

**THE 1948 NESTING SEASON AT THE
UNIVERSITY OF MICHIGAN BIOLOGICAL STATION**

George E. Grube

Rothsville, Penna.

August 5, 1948

Prepared for the partial fulfilment
of requirements in Advanced Ornitho-
logy (Z 219) at the University of
Michigan Biological Station, Cheboy-
gan, Michigan.

THE 1948 NESTING SEASON AT THE
UNIVERSITY OF MICHIGAN BIOLOGICAL STATION

By George E. Grube

INTRODUCTION

A study of the extent of nesting of the various species of birds at the University of Michigan Biological Station was made from June 21, 1948 to July 30, 1948. The Biological station is situated on the shore of South Fishtail Bay, Douglas Lake in Cheboygan County, Michigan. The plot under study is approximately 2400 feet long (east-west) and 1100 feet wide (north-south), about one-third of which is covered by the waters of South Fishtail Bay, so that approximately twenty acres of land are involved in this study.

During the six weeks of study a total of sixty nests were found; of these forty-seven were studied by me, eight were studied by other investigators, and the remaining five nests were reported or discovered too late for study or in situations where regular examinations were impractical. The nests were of seventeen species: Spotted Sandpiper (Actitis macularia), Ruby-throated Hummingbird (Archilochus colubris), Flicker (Colaptes auratus), Eastren Kingbird (Tyrannus tyrannus), Eastren Phoebe (Sayornis phoebe), Least Flycatcher (Empidonax minimus), Wood Pewee (Contopus virens), Tree Swallow (Iridoprocne bicolor), Purple Martin (Progne subis subis), (this species was not studied), Robin (Turdus migratorius), Eastren Bluebird (Sialia sialis), Cedar Waxwing

(Bombycilla cedrorum), Starling (Sternus vulgaris), Red-eyed Vireo (Vireo olivaceus), Baltimore Oriole (Icterus galbula), Cowbird (Molothrus ater), and eastern Chipping Sparrow (Spizella passerina).

About half of the nests were examined on one day and the others on the following day so that all were observed on alternate days while the young remained in the nests. An average of two and one-half hours per day or a total of approximately one hundred and five hours were used in the survey.

Observations were, for the most part, made directly and at close range but in several cases a mirror which was mounted on a pole was used to pry into the contents of nests which were located high in trees or ^{on} buildings. An observation tower with blind was employed in studying the nest of one pair of Cedar Waxwings. A total of one hundred and thirty-one birds representing ten species were banded with United States Department of Interior, Fish and Wildlife Service bands.

I am indebted to Dr. Olin Sewall Fettingill, Jr. for his guidance and advice throughout the study. Many persons at the Biological Station, children, students, faculty members and their wives, and members of the staff earned my heartfelt gratitude for reporting to me the location of nests about the Biological Station. Without their aid many nests would not have been noticed.

ENVIRONMENT

The plot of approximately twenty acres involved in this study is bordered on the north by the concave shore of Douglas Lake's South Fishtail Bay. A sandy beach extends some twelve to eighteen feet southward from the shore and at the edge of the eastern half of this are located Tree Swallow houses. (Box numbers 1 to 23). The greater portion of the plot to the south is occupied by the one hundred and thirty seven buildings of the Biological Station; (See map Plate 1) this area bears scattered trees, vines and shrubs of several varieties: White Pine (Pinus strobus), White Birch (Betula alba), Yellow Birch (Betula lutea), Red Maple (Acer rubrum), Sugar Maple (Acer saccharum), Red Oak (Quercus rubra), Large-toothed Aspen (Populus grandidentata), Wild Black Cherry (Prunus serotina), Choke Cherry (Prunus virginiana), Wild Red Cherry (Prunus pennsylvanica), Low Sweet Blueberry (Vaccinium pennsylvanicum), Grape (Vitis sp.) Smooth Sumach (Rhus glabra).

Near the south eastern corner of the plot in which a sawmill is situated, is a large clearing in the forest, four hundred feet by two hundred feet. At the forest edge of this clearing are Tree Swallow houses, numbers twenty-four to thirty-one. (See map Plate 1). At the southwestren corner of the plot another clearing, the Athletic Field, occupies an area of approximately two hundred and fifty feet by two hundred and thirty feet. A network of roads and trails extends throughout the area providing openings in the forest of the south central and westren portions. The Athletic Field is situated at an elevation of about seven hundred and

eighty-five feet above sea level. There is a sharp decline in elevation to the north of the Athletic Field to Douglas Lake which has an elevation of seven hundred and ten feet above sea level. Eastward from the Athletic Field the decline is quite gradual to the sawmill at the eastern end which is about five feet above the water level of the lake.

THE SEASON

The 1948 nesting season was extremely early for most of the nesting activities were well under way on June 21. Several empty nests were found where the young had probably left the nests. In 1947 Burget (1947) found most of the Tree Swallows newly hatched or incubating on June 23, whereas this year only one nest contained eggs which were later incubated and hatched, and most of the young swallows were about one week old. Beatty (1946) in 1946 reported "young without down" in several nests on June 29. Hofslund (1944) found incubating eggs in four nests and eggs and young in the fifth on June 22 to June 26, 1944. This year's investigation was started earlier than those of previous years.

