

A STUDY OF A SINGLE NEST OF THE
LEAST FLYCATCHER(Empidonax minimus)

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A report of an original field study conducted as a requirement
for Advanced Ornithology (Zoology 119), at the University
of Michigan Biological Station.

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CONTENTS

Introduction -----	1.
Call notes , general behavior -----	2.
Nest -----	2.
Location -----	2.
Description -----	3.
Eggs -----	4.
Incubation -----	6.
General observations -----	6.
Weather -----	7.
Hatching -----	8.
Growth period -----	10.
Habits -----	11.
Food of the young -----	11.
Sanitation -----	14.
Weight -----	16.
Caged birds -----	16.
Summary -----	20.
Bibliography -----	22.
Plates -----	23.

Introduction

The relative abundance of the Least Flycatcher in the Douglas Lake area of Cheboygan County, Michigan is very noticeable. According to Katherine White (1940, manuscript) the bird was sixth in frequency of occurrence in the immediate vicinity of the Station. The species, because of its number offered an excellent opportunity for study.

This paper is a report on the study of a nest of the Least Flycatcher (Empidonax minimus) from the time the eggs were laid to the end of the nesting period. The study was conducted at the University of Michigan Biological Station at Douglas Lake during the summer of 1941.

Two nests were used in the study and were called nests I and II. This paper is based upon observations at nest I, with occasional reference to nest II for comparative purposes.

A tower blind was set three feet from the nest to observe the nesting activities. It consisted of a wooden platform fifteen feet from the ground with a canvas cover for the blind proper. Daily weights were taken of each young bird between 7:00 and 8:00 p.m. A time clock was used during the period of observation to record bird activities at the nest. Nest I was watched for a period of 65 hours.

I desire to thank Dr. O. S. Pettingill Jr. for the great aid he has given me in carrying on my study, and for his willingness to answer questions concerning the problems that arose. I also wish to thank Mrs. O. S. Pettingill, Jr. for finding nest I, and Mr. Clifford Davis for finding nest II.

Call Notes and General Behavior

The familiar chebec call was not characteristic of the female at nest I. Never once did I hear the well-known chebec, but instead a short quick chweep was given. On giving the call the bird's crest was raised quickly and the tail quickly moved. On my first day of observations I heard a series of call notes given closely together as the bird flew **rapidly** from the nest. This call was never repeated again. If the female became excited she would sound her call sharply raising her crest with each call. If it was merely to indicate her approach to the young it became a series of soft chweep calls.

The nest contained one egg when discovered on July first. On the two following days two more eggs were layed making a total of three eggs in the nest. The observations were not started until July fourth.

Only one bird was present in the vicinity of the nest from the very beginning of my study. I assumed that this bird was the female, because of her general behavior and activity at the nest. The reason for the absence of the male bird is not known, but it is very likely that it had been killed or had deserted the nest.

Nest

Location

The location of nest I was in the fork of a white birch (Betula alba). Nest II was located in a Norway pine (Pinus resinosa) on the branch of the tree. Both nests were located in the immediate grounds of the Biological Station.

Nest I was located about ten feet from the southeast corner of cabin 30 on East State Street. It was in the fork of a small white birch 13 feet from the ground. The area about the nest was

predominantly aspen. The tree stood about four feet from a well-traveled foot path connecting the faculty cabins.

The area around the nest was never free from human interference. Children played in the vicinity and people were constantly walking by. The Least Flycatcher seems to prefer this type of nesting territory. According to Forbush, (1929, p.359) it is almost always found near the edge of woods, along roads and near human dwellings.

Other birds sharing the aspen association with the Least Flycatcher were:

- Red-eyed Vireo
- Cedar Waxwing
- Black-capped Chickadee
- Baltimore Oriole
- Purple Finch
- Kingbird
- Nighthawk
- Rose-breasted Grosbeak
- Robin

Description

The nest was compactly made with a deep oval cup. When the bird settled in it, its body fitted in below the edge of the nest, and all that could be seen was the head and tail projecting above it.

MEASUREMENTS OF NESTS

	Nest I	Nest II
Inside width	50 mm. x 63 mm.	56 mm.
Outside width	56 mm. x 70 mm.	70 mm.
Inside depth	38 mm.	25 mm.
Outside depth	50 mm.	45 mm.
Height from ground	14 feet	15 feet

The nest was made up of three different sections: the first or inside section, the second or middle section and the third or outside section. The inside consisted of finely woven grasses lined with feathers and hairs which had been picked up near the nest. These grasses were bound together on the edge of the cup with thin strands

of bark. The middle section consisted of strips of bark woven into the grasses. The outside was made up of large masses of birch shavings placed on top of the bark, thus giving a camouflage effect. Included in all three sections were string, cotton, fibers of herbs, and even a section of a wasp's nest.

