratorius)

Redstart (Setophaga ruticilla)

Least Flycatcher (Empidonax minimus)

The mean daytime temperature during the period of study between June 30 and July 20, 1948 was 69.7°F., and the total rainfall for the same period was .95 inches. The average daytime temperature for the month of July, 1948 was 69.7°F. and the total rainfall was 1.95 inches. As the normal precipitation for July is 1.85 inches and the normal temperature 66°F., the 1948 month was wetter and warmer than normal. Climatic data was obtained from Dr. Frank C. Gates, Kansas State College, and the U.S. Weather Bureau at Cheboygan - 13 miles east of the Biological Station.

As both nests under study were located approximately 400 yards apart, environmental conditions were similar.

## NESTS

Nest A was located about 150 yards south of the west shore of South Fishtail Bay, Douglas Lake. It was situated on a downcurved branch of a White Birch, 2.2 meters from the trunk, and 4.0 meters from the ground. The nest was composed of a base of bud scales and plant down, trimmed with lichen, and fastened to the branch with spider silk. The dry weight of the nest was 1.52 grams, and the percentage composition by weight of the different nesting materials was bud scales 3%, plant down 24%, and lichen 72%.

Nest B was located approximately 400 yards east of Nest A. It was situated in a White Birch, 2.5 meters from the trunk, and 3.8 meters from the ground. Its dry weight was 1.51 grams, and it was similar in composition to Nest A.

The following table compares the dimensions of the two nests:

	Nest A	Nest B
Inside diameter	3.0 cm.	3.0 cm.
Outside diameter	5.0	3.5
Inside depth	1.0	1.0
Outside depth	3.0	3.0
Maximum	4.0	4.0
Minimum	2.0	1.5

Of the 12 hummingbird nests studied in this area including the present study, six were in White Birch, two in Red Oak, and one each in Beech, Sugar Maple, Red Maple, and Elm. The

nests ranged in height from 12 to 26 feet. Seventy-one per cent of these nests were 12 to 13 feet above the ground.

Kendeigh (1948) reports the Ruby-throated Hummingbird as nesting in Aspen-red maple, Cedar-aspen, and Beech-maple-pine communities of this region.

## PATERNAL CARE

### Brooding

Brooding of the nestling at Nest A extended from the day of the first observation, June 30, at which time the young bird was assumed to be one to two days old until July 7, a period of 8 days.

Hofslund (1947) and Eyer (1947) both reported a brooding period of 9 days. This seems to compare favorably with the time found in the present study, and further substantiated the assumption as to the age of the nestlings.

The total time of attentiveness decreased from 75% and 77% on the first and second day to 35.4% and 9.1% on the seventh and eighth day. The decrease of 26.3% between the last two days was the greatest between any two successive days of brooding.

During those days in which brooding was observed all day, the percentage of total time of attentiveness was in all cases greater in the morning hours than in the afternoon. A relationship seemed to exist between the length of attentive periods and light conditions. It can be seen from table 1. that under

shady or overcast conditions the time of attentiveness was less than when it was clear. It should be noted that the nest was more shaded in the morning hours than in the afternoon. Even though in all cases there was a greater percentage of total time spent in attentiveness during the morning, the actual average periods of attentiveness seemed to fluctuate with the light factors.

Upon entering the nest after an inattentive period the female hummingbird would settle in the nest facing a westerly direction more often than any other position. She would constantly shift her position in the nest, but invariably would spend most of the time facing west. During days of extreme gustiness she would shift her position more than usual. Sixty-six per cent of the time she faced west after entering the nest, and 57% of all positions faced was west. This habit of facing west may have been due to the prevailing westerly winds, or to the fact that her food supply was located in an easterly direction.

Brooding was carried on entirely by the female hummingbird. While brooding she was constantly alert, opening and closing her bill, preening, stretching her wings, moving her head back and forth, trying to catch insects, and pecking at the nest or branch. She flushed immediately at the approach of person or vehicle. For the first two days of brooding she did not remain away from the nest more than five minutes when flushed, but during the last four days she stayed away from 8 to 35 minutes. The young were fed upon returning 67% of the



time she was flushed. She returned to the nest and brooded without feeding the nestling 42.4% of the time.

During the first 7 days of brooding, the adult appeared to clean the nest from time to time. It was not until the last days of brooding that the young bird was seen to void fecal sacs over the side of the nest.