OUTLINE of the NESTING ACTIVITIES

Following is an outline of the nesting activities at the University of Michigan Biological Station.

I Tree Swallow

The nests of the Tree Swallow were all located in bird boxes designed for their use. These are located on the eastern half of the beach, around the sawmill plot and around the Athletic Field and its environs.

Box # 2. On first examination on June 21, 1948, five

young swallows were found; their age was estimated to be nine to ten days. These young left the nest on June 27. Two swallows were banded that day. All eggs had hatched and all progeny were raised successfully to leave the nest.

Box # 3. Throughout the investigation this bore three eggs of the Tree Swallow. They were never warm. Undoubtedly the nest was deserted or the female met some calamity.

Box # 4. On June 21, 1948 the six young swallows in this nest were estimated to be eight to nine days old. The nest was empty on June 27 so the young left then or the previous day.

Box # 6. First examination on June 21 showed this nest to contain four young same age as in Box # 4. Three young were banded on June 27; one left the nest earlier and the three were gone from the nest on June 28. There was no evidence in the nest of an unhatched egg.

Box # 7. Six young were estimated to be eight to nine days old on June 21. One bird left the nest prior to the June 27 examination, when the remaining five were banded. These birds were very active at this time: one flew directly from the nest into the waters of Douglas Lake from whence he was rescued and replaced in the nest. Another bird from this nest was rescued from the lake on June 28; He was alive and fairly active. I replaced him in the then empty nest and he flew to the ground immediately.

Box # 8. The June 21st. inspection netted five swallows about eight to ten days old. They were banded on June 24 and left the nest on June 26. The following day I found one of these young birds washed up on the beach; it had apparently

drowned.

Box # 9. This nest contained four eggs (cold) on June 21. The following day there were five cold eggs. Incubation started on June 23 or 24 for the eggs were warm on the latter date and were kept warm there after until they hatched on July 3. (Time for incubation: ten days.) The adult female was banded on June 29 and was recaptured on July 1. On the July 6 examination I found the dead body of the female in the box. Its carcass was rather thoroughly eaten out. Three of the five young birds were dead, either from exposure or from being trampled by the invader. This ignoble act was probably done by a flying squirrel (Glaucomys sabrinus), although no conclusive proof could be found.

Box # 11. Five young, estimated at five to seven days old, were found on June 21. These young were banded on June 27. Two days later all the swallows were found dead in the box; their bodies thoroughly devoured so that only the skin and bones remained. Again it is believed that the Flying Squirrel was responsible. Had they lived another day these birds would very likely have left the nest.

Box # 12. The June 21 examination found five young estimated to have been eight to nine days old. They were banded on June 24 when the blood-sucking larval fly (Protocalliphora) was found attached to the second left phalange of one swallows foot. The nest was vacated on June 26.

Box # 13. The first day of the survey produced a dead

adult female in this nest. Again the carcass was eaten and the five eggs were broken in the nest.

Box # 14. Five young, one day old, and one unhatched egg were in this nest on June 21. These five young swallows progressed nicely until July 1, when the adult female and one of the young (then ten days old) were found dead in the nest. The carcasses appeared as did those of previous nests. One young had a half-inch gaping wound under the right wing, and the remaining three appeared all right. At this time the adult male hovered near the nest with an insect in its bill, apparently having taken over the full responsibility of rearing the young after its mate was killed. On my return to the nest on July 3rd, three more young were killed and eaten leaving a lone survivor. The last bird was killed that night for it was found dead and its flesh devoured the following day.

Box # 17. This nest contained five broken eggs on June 21. No subsequent activity was observed.

Box # 19. A dead female, its fleshy parts devoured, was found on this nest on June 21.

Box # 20. Four broken eggs were contained in this box on June 21.

Box # 21. The nest appeared as though a brood of young had left the nest prior to the start of the investigation on June 21, when one egg bearing a small hole in it was present.

Box # 22. The nest contained a dead and eaten female

and five broken eggs. A short (five-eighths inch) hair colored gray at the base and reddish at the tip was found at the opening to the box. The box is supported on a post about five feet high, which bears about two feet of galvanized iron wrapped around it one and one-half feet above the ground. This would tend to exclude all of the mammalian predators except the Flying Squirrel, which could easily have glided from a nearby tree to the top of the bird box.

Box # 23. Four broken eggs were found on the June 21st examination. No subsequent activity was noted.

Box # 25. On June 21 this nest contained five young estimated at nine to eleven days old. They were banded on June 22 and left the nest on June 27.

Box # 36. On June 21, six young, estimated about four days old, were recorded. All were banded on June 27. Two young were gone from the nest on the July 3rd examination. By the evening of July 4th the nest was evacuated. The period of nesting of these birds is estimated at seventeen to eighteen days.

Box # 40. Five young, about three or four days old, were found on June 21. On June 23 the adult male was captured on the nest and banded. The adult female was banded on June 27, at which time the young also were banded. The fledglings had departed from the nest on July 5.