The bulk percentage of different nesting materials was determined by taking the nest apart and separating the material into separate piles. An estimate was then made of the relative sizes of each pile. The chart on the next page explains the percentages graphically.

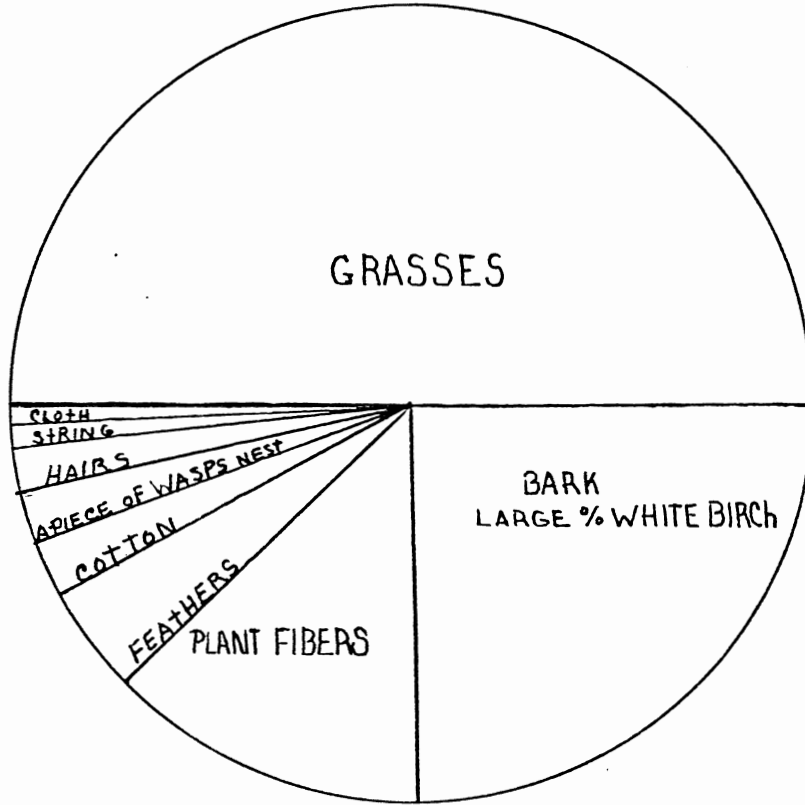
In nest II very little birch was used. Instead more pine needles were used in the nest. A piece of toilet tissue was hanging down from the nest and woven into the nest fibers, giving the same camouflage effect as in nest I. A tremendous amount of cotton was found woven through the nest which looked as if it had been taken from the stuffings of an old car seat. In both nests branches were used to support the nest although nest II was saddled on the branch itself instead of wedged in a fork and had two limbs woven into the nest. Nest I had two small twigs which extended from the fork in the tree and were included as part of the nesting material. The shape of the nest I was oval while nest II not being in a fork was round.

Eggs

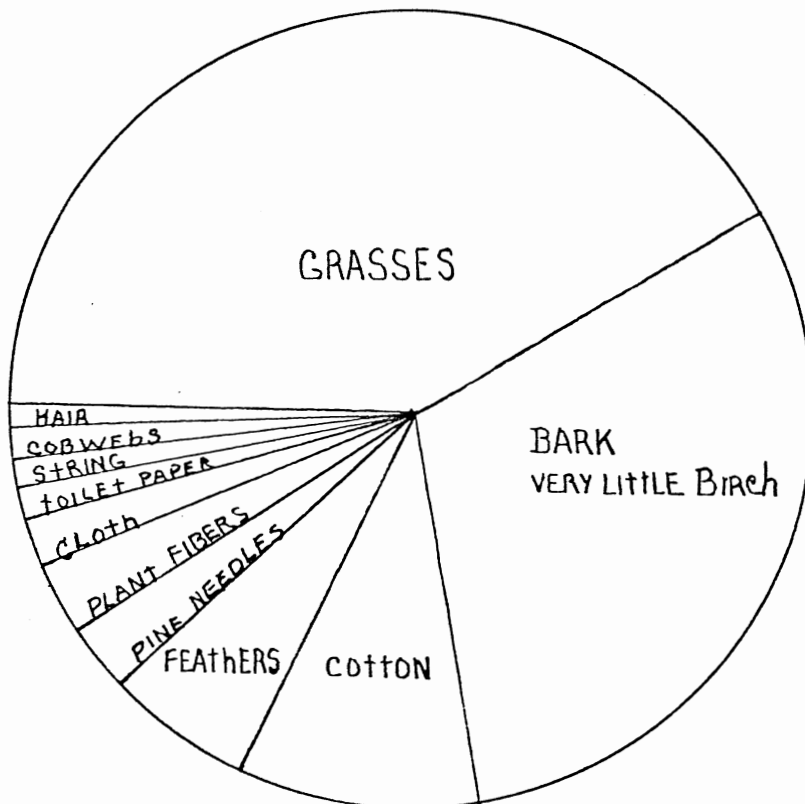
The clutch consisted of three eggs in both nests I and II. These eggs were plain white in color with no markings on them. However, on the day of hatching I noticed that they turned a buff color which was probably caused by the nearness of the blood vessels to the shell.

