A STUDY OF THE NESTING HABITS OF THE RED-EYED VIREO
Vireo olivaceus (Linnaeus)

by

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A field study conducted for
Advanced Ornithology,
University of Michigan
Biological Station

September 1, 1947

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INTRODUCTION

This study of the Red-eyed Vireo (Vireo olivaceus ((Linnaeus)) was made at the University of Michigan Biological Station located on Douglas Lake, Cheboygan County, Michigan. The study was carried on during the summer session of 1947, from July 5 to August 16.

The two nests used in the study were observed from tower blinds placed six and eight feet from the nests. Observations on Nest A began on July 5 and were completed on July 18. Nest B was discovered on July 17, while it was still being built. Activities at this nest were first carefully observed on July 24. The nesting period of this pair of Vireos was completed on August 16. In addition to 48 hours spent in the blinds, approximately five hours of observations were made from the ground.

ACKNOWLEDGEMENTS

I am greatly indebted to Dr. Olin Sewall Pettingill, Jr. for his guidance and encouragement in making this study. I acknowledge the helpful suggestions and willing assistance of Dr. Theodora Nelson and Mr. Robert B. Lea, and I also thank Mr. and Mrs. Russel L. Burget and Dr. Pettingill who located the nests used in this study.

ENVIRONMENT

The area aboutDouglas Lake is primarily an aspen (Populus grandidentata) and(Populus tremuloides)-maple (Acer saccharum) and (Acer rubrum) association with several other species present to a lesser degree.

Nest B was situated in a Red Maple (Acer rubrum) about 22 feet from the lake shore in Dr. Hungerford's yard. The surrounding vegetation was composed of Sugar Maple (Acer saccharum), Red Pine (Pinus resinosa), and White Birch (Betula alba). The floor of the area supported the growth of a fern ( ).

Nest A was found beyond the camp area, on the southwest side of the dry sandy hill between Douglas and Burt Lakes. This nest was also located in a Red Maple. Aspens (P. tremuloides) and (P. grandidentata), Red Oak (Quercus borealis), White Pine (Pinus strobus), Red Pine (Pinus resinosa), and White birch (Betula Alba) were growing in the immediate vicinity of the nest. In addition, there was a thick undergrowth of shrub, mainly Dogwood (Cornus rugosa). This vegetation was quite dense to the south but was much thinner to the north, at last giving way to an opening in the trees which had been cleared as the camp picnic grounds.

Both nests were situated in the lowest branches of Red Maples. The leaves of these trees hung about the nests concealing them beautifully. The concealment of Nest A was especially striking. This nest could not be seen by one approaching it from any direction unless that person walked under the nesting tree and looked up.

TERRITORY

The Red-eyed Vireos that I studied established and maintained definite territories. Although territorial observations were made both during the incubation and feeding periods, no definite lines of demarcation other than natural barriers were determined.

Apparently, these birds defend only the actual nesting sites. I watched Pair A drive away Cedar Waxwings on six different occasions. Also, on June 10, while the female was on the nest brooding the young, a strange Vireo perched in the maple tree in which the nest was situated. The female became extremely excited and fluttered off the nest uttering loud cries. She made no attempt to drive off the intruder, however, until her mate appeared. At this time, the two birds flew at the Vireo and drove it away. The latter instance was the only time when I saw both sexes participate in territorial defense.

The second pair of Vireos to be observed showed the same agressive attitude toward Cedar Waxwings. In addition, on the several attempts I made to observe Nest B from the ground, the male loudly protested my presence and normal nesting a activities were abandoned until I left the area or again entered the blind.

The presence of Phoebes, Pewees, Robins, or Myrtle Warblers for examples, near the nesting site was always completely ignored or tolerated by the nesting Vireos, and the only

interspecific clashes I observed were those with the Cedar Waxwings. I am unable to explain this hostility. It would seem that these two species would never need to quarrel since each has a separate ecological habitat and their feeding habits differ completely.