Box # 41. The June 21st examination found the nest to contain five young, about three to four days old. In addition the nest contained one unhatched egg. The adult female was banded on June 23, and on June 27 the five

fledglings were banded. The young left the nest on July 4 or 5, for they were gone on the latter date.

Box # 44. The five young in this nest were estimated at one to two days old on June 21; they were banded on July 1. When I examined the nest on July 6 the last two young left the nest. Estimated nesting time; seventeen days.

Box # 46. On June 21, five young, about, five to seven days old, were found here. They were banded on June 27 when they were found to be heavily infested with bird lice (Mellophyta sp.). Of the twenty Tree Swallow nests bearing live young, which I handled in this investigation, only this group was infested with lice. This nest was the only one in the study where the adults apparently did not practice a thorough nest sanitation procedure, for the nest and young were extremely dirty from the start of the investigation. On June 29, a warm and sunny day, the box was spotted with lice in several large patches which measured two to three inches in diameter. These young left the nest on July 2 or July 3.

Box # 48. Five young, about two to four days old, were found in this nest on June 21. They were banded on June 29, and on July 6 one of the fledglings had left the nest. The other four followed in his path the following day.

Box # 50. The June 21 investigation yielded five young estimated at three to five days old. The young were banded

on June 27 and left the nest on July 4 or early July 5.

Box # 51. This nest bore four young, about nine to ten days old on June 21. They were banded on June 24th and left the nest on June 28 or 29.

Box # 52. This nest contained six young about eleven days old on June 21. These swallows were banded on June 23. On June 27, three had left the nest and the other three were gone by noon of June 28 when I rechecked the nest.

Box # 53. Five young, about four to five days old, were present on June 21. Banding was done on June 27 and the young departed from their home on July 4 or July 5, for they were gone when I examined the nest on the latter date.

II Baltimore Oriole

The five nests of the Baltimore Oriole were originally to be the subject of a life history study by Miss Agnes Kugel; however after several days of examination the study was abandoned because the nests had progressed too far. For the ensuing information on this species, I am indebted to Miss Kugel.

Nest n. The nest was located in a Sugar Maple (Acer saccharum) front of Cabin 1, Upper Drive West. The young left the nest on June 30.

Nest p was located on a white Birch (Betula alba) east of the Athletic Field. The young left the nest on June 29.

Nest w was located in a Sugar Maple near Cabin 2 on West State Street. The young departed on June 28.

Nest y. This nest was found in a Large-toothed Aspen (Populus grandidentata) between C and D Streets near the center of the plot. The young left the nest on June 29.

Nest z. The nest was situated in a Large-toothed Aspen on the western side of the garage near the east-central portion of the plot. The young departed on June 28.

III Robin

Nest e. This nest was located at a bifurcation of the main branches of a Sugar Maple which is situated between the roadway and Cabin 9 along the beach at the northwestern end of the plot. It was twelve feet above the ground. The nest's two eggs were hatched about July 10, and the young left the nest on July 18.

Nest j. This Robin nest was located on a grapevine (Vitis sp.) at the rear of Upper Newcombe Laboratory, situated about one hundred yards to the east of the Gravel Quarry. The nest was poorly constructed and poorly attached to the vines which supported it, for when the nest was located on June 22, it was setting loosely and unattached. It contained two young about six days old which were banded that day. The young left the nest on June 25. Four days later, June 29, I observed one of the young being fed at the eastern end of the Athletic Field. It was positively identified as one of the young from this nest since these were the only banded Robins in the area at that time.

Nest m. The nest was located ten feet above the ground

on a Red Maple (Acer rubrum) in front of Cabin 5 along Upper Drive West. On June 23 the nest contained two eggs, one of which had a tiny puncture. On June 25, three eggs were found and on June 26, I discovered that the egg with the hole was gone leaving only two. The female Robin was roused from the nest on June 29; incubation apparently had begun. The two eggs hatched on July 8. Both young were banded on July 12 and they left the nest on July 16.

Nest o. This nest was located on a horizontal branch of a Red Oak (Quercus rubra) about ten feet above the ground and seven feet from the trunk. The tree is near the rear of Cabin 19, Upper Drive West. The nest was discovered on June 21 when it contained four eggs. On June 22, one egg hatched, the remaining three never hatched. The fledgling was banded on June 30 and left the nest on July 2.

IV Cedar Waxwing

Four nests of the Cedar Waxwing were located on the plot. Following is an account of these nests.

Nest b. This nest was about seventeen feet above the ground in a Sugar Maple, east of the aquarium. The nest was found on July 1 at which time it was empty. On July 6, four eggs were found and on July 7 there were five. Examinations were continued until July 17 when the nest had completely and mysteriously disappeared

Nest g. This nest was observed from the ground during the first week of July. It was situated in a White Pine

(Pinus strobus) about twenty-five feet above the ground, near the aquarium. Its specific contents were not noted.