The size of the eggs varied from 19 mm. x 14 mm. to 17mm. x 15 mm. and the weight varied from 1.10 gm to 1.8 gm. The weights were taken

NEST I. BULK PERCENTAGE OF NESTING MATERIALS



NEST II.



on the twelfth day of incubation.

<u>Date Layed</u>	<u>Size</u>	<u>Weight</u>
7/1/41	19 mm. x 14 mm.	1.10 gm.
7/2/41	17 mm. x 15 mm.	1.7 gm.
7/3/41	18 mm. x 16 mm.	1.8 gm.

Incubation

General Observations

The blind was erected on July 4 and the canvas put up on July 5. The female remained on the nest all of the time the tower was being put up, even though many people were below talking. However, when the canvas was put up she left the nest and did not return until I had left the blind. I returned in ten minutes to find her on the nest again incubating the eggs. My observations began on the afternoon of July 5 after the blind had been completed. It was an exciting experience to see the female fly nervously back to the nest after waiting fifteen minutes for her return.

Throughout incubation the bird was usually silent on leaving and entering the nest. The chweep call was sometimes given from a nearby tree or across the road from the nest, a distance of fifty feet.

On the second day of observation a second Least Flycatcher came into view for the first and only time that I was stationed in the blind. It flew into the nesting area only by chance for a few moments, paying no attention to the nest and then flew away again.

On approaching the nest the adult never flew directly to it. First she would fly to the edge of the tree, often to the same branches and twigs each time, and work gradually to the well-hidden nest.

Just as the bird moved onto the nest the breast feathers were lowered so that the brood patches could come in contact with

the eggs. Each time the female entered the nest the eggs were moved slightly by a rocking motion of her body. Once in about every two hours she would rise up on the nest and move the eggs with her feet. The female sat in a southerly direction facing the blind the greater part of the time. Another direction was taken about ten times out of the entire time that I watched.

At one time the wind was about twenty miles an hour and very cold. The leaves of the tree above the nest were constantly hitting the bird's head and could have been avoided had the bird moved to another direction. It did not move but stayed in the same position which indicates that the direction of sitting seems to be governed by habit. The cup being very deep protected the female from the wind and it did not have much effect on the bird's sitting direction.

Weather

The effect of weather during an incubation period is an important phase to study. The Flycatcher, feeding principally on insects of various types, is governed in its activity by their abundance and activity during the day. As a general rule the feeding activity decreased in cold periods when insects were scarce while it increased on warm sunny days, when they were in abundance.

On two successive mornings, July 10 and 11, I observed the Flycatcher in the early morning. The temperature was 65° on the 10th and 58° on the 11th. The chart below shows the amount of activity at these times.

7/10/41 Temp. 65° cloudy			7/11/41 Temp. 58° cloudy		
Time	Left	Return	Time	Left	Return
6:00	x		4:42		
6:14		x	5:24	x	
6:21	x		5:28		x
6:29		x	6:40	left	blind
6:45	left	blind			

Only once did the bird leave the nest during the two hour period on the 11th. This time of morning is usually a very active one for most birds. However, the extreme temperature probably caused the bird to wait until a later time in the day when insects were more abundant. All my observations of incubation took place during an abnormally cold period in the summer.

A comparison was made of the length of time the bird remained on the nest during the period between 9:00-10:00 a.m. and 1:45-2:45 p.m. The longest period the female remained on the nest in the morning period was 54 minutes and the shortest time was 43 minutes. In the afternoon the longest time of incubation was 47 minutes and the shortest time 33 minutes. During the afternoon period insects are more abundant, therefore, the Flycatcher incubated a shorter period of time.