Most of the searching for food in the case of Pair B was done in a particular Sugar Maple located about 65 feet from the nest. No attempts were made to defend this tree. The presence of other adult birds, including Red-eyed Vireos, was tolerated by the pair. They would fly to the tree and immediately begin their patient and methodical search for insect larvae, paying no attention to any activities which might be going on around them.

The male Vireos continued to sing throughout the entire nesting cycle, and the nesting sites ~~was~~ were defended up to the time the young left the nests. Nest B was probably the second nest of the season for that pair of birds, and was completed late in the season when most birds had quieted down or stopped singing altogether. However, it is obvious to even the casual observer that this vireo is a perpetual singer throughout the entire summer, and on August 16, the last day observations were made, the male was heard singing as vigorously as ever.

NESTS AND NEST-BUILDING

For its nesting area, the Red-eyed Vireo prefers open deciduous woodlands where an undergrowth of shrub is present and where their food which consists largely of insect larvae is abundant. However, according theA. A. Allen (:41) "the Red-eyed Vireo has learned to adapt its life to the conditions of our shade trees and gardens." This statement was found to be true, for several Vireos successfully raised young in the center of the Station grounds. The Red-eyed Vireo always chooses the lower branches of some small tree in which to nest, a Red Maple being a favorite. Both pairs of Vireos which I studied chose that species of tree. Nest A was located approximately four feet from the ground, while Nest B was about eight feet.

The nest itself is a beautifully constructed dainty nest of the cupped-pensile type, suspended from a forked branch. The main structure of a typical nest is made up of strong coarse grasses, tiny pieces of wood, and newspaper and is covered on the outside with strips of birch bark and spider webbing. The lining is composed of fine grasses, small vines, and pine needles. A record of the exact composition of the two nests studied in detail is presented in the accompanying chart.

Nest B was found while the birds were still constructing it. From its appearance, the nest was judged to be about half finished when it was discovered. Going on this assumption, six days were required for the completion of the nest. This information does not agree with the findings of Herrick(1911:354)

who states that the nest is usually completed in about four and one-half days. Forbush (1939:407) on the other hand, has found that a weeks time is usually required and that if weather conditions are unfavorable even more time may be needed.

The progress made in the construction of Nest B was only watched for a few minutes daily. It was not thought advisable to spend more time near the nesting site for fear that my presence would disturbe the birds and cause them to desert the nest. However, I was able to determine that the side of the nest having no supporting branch was the last portion of the nest to be completed. This finding supports Herrick (1911:351-354) who in his work with the Red-eyed Vireo also found that the side of the nest away from the supporting crotch was the last to be completed.

One of the main problems involved in the study of the Red-eyed Vireo is the difficulty of determining the sexes. Since no attempt was made to mark these birds during their nest building activities, no definite information on the participation of the sexes was obtained. However, I am quite sure that it is the female who does the actual building, the male occasionally bringing her nesting material. This is assumed because during my observations, while one bird was busy at the nest, a male was heard singing in the vicinity. Also, on two occasions the male brought grasses to the female and then perched in the top of the nesting tree and sang.

Egg laying was not started until the nest was entirely completed. After the first egg had been laid no new materials were added to the nest.

EGG LAYING

The morning after the nest building activities had ceased, the first egg was laid and an additional egg was laid on succeeding mornings until the entire cluthh of three eggs was completed. The eggs were always laid early in the morning, sometime before 6:30 A. M. At that time I regularly visited the nest during the egg laying period, and I always found the nest unattended. In fact, during this period, I never saw either Vireo at or near the nest. This behavior shows a marked contrast to that of the nest building period. The first egg was laid on July 20, and incubation began on July 22, after the third egg had been laid.

EGGS

The eggs according to Forbush (1929, vol.III:180) measure from 21 to 25 mm. by 12 to 17 mm. They are white eggs with tiny brown spots, mainly concentrated at the larger end.

The nests of the Red-eyed Vireos of the Douglas Lake region are heavily parasitized by Cowbirds. The statements of Forbush and May (1939:478) summarize the conditions as I found them very well. "The Cowbird sometimes deposits several eggs in the nest of the Red-eyed Vireo, and where Cowbirds are plentiful the first brood often consists of one or more Cowbirds, so that if they are to raise any young of their own, they must nest again later in the season."