Nest q. This nest was located in a White Pine, eighteen feet above the ground, at the southeastern corner of the Athletic Field. The nest was under construction when first observed on June 21. June 27th found the female on the nest, apparently incubating. The five eggs hatched on July 9. A tower was placed eighteen inches from the nest on July 11 and the following day a blind was placed on the tower so that the bird could be observed at close range. Feeding occurred approximately every fifteen minutes throughout the nine hours of watching from the blind. The female averaged about two feedings to one by the male. The female fed fruits, Blueberry (Vaccinium pennsylvanicum) and probably the Wild Red Cherry (Prunus pennsylvanica) while the male invariably carried insects exclusively or a combination of fruits and insects. The close proximity of the blind seemed not to bother the waxwings in the least. On July 23, I found only two young in the nest. I moved some of the branches aside and found two more sitting on the boughs about two feet from the nest. The parents fed those birds which sat away from the nest first, then proceeded to feed the young in the nest. Before I left the blind, at 6:10 P.M., the four fledglings were reassembled in the nest. One young wasn't seen in the vicinity. The two young apparently left the nest willingly and willingly returned as nightfall approached; or perhaps they were coaxed out of the nest by the adults. The nest was evacuated on

July 24. The five birds were banded on July 19.

Nest u. This nest was located in a Red Maple (Acer rubrum) along the extreme west end of State Street. The nest was found on July 20 when the young birds were about seven days old. Four of these birds were banded on July 25 and the fifth was collected for Dr. George M. Sutton. One bird flew from the nest after it was banded. I watched the parents feed this bird the following day on the ground about the nest tree. The remaining three young left the nest on July 27.

V. Eastern Bluebird

The Bluebirds nested in the swallow-type houses exclusively, so far as is known. One of these (Box 5) is on the beach, another (Box 30) in the Sawmill clearing, and the third (Box 55) in the area east of the Athletic Field.

Box 5. On June 21 a completed nest was present but it was five days later, June 26, when the first egg appeared. One egg was laid each day until June 29 when the complete clutch of four was found. The eggs were cold on the July 1st examination; they were warm on the afternoon of July 2 and were incubated until July 15, when I found three young completely hatched and the fourth almost completely emerged from its shell. The shells which contained the first three young were gone when I found the fourth bird hatching. The four Bluebirds were banded on July 24. On July 29 one young

was gone. The remaining three left the nest on August 3. The incubation period on this nest was found to be thirteen to fourteen days. The nesting period was 19 days.

Box 30. The June 21st examination found five young estimated at four days old. These birds were banded on June 29. The nest was evacuated on July 2.

Box 55. The four young in this nest were estimated to have been three days old on June 23. The nestlings were banded on June 29. They left the nest on July 4. The adult pair of Bluebirds which raised this brood, showed considerably more activity than did the previous two pairs. One or both were usually to be found in the vicinity of the nest and on several occasions they protested my presence with dives much as was common with the Tree Swallows.

VI Chipping Sparrow

Three nests of the Chipping Sparrow were found. Two of these were parasitized by the Cowbird with one egg each.

Nest a. This nest was on a horizontal branch of a small Red Maple, six and one-half feet above the ground, along the beach north of B Street. When first examined it contained three young Chipping Sparrows and one Cowbird which had hatched on July 11 or earlier on July 12, when the nest was found. The young were banded on July 13 and left the nest on July 18.

Nest i. A nest bearing four young, estimated age:

three days, was found on June 27 on a grape vine (Vitis sp.) along the south side of Newcombe laboratory. These birds were banded on June 29; the following day one remained in the nest. It was gone on July 1.

Nest k. This nest was also situated on a grape vine but on Reighard Laboratory. It bore two sparrows and one Cowbird, about two days old on June 22. The Chipping Sparrows were not banded for they flew from the nest when I approached to band them on June 26. The Cowbird was banded on that date; he left the nest on June 28. I observed the adult Chipping Sparrows feeding this banded Cowbird on many occasions about the western end of the plot as late as July 18.

VII Ruby-throated Hummingbird

The two nests of the Ruby-throated Hummingbird found on the plot were the subject of a life history study by Mr. Richard Tashian who contributed the following information about them.

Nest s. This nest was located in a White Birch (Betula alba), east of the Athletic Field (See map, Plate 1). I discovered the nest on July 3, when it bore two half-grown young. These left the nest on July 12.

Nest t. The nest, found on June 25 by Mr. Duryea Morton, in a White Birch on the western drive to the Athletic Field, contained one young on June 30. It was hatched about June 29. Whether there were two eggs is

unknown. This bird left the nest on July 19.

VIII Flicker

Two nests of the Flicker were found on the plot. One was observed in Box C along the eastern half of the street which runs along the beach in the station proper. On June 21, six young, two to three days old, were present. I observed the adult female only once, on the evening of June 26 when I surprised her at the nest. On my rounds on July 6, I found that one young was missing from the nest; no trace of violence was found. The remaining five were banded at that time. On July 13, only three young were left, and on July 15 only one was present. The last fledgling was gone from the nest on July 16. Nesting period for this nest was twenty-four to twenty-six days.

The second nest (Nest v) was located in a hole in a tall flagpole east of the Athletic Field. The only activity observed here was that of the adult Flickers entering and leaving the nest at various times during the first two weeks of July.

IX Eastern Kingbird

Two nests of the Eastern Kingbird were situated along the western half of the street which runs along the beach. Both nests were in Sugar Maples.

Nest c. This nest was located about thirty-five feet above the ground and far out from the trunk on a diagonal

branch. It was impossible to study the nest but the adults were observed feeding on July 15 and July 19. The nest was found on July 11.