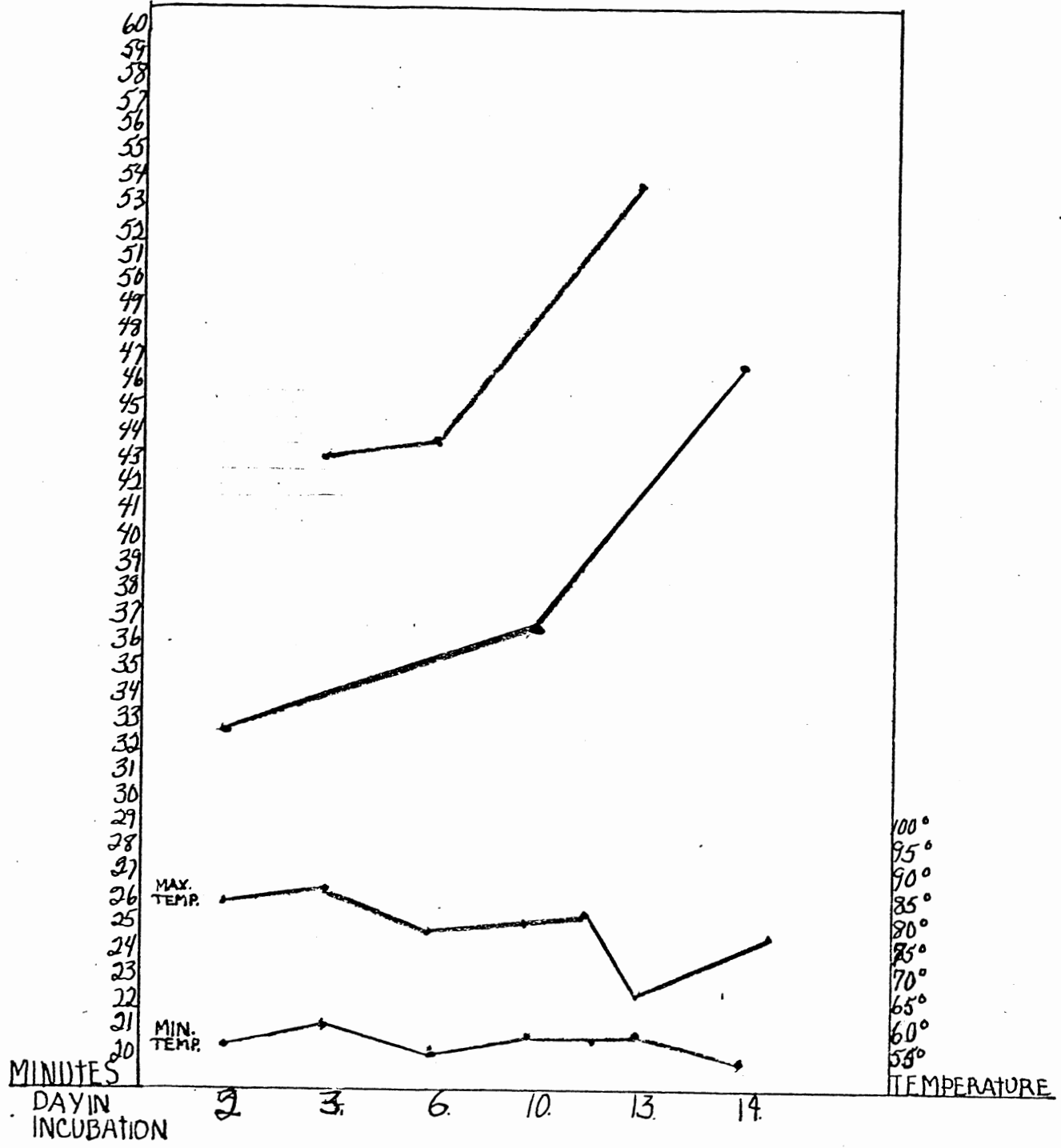
As incubation progressed the time the female remained on the nest gradually increased until on the last day the maximum time of 54 minutes out of an hour was reached. Conversely, the lowest period, 33 minutes, out of an hour was found to be at the beginning of incubation.

These figures were arrived at by taking three different days of incubation representing the typical periods in incubation for an hour in the morning and an hour in the afternoon and then comparing the results.


A graph of the length of incubation during these periods is found on the next page.


Hatching

The three eggs were layed on successive days starting on July 1 to July 3. Incubation started on July 1 after the first egg was layed. The eggs were numbered 1, 2, and 3.



THE NUMBER OF MINUTES PER-HOUR THAT THE ADULT INCUBATED THE EGG AT NEST I.