When I first saw Nest A it contained two Cowbird and two Vireo eggs, the eggs of the Cowbird being considerably larger and browner in coloration. However, on the following day, the Vireo eggs were missing and an additional Cowbird egg was present. It is possible that the female Cowbird pushed the eggs out of the nest at the time she deposited her own. It is also believed that at a later date one of the original Cowbird eggs was replaced by a fresh one. This is assumed because one egg failed to hatch until July 18, the day the 12 day old nestling left the nest. Thus, the egg must have been deposited in the nest after incubation was well underway or even after young were present in the nest. I have no proof of this because I failed to mark the eggs. At any rate, this new nestling was completely disregarded by the adult Vireos, and it died the day of its hatching from starvation and exposure.

Whether or not the Cowbird destroys eggs has not as yet been satisfactorily proved. My conclusions support those of Bendire (1895:435-438) who states that in all probability Cowbirds do remove the eggs of their hosts. Friedman (1929:186) on the contrary, declares that ~~their~~ there is absolutely no proof of this.

Nest B, probably the second nest of the season for this pair of Vireos, was built after the breeding season of the Cowbirds was over and was not parasitized.

INCUBATION

All the information concerning incubation is based on data from Nest B. Incubation was begun on July 22, after the entire clutch of three eggs had been laid. All three of the eggs hatched on August 4, two of them in the morning before 7:30, and the other in the early afternoon. Thus, the incubation period for all three of the eggs was 14 days. Both Bergtold (1917:100) and Forbush (1929, vol.III:180) record the incubation period to be 12 to 14 days.

I believe incubation was done entirely by the female. My reasons for believing that the sexes did not participate equally in this task are that the male was heard singing during the majority of attentive periods and that no exchanges of the pair were made at the nest. In fact, during the entire incubation period I never saw the male come to the nesting tree.

As the incubation period progressed the female's instinct to incubate became stronger and her attentive periods lengthened considerably. (See tables on incubation rhythm.) During the first few days, anyone passing close to the nest caused the female to leave. However, after the sixth day, she became more reluctant to leave and on the twelvth day I reached up and pulled the limb supporting the nest toward me about one foot before the bird flushed.

The Vireo always left the nest in the same manner during both the incubation and nestling periods. It would slip very quickly and quietly over the edge of the right side of the nest and fly away close to the ground for some distance.

During her attentive periods the female would sometimes turn the eggs with her bill. This procedure was observed on five different days, always in the morning before 10:00. Shortly after the eggs had been turned, usually about four minutes later, the female would leave the nest. Another activity of the female while on the nest was hunting for insects on the nearby leaves. The female on Nest B frequently preened herself, far more than did the first Vireo that I watched. It was later determined that Pair B was infected with mites of the family Parasitoidea.

Owing to the nesessity of removing several leaves to facilitate observations, the sun's rays reached the nest in the afternoon. On especially hot days the female would pant heavily and often would stand on the edge of the nest, spreading and closing her wings.

The information presented on the following page shows that as hatching approached the attentive periods of the female progressively increased. At the same time the inattentive periods became much shorter although their number did not decrease. On July 31, the weather suddenly became extremely cold and windy. In fact, owing to the strong winds, the nest seemed to be in danger of being dislodged from the nesting tree. The result was that the female spent very little time off the nest. In fact, she was even more attentive during this period of unfavorable weather than she was on the last day of incubation. This behavior illustrates the importance of air temperature in the environment of birds.

HATCHING

As before stated, Nest A contained three Cowbird and two Vireo eggs, the latter being destroyed. One Cowbird egg hatched on July 6, this nestling being successfully reared by the Vireos. Another egg hatched on July 7, and a third egg remained in the nest throughout the nestling period, finally hatching on July 17, the day the nestling left the nest. The three Vireo eggs contained in Nest B all hatched on the same day, August 4.