Nest d. The nest was discovered on June 24 about fifteen feet from the ground, on a tree in front of Cabin 5 on West State Street. Its contents were examined with the aid of a mirror which was mounted on a bamboo pole. At the time of discovery the four eggs were being incubated. Three eggs were hatched on June 27. One egg never hatched. The three young left the nest around the fourth or fifth of July, for they were gone on the afternoon of the latter date.

X Red-eyed Vireo

Two nests of the Red-eyed Vireo were located on the plot.

Nest f. This nest was located behind the eastern cabins in the southern row off the beach at the western end of the plot. It was five feet above the ground on a horizontal branch of a White Birch. When I found it on July first it bore two young which I estimated to be four to five days old. On July 6 one young was gone and the other was banded after which it, too, flew from the nest. This nest was reported on June 28 by Miss Agnes Kugel who then found two young and one egg.

Nest xa. This nest was situated along the upper driveway through the camp, southeast of the dining hall. Two

young vireos and one Cowbird were reported by Mrs. I. B. Wasson on June 30. The date of their departure from the nest was not noted.

XI Spotted Sandpiper

The nest of the Spotted Sandpiper (Nest 1) was located on the floor of the Gravel Quarry. When I first examined its contents on June 23, the four eggs were incubating. On June 26 one of the adults (probably the male) was banded after having been captured with a drop trap. The four young hatched during the night of June 30-July 1. At 7:30 A.M. on July 1 only one young was in the nest at which time it was banded. It was gone by 10:00 A.M. that morning. Two more were captured in the Gravel Quarry in the afternoon when they were banded. The fourth was banded on July 3 about fifty yards northwest of the nest. During the time of incubation only one adult was observed at the nest at a time but after the eggs hatched I saw both adults with the young or in the vicinity. The birds were in the vicinity of the nest until July 5.

XII Phoebe

One nest of the Phoebe was located under the cornice of the roof at the south end of the Aquarium. When I first examined it of June 25 it contained five eggs. On July 8 I found three young hatched and two almost out of their shells. Four young were banded on July 22 at which time they left the nest. One escaped before being banded.

XIII Least Flycatcher

One nest, reported by Miss Fern Brooks, was situated between A and B Streets, near the center of the plot. It was reported as being on a White Birch, fifteen feet from the ground and contained young on June 26. (Nest a')

XIV Wood Pewee

One nest of the Wood Pewee was located in the forest southeast of the sawmill area at the southeastern end of the plot. It was the subject of a life history study by Mr. William B. Heed. The following notes were contributed by him. The nest was found on June 24 at which time the eggs were incubating. One egg hatched on July 8. For some unknown reason the adults deserted the nest and this young was reared in the nest of another pewee at Pine Point. It left this nest on July 24.

XV Starling

One nest of the Starling was found in Box A, along the road which runs eastward along the beach on the station proper. This nest contained four almost grown young on June 21. They left the nest when I opened the box on June 22.

XVI Cowbird

For information relative to the Cowbird, see the discussion of Chipping Sparrow Nests a and k and Red-eyed Vireo nest x_a.

XVII Flying Squirrel

The nest of a Flying Squirrel (*Glaucomys sabrinus*) was found in Box 15 on June 21. At this time it contained three or four half-grown young. On the morning of July 22 the nest was examined by Miss Elizabeth Vandegrift who found that all but one of the young had been removed. The one that remained was collected at that time. About two weeks later the nest was located by Miss Vandegrift, in the old aquarium shelter a few feet away from the site of the original nest. It again moved after its discovery.

REPRODUCTIVE EFFICIENCY OF THE TREE SWALLOWS

All but one of the Tree Swallow nests which produced young contained fledglings at the time the investigation started. It was assumed that all eggs hatched if there was no evidence to prove the contrary. Three eggs in Box 3, five in Box 13 (female killed), five in Box 17 (deserted, eggs broken), four in Box 20 (deserted, broken), one in Box 21, five in Box 22 (female killed), four in Box 23 (female killed), one in Box 41, one in Box 46, one in Box 48, and one in Box 51, or a total of thirty-one eggs were not hatched. A total of 133 eggs and young were found and of these eighty-six were reared. Again it was assumed that these young thrived if there was no evidence to prove otherwise. Of the sixteen young which were not raised, one was drowned when it flew from the nest into Douglas Lake (Box 8), five died of starvation or exposure when the adult female

Table 1
Reproductive efficiency and young and adult mortality
of the Tree Swallow colony, Biological Station, 1948.

	Total Number of Eggs	Total Number of Young	Young Reared	Young not Reared	Adults	Adults Killed	Percent
Eggs Hatched	133	102					76.7
Young Reared		102	86				84.3
Reproductive Efficiency	133		86				64.6
Mortality of Young		102	86	16			15.7
Mortality of Adults					56	6	10.7

was killed (Box 9), and ten were killed (Boxes 11 and 14). The latter ten mortalities were, almost without doubt, directly the responsibility of the Northern Flying Squirrel. In addition six adult females were killed on the nest by the same animal (Boxes 9, 13, 14, 19, 22, and 23). Assuming that there was one pair per nest, twenty-eight pairs or fifty-six adult swallows nested in the colony.