9:00-10:00 

1:45-2:45 

TEMPERATURE  MAX.-MIN. FOR EACH DAY

On July 17, I left the blind for an hour between 10:30 a.m. and 11:30 a.m. On examining the nest, when I returned, only two eggs were found and no young were present. Under the blind were found two pieces of egg shell indicating that the egg had hatched. The explanation for such a disappearance may be that the young was still attached to the shell and taken with the shell when it was removed. Mrs. M. N. Nice (1937, p.145) observed an instance of this sort in the nesting of the Song Sparrow.

Eggs 2 and 3 hatched on the following day, July 18. At 8:00 p.m. on July 17 eggs 1. and 2. were still unhatched and when I returned on July 18. at 7:00 in the morning I found two young in the nest. The incubation period, therefore, was 16 days.

The above incubation period differs from Bergtold (1917, p.96) who gives it as 12 days, and Forbush (1927, p.359) who gives it as 12 to 14 days.

Growth Period

On entering the blind on July 18, I found two young in the nest. The down was dry when I examined them at 7:00 a.m. They had undoubtedly hatched earlier in the morning.

The two young were typically altricial. The legs and skin were a pinkish orange with very little down covering the feather tracts. White down covered the capital, alar spinal and humeral tracts. The ventral tracts were without down. The mouth lining was the most colorful part of the young as it was bright orange. The beak was brown in color and extremely wide in proportion to the head.

The young on the first three days were quick to react to any noise or movement about the nest. Resting on their huge pot-bellies as a central pillar, the young birds would raise a trembling head using their wings as a support and open their huge orange mouths

for food. This reaction was similar to a jack-in-the-box. After the third day the young became aware of their surroundings. In place of reactions given to any sound they began to raise their heads for food only when the mother's call was given or a vibration was given near the nest. A group of associations had been built up instead of merely a reaction to noises and movements.

Habits

The female's habits changed markedly after the hatching of the eggs. For the first three to four days she brooded the young at the nest. After this time she merely brought food to them, performing no brooding at all. This behavior is not ^{the} normal behavior of the Least Flycatcher for in Means (1938, manuscript) study, where two birds were present, the female brooded the young during the growth period. The action of the female at nest I was probably abnormal due to the fact that only one bird attended the nest.

Instead of slipping into the nest silently as before, the female made a series of chweep calls about three feet from the nest. Often, when suspicious, she would stay perched for about five minutes calling to the young before feeding. The path that was now taken to the nest was evidently determined by habit. The bird flew to a certain branch, grasped certain twigs before it finally landed on a certain path of the nest itself.

Food of Young

The young were fed for the first two or three days on small bits of food held in the gullet. As to whether this food had been predigested I was unable to ascertain. The food after this period was made up of insects of different kinds, the main food being Tipulidae which was very abundant in the vicinity of the nest as

well as Vespinæ, Cicondellidae, Ephimerida, Odonata, Hymenoptera, Diptera and Coleoptera. It was difficult to distinguish the exact nature of the food, because the female often held it inside of her mouth before feeding.