Normal brooding activity continued during a light rain on the morning of July 3. The afternoon of July 5, however, was occasioned by heavy shower activity. One minute after the onset of a shower lasting five minutes, the adult returned to the nest, and remained there until 9 minutes after the rain stopped. Later in the afternoon she returned at the beginning of a particularly heavy shower. After shaking her wings somewhat, she remained motionless throughout the major portion of the shower which lasted 40 minutes. Her head was held at an approximate  $45^{\circ}$  angle during the course of the rain, and was lowered at the cessation of the rain.

On the afternoon of July 6, after returning to the nest, and in the process of feeding the nestling, she was attracted by the appearance of a large beetle crawling along the nest branch about one foot away. She immediately flew at the insect, jabbing at it several times with her bill without dislodging it. The hummingbird then returned and continued to feed the young bird. Again she seemed disturbed by the presence of the beetle, and flew at it, pecking it repeatedly, until she finally succeeded in pushing it off the branch. She then returned to brood.

On another occasion she apparently noticed a young Robin perched about 10 feet from the nest, and five feet above it. Immediately she took on a frozen attitude, and remained so until the bird flew away. Hummingbirds are well known for the active defense of their nest, and the above described reaction seemed strange.

On the afternoon of July 8, one day after the cessation of brooding, after remaining away from the nest for 74 minutes, the adult returned, fed the nestling, and began to brood. The nestling pushed its head past the parent's body, and it could be seen in a begging attitude. The parent touched her bill to the nestling's in an indifferent manner. The young bird continued this begging attitude for the full 15 minutes the adult remained on the nest.

Table 1 summarizes the brooding data.

#### Feeding

Feeding was carried on exclusively by the female hummingbird. When returning to the nest either during brooding or after, she never flew directly to the nest, but would perch on a nearby branch first. All feeding took place by regurgitation, and no food was seen to pass between parent and young. Feeding was accomplished by a series of probes in which the bill of the parent was thrust down the throat of the young bird. A single probe ended by the complete withdrawal of the adult's bill.

While flying around the nest or to it, the adult hummingbird would invariably utter a series of unmusical call notes prior to each feeding visit. These notes were not heard when she returned to the nest without feeding the nestlings.

The nestling in Nest A was fed on the average by 3.5 probes of the parent's bill. After the young bird had left the nest the average feeding consisted of 2.2 probes. The two nestlings in Nest B were fed by a total of 5.1 probes per feeding visit. They were usually fed alternately by individual probes ranging from one to six. After nest leaving the one fledgling from Nest B was never fed by more than one probe on all 20 feeding visits observed.

A total of 94 feeding visits were observed at Nest A. Forty-two were observed during brooding with an average of 1.33 feedings per hour. Between the end of brooding and nest leaving, 26 feedings were observed with an average rate of 1.65 feedings an hour. After nest leaving the fledgling was seen being fed on 26 occasions at an average 2.22 feedings an hour.

Data from Nests A and B compare favorably. In both cases the rate of feeding prior to nest leaving was the same - 1.65 per hour, and the rate after nest leaving was 2.26 for Nest A and 2.22 for Nest B. There was, then, an increase of .61 and .57 feedings per hour after nest leaving. Apparently the size of the brood had little effect on the feeding rate. The intervals between feedings at Nest A decreased from 38.9 minutes before nest leaving to 30.1 minutes after nest leaving. In Nest

B the time interval decreased from 36.2 minutes to 23.9 minutes.

On July 12, the day of nest leaving at Nest B, the nest was under observation from 4:00 A.M. to 9:00 P.M. The first feeding occurred at 4:43 A.M. The last feeding of the fledgling took place at 8:25 P.M.

A much higher pitched note than usual was heard from the adult after nest leaving. The fledgling was noted to emit a series of squeeks whenever the hum of the parent's wings and her call notes were heard. This system of locating the fledgling worked very well as the adult had little difficulty in locating the young bird even though the fledgling moved about considerably.

The first feeding after nest leaving at Nest A the parent returned to the nest, but soon saw the young bird on a nearby limb. She flew directly to it, but did not feed until she had flown about the immediate vicinity for about a half a minute. Thirty-five minutes later, immediately following the third feeding after nest leaving, the adult hummingbird flew to the empty nest, pecked at for awhile, then flew away.