Table 1 shows the percentages of reproductive efficiency and young and adult mortality at the Biological Station Tree Swallow colony in the 1948 nesting season.

Burget (1947) found this colony to have a reproductive efficiency of sixty-nine percent. No figures on mortality were given but from his paper I have calculated a mortality of 17.8 percent. Kuerzi (1941) found a three year average reproductive efficiency of 70.46 percent and a mortality of 2.4 percent in his study of the Tree Swallows at Kent, Connecticut. Low (1933), at Cape Cod, Massachusetts, found a three year average reproductive efficiency of 50.0 percent and a mortality of 36.2 percent and Chapman (1935) had a five year average reproductive efficiency of 62.16 percent and a mortality of 31.8 percent at Princeton, Mass.

The high mortalities cited by Low and Chapman were attributed to low food supply due to poor weather during the nesting period.

A total of thirty-one eggs were not hatched; of these twenty-three were broken or whole but under a dead adult.

Three eggs were deserted and the remaining five were found in nests with young. Whether the Flying Squirrel may be accused legitimately as the plunderer of these nests is unknown but in the cases where a dead adult was found on the nest, the nocturnal mammal is almost certainly responsible,

THE FLYING SQUIRREL AS A PREDATOR ON THE TREE SWALLOW

Of the several papers pertaining to Tree Swallows, only Burget (1947) mentions the Northern Flying Squirrel (*Glaucomys sabrinus macrotis*) as a possible predator on this bird. Burt (1946) and Hamilton (1943) mention only that this squirrel will eat meat. Seton (1909) asserted that "... there is every reason (except direct evidence) to believe that the Northern Flying Squirrel ... will eat bark, buds, fruit, seeds, nuts, insects, birds, or meat..." Burget reported three nests where young swallows had been chewed, supposedly by Flying Squirrels which nested nearby.

This year, at the Biological Station colony, seven nests were preyed upon, (Boxes 9, 11, 13, 14, 19, 22, and 23.) In all cases the swallows were devoured except for the skin and bones. In Boxes 13, 19, 22, and 23 the adult female was found dead on the nest when the investigation was started. The five young in Box 11 were within a few days of leaving the nest when they were destroyed on the night of June 28-29. In Box 14, the adult female and one young, ten to twelve days old, were killed on the night of June 30. Three more young

were found dead and eaten on the morning of July 3 and the fifth fledgling was found in the same condition the following day. In Box 9, the young were three days old when the adult female was killed and eaten on the nest on the night of July 5. Here the young birds were not eaten.

Five of the seven boxes which were molested, are affixed on posts which are equipped with a cover of galvanized iron which extends from about eighteen inches to forty-two inches above the ground. This metal sleeve should prevent the entrance of any other mammalian predator which is small enough to enter the opening to the boxes. The diameter of the opening to the boxes is one and three-fourths inches. Thus a bit of circumstantial evidence tends to point to the Flying Squirrel which could glide to the box from any one of the many nearby trees. Another fact which tends to condemn this mammal is that in the cases under observation, the killing was done at night. Beside the Flying Squirrel only the weasel (Mustela) could qualify as the culprit on this account. The behavior of the weasel is such that all the birds in Box 14 would have been killed on one visit rather than three visits as was the case. Seton (1909b) describes the bloodthirsty activities of this animal. It is possible that the weasel could leap past the metal sleeve.

The most conclusive bit of evidence was found on the side of the opening to Box 22. Here one hair, which measured five-eighth inch (15 mm.) was found. The basal two-thirds of this hair was gray and the distal third was a

reddish-brown color. This hair was diagrammed in my notes and then folded in a page of the notebook for lack of a better container. It was found on June 24. Later when I sought the hair it was not to be found. However the described diagram was compared with the hair of all the small mammals in the Biological Station collection and only the Flying Squirrel produced hair of this description.

A fourth factor, not at all conclusive, is the fact that the nest of the Flying Squirrel was known to exist in the vicinity of the nests which suffered depredation. When I examined the boxes on June 21, a nest bearing four or five half-grown young was found in Box 15. The young were moved from there to the old aquarium shelter, only a few feet away, where they were found about two weeks later. This last disturbance brought about another moving; the nest was not found thereafter.

While this evidence is not perfectly conclusive, it is sufficient to convince me of the guilt of the Flying Squirrel. Future investigators should try to trap or photograph (with an electrical control attached to the box and to a flash camera) the culprit while he is at work. The area of predation is not constant. In 1947 when this mammal nested in the environs of the Athletic Field, swallows were preyed upon in that area. This year, again, depredation occurred in the area where the Flying Squirrel was known to nest.

SUMMARY

This study of the nesting activities of birds was carried on from June 21 to July 30, 1948 at the University of Michigan Biological Station, Douglas Lake, Michigan. The study was under the supervision of Dr. Olin Sewall Pettingill, Jr. The area covered is a plot of about twenty acres at the southernmost tip of South Fishtail Bay.