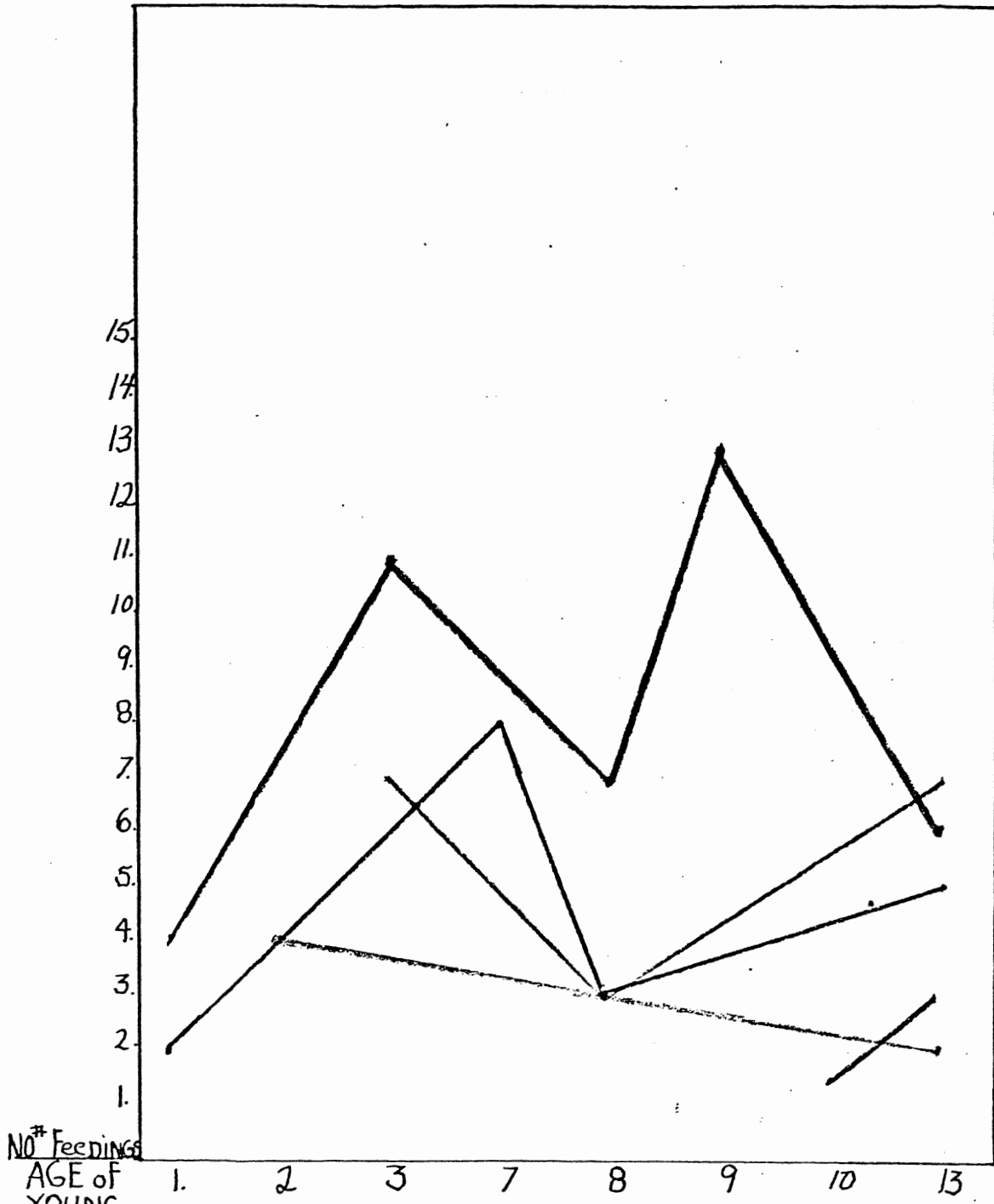
The distribution of food between the young was governed by which bird could thrust its neck up the farthest. Often the same bird was fed many times. However, the number of times was limited to the amount of food that the bird could hold. The food, if not quickly taken by one young, was whisked out, and passed to the other bird. According to Herrick, (1935, p.290) this behavior is caused by the inactivity of the swallowing reflex when the throat is already filled.

The rate of feeding was studied on eight different days during the growth period. Five intervals of an hour's duration were used to represent typical times in feeding. The number of times observed at each hour and the periods of observation are as follows:






5 times	7:30-8:30 a.m.	3 times	10:30-11:30 a.m.
4 times	8:30-9:30 a.m.	2 times	3:00- 4:00 p.m.
4 times	9:30-10:30 a.m.		

The greatest number of feeding during these periods came on the ninth day between 8:30 and 9:30 a.m. when it was 13. Means (ob.cit.) found that the feeding interval at the same period on the sixth day of feeding was 20 times. The rate of feeding per hour is much greater in Means' study than in mine. This difference is perhaps caused by the absence of the male in my study. The lowest rate of feeding came between 3:00-4:00 p.m. These figures are shown graphically on the next page.

A typical day in feeding shows that the greatest rate of feeding of nine times in the half hour period comes between 7:30-8:00 p.m. and the lowest period of one time in a half hour comes between



THE NUMBER OF FEEDING PER HOUR OF YOUNG IN NEST I

7:30 - 8:30		10:30 - 11:30	
8:30 - 9:30		3:00 - 4:00	
9:30 - 10:30		FROM 7/18/41 to	
		7/30/41	

3:00-3:30 and 3:30-4:00 p.m. There was no activity at all between 4:30-5:00 a.m. These figures are shown graphically on page 13.