The Red-eyed Vireo is always very careful to remove the empty egg shells from the nest. On July 7, I saw the female Vireo carry off the newly-hatched Cowbird which was stuck to a large piece of its egg shell. The female soon returned to the nest and removed the remainder of the shell, giving no indication that she noticed the absence of the unfortunate nestling.

Another interesting occurence in this connection took place on July 17. On that day, the third Cowbird egg hatched and the empty egg shell was carefully removed as usual although no attempt was made to brood or feed the young.

BROODING

The task of brooding, like that of incubation, was performed entirely by the female. At Nest A the young Cowbird was brooded from July 6 to July 13. After this time, the female stayed at the nest only long enough to feed. At Nest B which contained three young Vireos, brooding began on August 4 and was continued during the day to August 14. Although after this date the female did not brood during the day, she did spend the night on the nest until the end of the nesting

period.

The attendance of the female was greatest on the last day of incubation and the first day of nestling life. From then on her periods of attentiveness steadily decreased. As soon as nestlings were present, the male began to show an interest in the nest and began to bring food. During the first two days of nestling life, the male Vireo at Nest B often brought food to his mate while she was brooding. She ate some of this food although most of it was fed to the young after the male had left the nesting tree. This male was not seen to feed the nestlings until they were three days old. The latter behavior did not take place at Nest A. Here the male fed the Cowbird directly as soon as it had hatched, and he was never seen bringing food to his mate.

On any typical summer day the female's attentive periods became shorter and less frequent as the heat of the day increased. Throughout the entire nesting period, the male Vireo was present at the nest only during the feeding sessions.

For more detailed information, seeeTable 3, which shows the attentiveness of the females at the nests in relation to the age of the nestlings. While obtaining this data, periods of three to five hours were spent in the blinds. The purpose of the table is to reveal the steady decrease in the attentiveness on the part of the female.

When the nestlings were quite young the adults ordinarily brought them small insects. As the nestlings grew, the food also increased in size until on the last few days of nestling life the food consisted almost entirely of large Lepidoptera larvae.

Table 4 shows the rate of feedings at different ages of the young. The number of hours the Red-eyed Vireo spends per day in searching for food and feeding its young was determined to be between 14 and 15 hours. The first feedings usually took place at 5:15 A.M., and the last at 7:30. Never more than one young was fed per feeding visit at any time during the feeding period.

When they were two days old, each young Vireo in Nest B was fed on the average of 23 times per day. The Cowbird nestlingsof the same age in Nest A was fed on the average of 30 times per day. This young Cowbird was capable of making more noise than the three Vireos put together, and his foster-parents willingly met his demands. Also, it seemed to me that the Cowbird gained strength more rapidly than did the Vireo nestlings and raised himself higher in the nest when begging for food. A young Vireo would have had a hard time competing with this larger and more active bird. Having made this study in the Douglas Lake region I agree completely with Herrick's statement (1911:351) that every Cowbird raised entails the loss of one to four other birds.

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TABLE 3.

Attentiveness of Female at Nest B. (Brooding) ♀

	Nestlings 1-2 days	Nestlings 4-5 days	Nestlings 7-8 days	Nestlings 11-12 days
Total hours of attendance	3.365 hrs. 85%	2.88 hrs 64%	1.92 hrs. 40%	1.25 hrs. 29%
Total hours of absence	.50 hrs 15%	1.77 hrs 36%	2.77 hrs. 60%	3.02 hrs. 71%

FEEDING

The food of the Red-eyed Vireos that I watched consisted chiefly of insects and insect larvae. Chapin (1925:6) made a careful study of the feeding habits and requirements of these birds and determined that seven-eighths of their food is animal matter and the rest is vegetable matter.

Both male and female fed the young and both were very attentive parents. They used a direct method of feeding, carrying food to the nest in their bills and placing it in the gaping mouths of the young. Up to the fifth day of nestling life the male brought most of the food. However, as the nestlings grew and required less attention from the female, she spent increasingly more time searching for food.