A total of sixty nests were observed and studied; these represented sixteen species (excluding the Purple Martin). There were twenty-eight nests of the Tree Swallow, twenty of which produced young and seventeen nests produced fledglings which left the nest. A total of 133 eggs and young were found; 102 eggs hatched and eighty-six young were reared. The mortality of the young was 15.7 percent and the reproductive efficiency was 64.6 percent. Six adult females were killed. Assuming that there were two swallows for each nest, there were fifty-six adults, so that the adult mortality was 10.7 percent. From one to five nests of the other fifteen species were found; most of these were included in the alternate day examinations.

The relatively high mortality of the Tree Swallow young was almost entirely caused by the predatory habits of locally nesting Flying Squirrel. Four pieces of evidence tend to prove that this mammal was responsible for the death of six adult and fifteen young swallows. Posts covered in part by galvanized sleeves, the nocturnal habit of the predator,

the comparison of a hair taken from Box 22 with those of smaller mammal specimens in the Biological Station collection, and the known proximity of a nest of the Flying Squirrel all point rather conclusively to that gliding nocturnal mammal.

LITERATURE CITED

- Beatty, Robert O.
1946 Bird Box Activity. MS.
- Burget, Russel L.
1947 Some Observations on the Tree Swallow (Iridoprocne bicolor). MS.
- Burt, William H.
1946 The Mammals of Michigan. The University of Michigan Press, Ann Arbor, Mich.
- Chapman, L. B.
1935 Studies of a Tree Swallow Colony. Bird Banding, 6:45-57.
- Hamilton, William J. Jr.
1943 The Mammals of Eastern United States. Comstock Publishing Co., Inc., Ithaca, N.Y.
- Hofslund, Fershing B.
1944 Nesting Records of the Douglas Lake Region. MS.
- Kuerzi, Richard Gotttron
1941 Life History Studies of the Tree Swallow. Proc. Linn. Soc. N.Y. No. 52-53:1-52.
- Low, S. H.
1933 Further Notes on the Nesting of the Tree Swallows.

Bird Banding, 4:76-87.

Seton, Ernest Thompson

1909a Life Histories of Northern Animals. Volume 1.

Charles Scribner's Sons, N.Y.

1909b Life Histories of Northern Animals. Volume 2.

Charles Scribners's Sons, N.Y.

1948
SUMMARY OF NESTING ACTIVITIES AT DOUGLAS LAKE

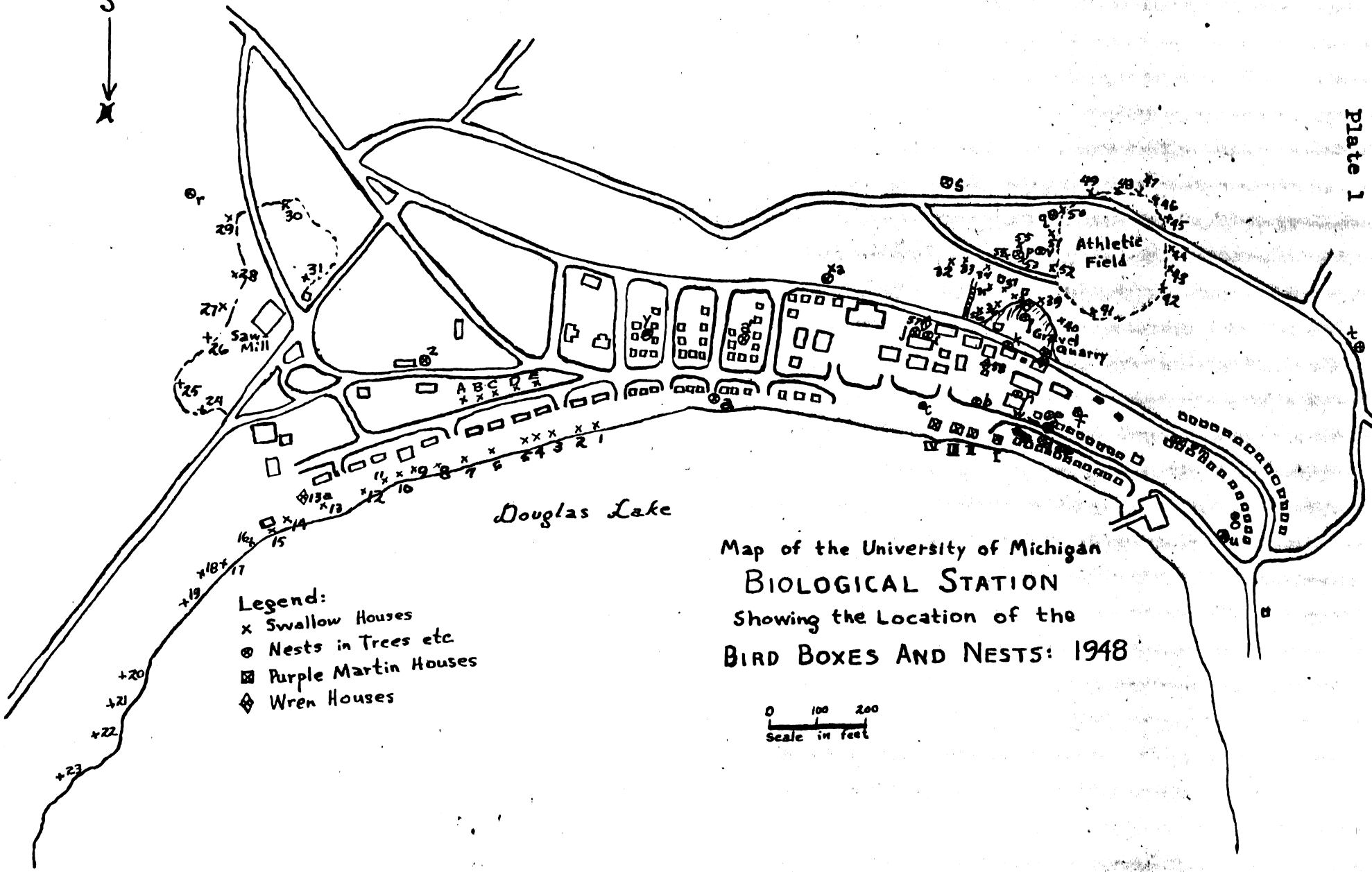
Box No.	Species	No. Eggs	No. Hatched	No. Reared	Date Hatched	Date Young Left Nest
2	Tree Swallow	5*	5	5	-	June 27, 1948
3	Tree Swallow	3	0			
4	Tree Swallow	6	6	6	-	June 26
5	Bluebird	4	4		July 15	
6	Tree Swallow	4*	4	4	-	June 28
7	Tree Swallow	6	6	6	-	June 27
8	Tree Swallow	5*	5	4	-	June 26
9	Tree Swallow	5	5	0	July 3	-
11	Tree Swallow	5*	5	0	-	-
12	Tree Swallow	5*	5	5	6	June 26
13	Tree Swallow	5	0			
14	Tree Swallow	6	5	0	-	-
15	Flying Squirrel					
17	Tree Swallow	5	0			
19	Tree Swallow	0				
20	Tree Swallow	4	0			
21	Tree Swallow	7	?-1			
22	Tree Swallow	5	0			
23	Tree Swallow	4	0			
25	Tree Swallow	5	5	5	-	June 27
30	Bluebird	5	5	5	-	July 2
36	Tree Swallow	6	6	6	-	July 3-4
40	Tree Swallow	5*	5	5	-	July 3-4