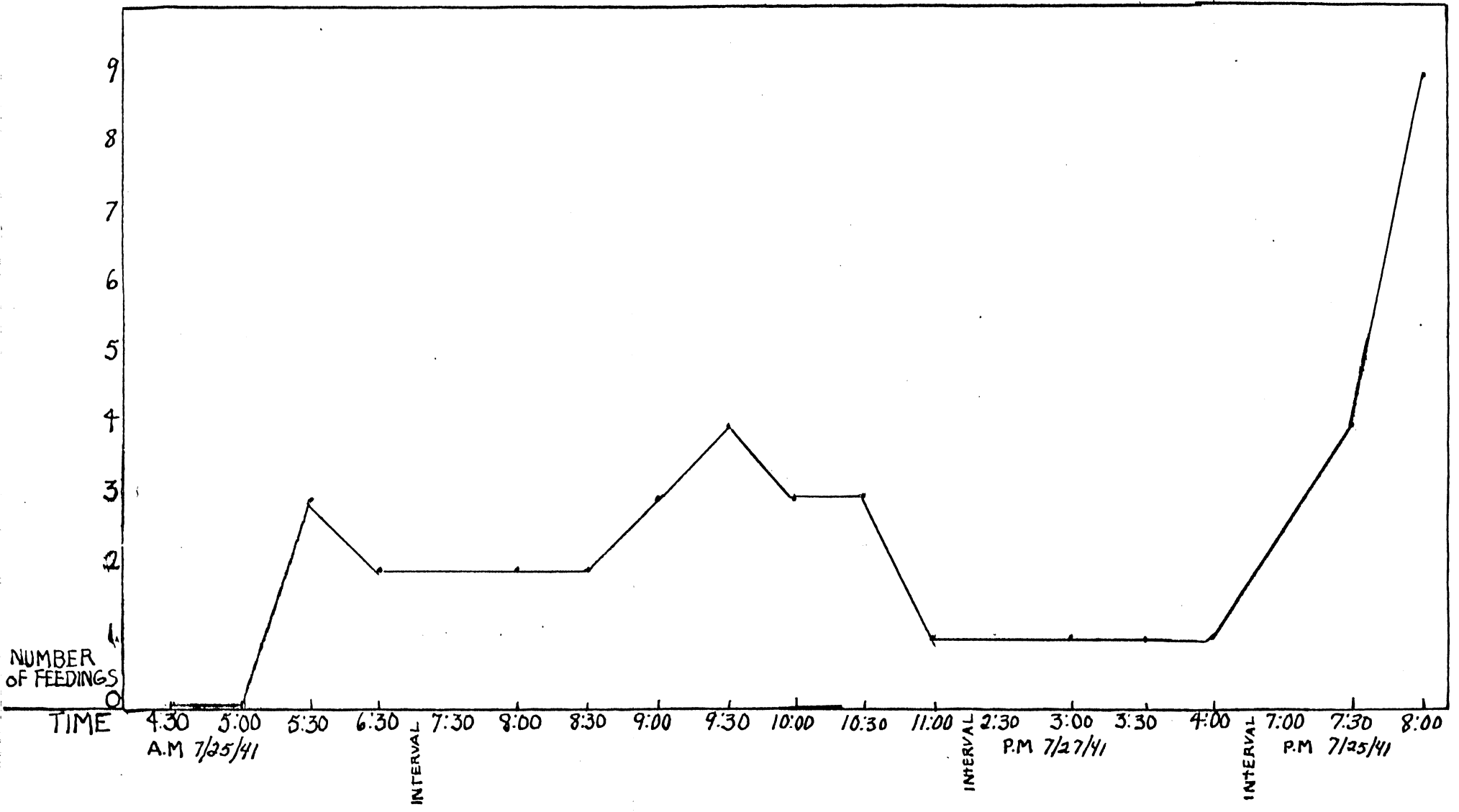
A period of extremely hot weather swept over the area on the fourth day after hatching. The temperature was 99° and in the sun it was very much warmer. During this period the young hung their necks out of the nest trying to relieve themselves from the heat. Not once during this sultry spell did the female protect the young from the sun which struck the nest directly during part of the day. Means (ibid.) noticed that the female had a very keen sense of the temperature and protected the bird from the hot rays of the sun. The heavy nesting duties in the case of this Flycatcher probably caused it to spend much of its time searching for food instead of protecting the young at the nest.

The female remained at the nest at each feeding for a period of about four to six seconds. Sometimes she would look into the nest, move the young about, and then leave. Feeding was a rapid process at all times.

Sanitation

After feeding the young the fecal sac was removed and either eaten or carried away. The sac was removed after about every third or fourth feeding. As the young increased in age a larger number of fecal sacs were removed. The sanitary condition of the young was a matter of great concern to this flycatcher. When the feeding was over, inspection followed with clock-like regularity and the excreta and any remaining food particles were taken away. On the 13th day the young often dropped their excreta over the side of the nest.

THE NUMBER OF FEEDING DURING HALFHOUR INTERVALS IN ONE DAY - NEST I



Weight

In the weight graphs and summary the young in nest I are referred to as B1. and B2., and in nest II the young are referred to as A1, A2., and A3.