On the warm, clear afternoon of July 8, during a prolonged absence of the parent of 74 minutes, the young bird was noted to beg as soon as the hum of the parent's wings was heard. It was not until 10 minutes later that she actually fed, but during all this time the young bird held its head in a begging attitude. The parent was not visible to the observer during this time.

On several occasions the young bird responded by begging as soon as the whirring of the parent's wings and call notes were heard. For the most part, however, the nestling did not respond until the adult touched the nest.

On July 15 the young bird at Nest A did not respond normally to the feeding attempts of the adult. It was fed during the usual intervals of time, but after the first feeding probe the nestling refused to open its bill. At 11:30 A.M., the sixth unresponsive feeding after 8:35 A.M., the adult seemed especially persistent to feed the young bird. She pecked repeatedly at the nestling's head and bill, but without success. Then, as though in frustration, the adult got into the nest where it remained in a brooding manner for three minutes. This feeding difficulty continued for the remainder of the afternoon observations. Difficulty with feeding and the subsequent sitting on the nest was also noted by Hofslund (1947). His bird left the nest on the following day. It did not seem likely that climatic factors could have influenced this behavior as July 15 was a clear day with a mean daytime temperature of 70°F.

Tables 2, 3, 4, 5, and 6 are a summation of feeding data.

## THE NESTLINGS

## Nest A

The following table lists the various actions, and the first time they were observed:

<u>Action</u>	<u>Time</u>	<u>Age</u>
Food <del>begging</del>	4:37 P.M.	2 days
Movement in nest	9:47 A.M.	4
Voiding of excrement out of nest	9:25 A.M.	8
Preening	10:25 A.M.	14
Scratching and wing stretching	9:09 A.M.	15
Wing exercising and first sounds	9:40 A.M.	15
Nest leaving	8:05 A.M.	20

The following notes were taken on the morning of July 19:

- 7:45 A.M. Entered blind to find young bird perched on branch about one inch away from the nest
- 7:50 A.M. Nestling began to move around - pecked at nest - stretched wings - exercised wings and squeaked - crawled back into nest - voided excrement - pecked at edge of nest
- 8:04 A.M. Adult returned and fed young by one probe - nestling then exercised wings - preened and pecked at nest

8:05 A.M. Nestling flew out of nest and perched  
on a branch about one foot away

After nest leaving the fledgling would periodically fly for short distances from branch to branch on the nest tree or trees in the near vicinity. It was observed thus for 27 hours and 32 minutes, after which time the author was unable to locate the young bird.

#### Nest B

When the two nestlings were first observed they were already scratching, preening, and stretching their wings. On that day their ages were estimated at 15 days. At 10:58 A.M. of the following day one young bird was first observed to exercise its wings and squeek. On 3:20 P.M., July 11. the author extended his hand toward the nest to observe the reaction. Without hesitation one nestling flew out of the nest while the other remained motionless. The flown bird was found on the ground about 12 feet away, and was returned to the nest. Twelve minutes later the parent returned, fed the young birds, and normal nest activity continued.

The next day, July 12, the nest was under observation beginning at 4:00 A.M. Movement of the nestlings was first observed at 4:15 A.M. Both birds were actively exercising their wings and squeeking at 5:02 A.M. Actual nest leaving was not observed by the author. It was reported by Mr. George E. Grube, however, that both young birds left the nest together as he

approached at 9:25 A.M. One fledgling was located at 2:25 P.M. that afternoon, and kept under observation until 9:00 A.M. that evening. Watch was again resumed at 5:22 A.M. the following morning until 10:00 A.M. at which time the fledgling could not be located. The young bird remained in the immediate vicinity, then, for a period of 23 hours and 20 minutes.

Smith (1937) reported hummingbird fledglings that he observed as remaining in the immediate vicinity of the nest 16 days after nest leaving.

The activities of the fledgling were similar to those of the Nest A fledgling. It spent much time actively scratching, preening, and flying from branch to branch for short distances.