NEST SANITATION

Nest sanitation was carried on by both male and female Vireo, and defecation ordinarily occurred after each feeding. The excrement of the young Vireos was produced in the form of fecal sacs which were always eaten by the adult birds. The Cowbird in Nest A also produced fecal sacs. However, after the second day of nestling life, this excrement was not eaten but instead carried away.

Both nests which I studied completed the nestling cycle. Of the five Vireo eggs laid, three hatched and produced fledglings. In addition, ~~two~~ two Cowbird eggs hatched, although only one Cowbird was successfully reared.

SUMMARY

This report on the nesting habits of the Red-eyed Vireo (Vireo olivaceus) represents the work done from July 5 to August 16, 1947, at the University of Michigan Biological Station, Cheboygan County, Michigan. The nesting activities of two pairs of Red-eyed Vireos were studied in detail.

The nests were both found in the lowest branches of Red Maple trees, Nest A being four feet from the ground and Nest B, eight feet. Both nests were dainty beautifully constructed structures of the cupped-pensile type. Six days were required for the building of Nest B. At this nest it is believed that the female did the actual building, the male occasionally bringing her nesting materials.

The nests of the Red-eyed Vireos of the Douglas Lake region are heavily parasitized by Cowbirds. However, the Vireos produce two broods per year, the second coming late in the season after the breeding period of the Cowbirds is over.

Incubation was not started until the entire clutch had been laid. The incubation period for the three eggs in Nest B was found to be 14 days. The female did all the incubating.

The task of brooding the young was done entirely by the female.

Male and female shared equally in the feeding of the young. As the nestlings grew, the brooding time decreased, and the feeding rate increased. Thus, the time spent at the nest by the male increased considerably, and the duties of the female became less important.

Nest sanitation was carried on by both male and female Vireo.

The nestling period of the three young Vireos in Nest B was found to be 12 days.

Of the five Vireo eggs laid in the two nests studied, three produced fledglings.

TABLE 4.

Records of two Red-eyed Vireo Nests.

Nest No.	Date Found	Location	Outside Depth	Inside Depth	Outside Diameter	Inside Diameter	Eggs: Vireo	Eggs: Cowbird	Incubation Period	Nestlings: Vireo	Nestlings: Cowbird	Nesting Period	Young Leaving Nest	Per cent Success
A	July 5, 1947	Red Maple	8.4	4.6	6.4	5.1	2	3	?	0	2	12 days	1	20%
B	July 17, 1947	Red maple	7.6	3.7	6.2	4.7	3	0	14 days	3	0	12 days	3	100%

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TABLE 2.

Incubation Rhythm (♀B)

Date	Stage of Incubation	Time of Day	Weather Conditions	Total number of attentive bird ♀ hours	Average time in minutes	Extreme in minutes	Percentage of total time	Total number of inattentive bird ♀ hours	Average time in minutes	Extreme in minutes	Percentage of total time	Total hours of observations
July 24	3rd day	8-11 A.M.	good; sunny & clear.	5	13.0	20	36.1%	5	23.0	43	63.8%	3
July 28	7th day	1:30-4:30 P.M.	good; sunny & clear.	5	18.5	33	51.1%	5	17.6	32	48.8%	3
July 29	8th day	8-11 A.M.	good; sunny & clear.	4	28.8	34	63.3%	4	16.6	19	36.6%	3
July 31	10th day	7:30-11:30 A.M.	poor; extremely cold & windy.	7	29.2	38	85.4%	7	5.0	8	14.6%	4
Aug. 3	13th day	1:30-5:30 P.M.	good; sunny & clear.	6	33.3	50	82.9%	6	8.8	15	17.5%	4

Nest A, located in a Red Maple (*Acer rubrum*).

TABLE 1.

Composition of two Red-eyed Vireo Nests.

	Main Structure of Nest					Lining		
	Coarse grasses	Birch Bark (*Betula alba*)	Wood of (*Betula alba*)	Newspaper	Webs of Ingrapid Spiders	Fine grasses	Grapevines (*Vitis vulpina*)	Needles of (*Pinus Strobus*)
Nest A.....	✓	✓	✓	✓	✓	✓	✓	
Nest B.....	✓	✓		✓	✓	✓		✓