* No evidence of more eggs was found.

Box No.	Species	No. Eggs	No. Hatched	No. Reared	Date Hatched	Date Young Left Nest
41	Tree Swallow	6	5	5	-	July 2-5
44	Tree Swallow	5	5	5	about June 20	July 6, 1948
46	Tree Swallow	6	5	5	-	July 2
48	Tree Swallow	6	5	5	about June 20	July 6
50	Tree Swallow	5	5	5	-	July 3
51	Tree Swallow	5	4	4	-	June 28
52	Tree Swallow	6	6	6	-	June 27
53	Tree Swallow	5	5	5	-	July 4
55	Bluebird	4	4	4	-	July 4
A	Starling	-	-	4	-	June 22
C	Flicker	6	6	5	about June 19	July 13-15

Nest No.	Species	No. Eggs	No. Hatched	No. Reared	Date Hatched	Date Young Left Nest
a	Chipping Sparrow and Cowbird	3	3	3	July 11	July 18
b	Cedar Waxwing	5	0	-		
c	Kingbird					
d	Kingbird	-	3	3	-	July 6
e	Robin	2				
f	Red-eyed Vireo	-	2	2	-	July 6
g	Cedar Waxwing					
h	Phoebe	5	5		July 8	
i	Chipping Sparrow	4	4	4	about June 25	July 1
j	Robin	3	2	2	-	June 24

Nest No.	Species	No. Eggs	No. Hatched	No. Reared	Date Hatched	Date Young Left Nest
k	Chipping Sparrow	3	2	2	-	June 27
	and Cowbird	1	1	1	-	June 28
l	Spotted Sandpiper	4	4	4	June 30- July 1	July 1
m	Robin	3	2	2	July 7	July 16
n	Baltimore Oriole	-	-	-	-	June 30
o	Robin	4	1	1	June 22	July 2
p	Baltimore Oriole	-	-	-	-	June 29
q	Cedar Waxwing	5	5	5	July 9	July 24
r	Wood Pewee	3	1	1*	July 8	July 24
s	R-t. Hummingbird	2	2	2	about July 12	July 12
t	R-t. Hummingbird	-	1	1	about June 29	July 19
u	Cedar Waxwing	5	5	4#	-	July 26
v	Flicker			Unknown		
w	Baltimore Oriole	-	-	-	-	June 28
xa	Red-eyed Vireo	3	2	2	-	-
	and Cowbird	1	1	1	-	-
y	Baltimore Oriole	-	-	-	-	June 29
z	Baltimore Oriole	-	-	-	-	June 28
a'	Least Flycatcher			Unknown		



- Legend:
- x Swallow Houses
 - ⊙ Nests in Trees etc
 - ⊠ Purple Martin Houses
 - ◇ Wren Houses

Map of the University of Michigan
 BIOLOGICAL STATION
 Showing the Location of the
 BIRD BOXES AND NESTS: 1948