#### SUMMARY

1. The nesting activities of two nests of the Ruby-throated Hummingbird were observed at the University of Michigan Biological Station, Cheboygan Co., Michigan.
2. At the time of the first observation Nest A contained one nestling estimated to be one day old, and was observed for a total of 60 hours from June 30 to July 20, 1948. Nest B was observed for a total of 20 hours from July 7 to July 13, 1948.
3. Brooding at Nest A lasted for 8 days.
4. Total time of attentiveness during brooding decreased from 75% on the first day to 9.1% on the last day.
5. The percentage of total time of attentiveness was greater



- in the morning than in the afternoon during brooding.
6. During brooding the adult faced a westerly direction after returning and settling in the nest 78% of the time.
  7. The number of probes required to feed the nestlings decreased in all cases after nest leaving.
  8. A total of 94 feeding visits were observed at Nest A. The rate of feeding during brooding was 1.33 feedings an hour; between the end of brooding and nest leaving, 1.65 per hour; and 2.26 per hour for the fledgling.
  9. A total of 46 feeding visits were observed at Nest B. During the nestling stage the feeding rate was 1.65 per hour, and that of the fledgling, 2.22 per hour.
  10. In both nests the rate of feeding increased after nest leaving.
  11. The first observed feeding at Nest B occurred at 4:43 A.M. on July 12, and the last feeding at 8:25 P.M.
  12. The nestling at Nest A was first seen to beg for food on the second day of nest life, moved in nest on the fourth day, voided excrement over side of nest on the eighth day, and preening, scratching, wing stretching, wing exercising and squeaking on the fifteenth day. Nest leaving took place on the twentieth day.
  13. Nest leaving occurred at Nest A on July 19 at 8:05 A.M., and at Nest B on July 12 at 9:25 A.M.
  14. The fledgling from Nest A was observed to remain in the immediate vicinity of the nest for 23 hours and 20 minutes, and the fledgling from Nest B 27 hours and 32 minutes.

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Table 1. Brooding Attentiveness at Nest A

Date and time	June 30 1:09- 5:34 PM	July 1 8:25- 11:28 AM	July 1 1:00- 5:11 PM	July 3 8:16- 11:36 AM	July 3 1:35- 5:36 PM
Age (days)	1	2	2	4	4
Total time observed	265 min.	183	251	200	241
Weather	Cloudy	Clear	Clear	Light Rain	Clear
Wind velocity	15-20 mph	8-10	10-15	4-6	6-8
Mean daytime temperature	61° F.	59	59	69	69
Attentive periods	16	9	9	9	7
Average time	12.3 min.	16.4	20.5	14.8	18.8
Extremes of total time	3-34	5-31	9-41	5-35	11-33
Percentage of total time	75%	80.9%	73.6%	66.7%	54.8%
Inattentive periods	16	9	9	9	7
Average time	4.1 min.	3.8	7.2	7.3	15.5
Extremes	1-8	2-6	2-10	2-15	7-26
Percentage of total time	25%	19.1%	26.4%	33.3%	45.2%

Table 1. (continued)

## Brooding Attentiveness at Nest A

Date and time	July 5 8:05- 12:12 AM	July 5 1:20- 4:50 PM	July 6 1:32- 5:27 PM	July 7 8:50- 11:25 AM
Age (days)	6	6	7	8
Total time observed	247 min.	210	152	155
Weather	Clear	Showers	Cloudy	Partly Cloudy
Wind velocity	15-20 mph.	15-30	10-15	0-5
Mean daytime temperature	77 <sup>o</sup> F.	77	66	70
Attentive periods	5	5	8	5
Average time	29.2 min.	23.4	10.3	2.8
Extremes	7-67	8-61	4-15	1-5
Percentage of total time	59.2%	55.8%	35.4%	9.1%
Inattentive periods	5	5	8	5
Average time	20.5 min.	18.6	19.0	28.5
Extremes	9-36	6-38	4-32	22-35
Percentage of total time	40.8%	44.2%	64.6%	90.9%

Table 2. Feeding Activity During Brooding  
at Nest A

Date and time	June 30 1:09- 5:34 PM	July 1 8:25- 11:28 AM	July 1 1:00- 5:11 PM	July 3 8:16- 11:36 AM	July 3 1:35- 5:36 PM
Age (days)	1	2	2	4	4
Total time observed	265 min.	183	251	200	241
Weather	Cloudy	Clear	Clear	Light Rain	Clear
Wind velocity	15-20 mph	8-10	10-15	4-6	6-8
Mean daytime temperature	61°F.	59	59	69	69
Feeding visits	7	2	6	5	5
Average no. per hour	1.7	.6	1.4	1.6	1.1
Extremes	1-3	0-1	0-2	1-2	1-2
Intervals	6	1	5	4	4
Average length	31 min.	66	46.2	37	36.5
Extremes	15-49		16-80	15-54	21-48

Table 2. (continued)

## Feeding Activity During Brooding at Nest A

Date and time	July 5 8:05- 12:12 AM	July 5 1:20- 4:50 PM	July 6 1:32- 5:27 PM	July 7 8:50- 11:25 AM
Age (days)	6	6	7	8
Total time observed	247 min.	210	152	155
Weather	Clear	Showers	Cloudy	Partly Cloudy
Wind velocity	15-20 mph.	15-30	10-15	0-5
Mean daytime temperature	77°F.	77	66	70
Feeding visits	5 3	3	6	5
Average no per hour	.7	.9	1.5	2.5
Extremes	0-1	0-2	1-2	2-3
Intervals	2	2	5	4
Average length	47.5 min.	33.5	38.2	28.7
Extremes	43-52	27-40	25-66	23-35

Table 3. Feeding Activity at Nest A Between  
the end of Brooding and Nest Leaving

Date and time	July 8 1:30- 4:15 PM	July 11 8:50- 11:30AM	July 13 10:15- 11:20AM	July 13 3:52- 5:30 PM	July 14 8:40- 11:30AM	July 15 8:35- 11:30AM	July 15 1:30- 4:53 PM
Age (days)	9	12	14	14	15	16	16
Total time observed	165 min.	160	65	98	170	175	203
Weather	Clear	Clear	Partly Cloudy	Clear	Clear	Clear	Clear
Wind vel.	0-5 mph.	0-5	10-15	15-20	8-12	0-5	8-12
Mean daytime temperature	69 <sup>o</sup> F.	76	71	71	70	71	71
Feeding visits	3	3	2	2	5	6	5
Average no. per hour	1.4	1.1	2.0	1.9	1.4	2.1	1.5
Extremes	0-2	1-1	2-2	1-2	1-2	2-2	1-2
Intervals	2	2	1	2	4	5	4
Average length	45.5 min	44.0	40.0	36.5	30.7	29.6	46.5
Extremes	17-74	33-55		30-43	23-40	23-36	30-65

Table 4. Feeding Activity of the Nest A Fledgling

Date and time	July 19 1:30-4:53 A.M.	July 19 1:00-4:45 P.M.	July 20 7:50-11:38 A.M.
Age (days)	20	20	21
Total time observed	225 min.	225	228
Weather	Cloudy	Partly cloudy	Clear
Wind vel.	0-5 mph.	10-15	10-15
Mean daytime temperature	71 <sup>0</sup> F.	71	74
Feeding visits	10	7	9
Average no. per hour	2.7	1.8	2.3
Extremes	2-3	1-2	2-3
Intervals	9	6	8
Average length	27.8 min.	35.0	27.7
Extremes	11-45	12-69	15-37



Table 5. Feeding Activity at Nest B

Date and time	July 7 1:45- 4:45 P.M.	July 8 8:10- 11:10 A.M.	July 11 1:26- 4:30 P.M.	July 12 4:15- 6:45 A.M.
Age (days)	15	16	19	20
Total time observed	180 min.	180	184	150
Weather	Clear	Clear	Clear	Clear
Wind velocity	4-6 mph.	8-10	0-5	4-6
Mean daytime temperature	70 <sup>o</sup> F.	69	76	75
Feeding visits	3	7	5	5
Average no. per hour	1.0	2.0	1.6	2.0
Extremes	1-1	2-4	1-2	1-3
Intervals	2	6	4	4
Average length	53 min.	26.5	41.2	24.2
Extremes	42-64	17-48	30-53	7-43

Table 6. Feeding Activity of the Nest B fledgling

Date and time	July 12 2:00-5:45 P.M.	July 12 7:06-9:00 P.M.	July 13 5:22-6:50 A.M.	July 13 8:00-10:00* A.M.
Age (days)	20	20	21	21
Total time observed	225 min.	114	88	120
Weather	Cloudy	Clear	Clear	Clear
Wind Vel.	0-5	4-6	0-5	0-5
Mean daytime temp.	75 <sup>o</sup> F.	75	71	71
Feeding visits	9	3	5	3
Average no. per hour	2.4	1.6	3.4	1.5
Extremes	2-3	1-2	2-3	1-2
Intervals	8	2	4	2
Average length	24.0 min.	34.5	19.7	17.5
Extremes	8-43	24-45	12-25	15-20

\* Fledgling last seen at 9:05 A.M.