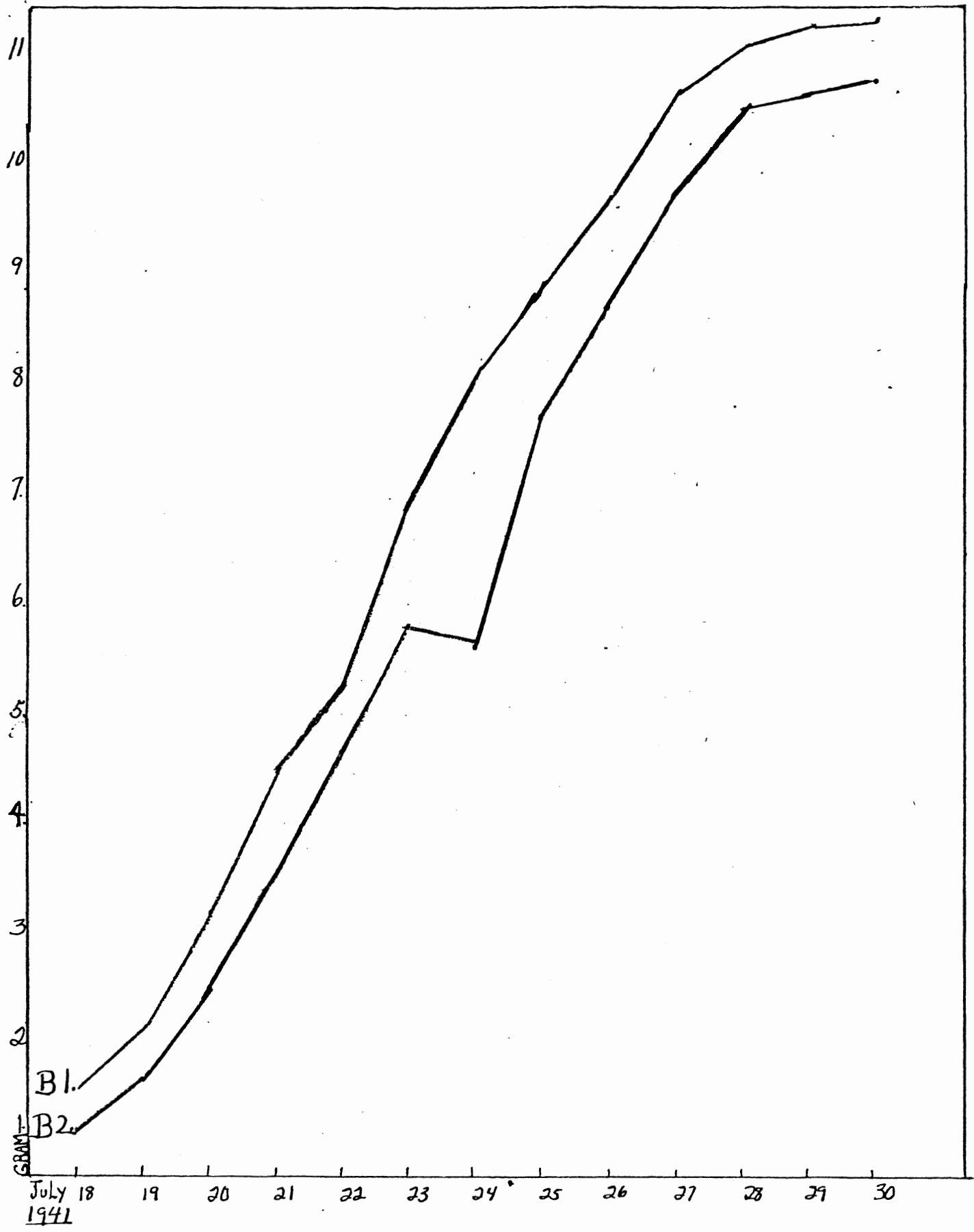
Although both birds in nest I hatched on the same day B1. was ahead of B2. during the entire nesting period. The greatest increase in weight came in the first eight days of growth. In nest II the greatest increase came on the seventh day. The average gain in weight of the nestlings was .83 gm. A leveling off of weights came on the last three days of nesting. It was during this time that the greatest development of feathers occurred. A summary of weight and plumage changes is given on the next page.

Caged Birds



On the thirteenth day after weighing at 7:30 p.m. the two young were taken out of the nest and placed in a cage. I put a dark cloth over the cage to calm the birds. After about an hour I made an attempt to feed the two ^{birds} but instead of opening their mouths to my chipping and squeaking calls they merely turned their heads. I decided to wait until morning and see if my luck would be better.

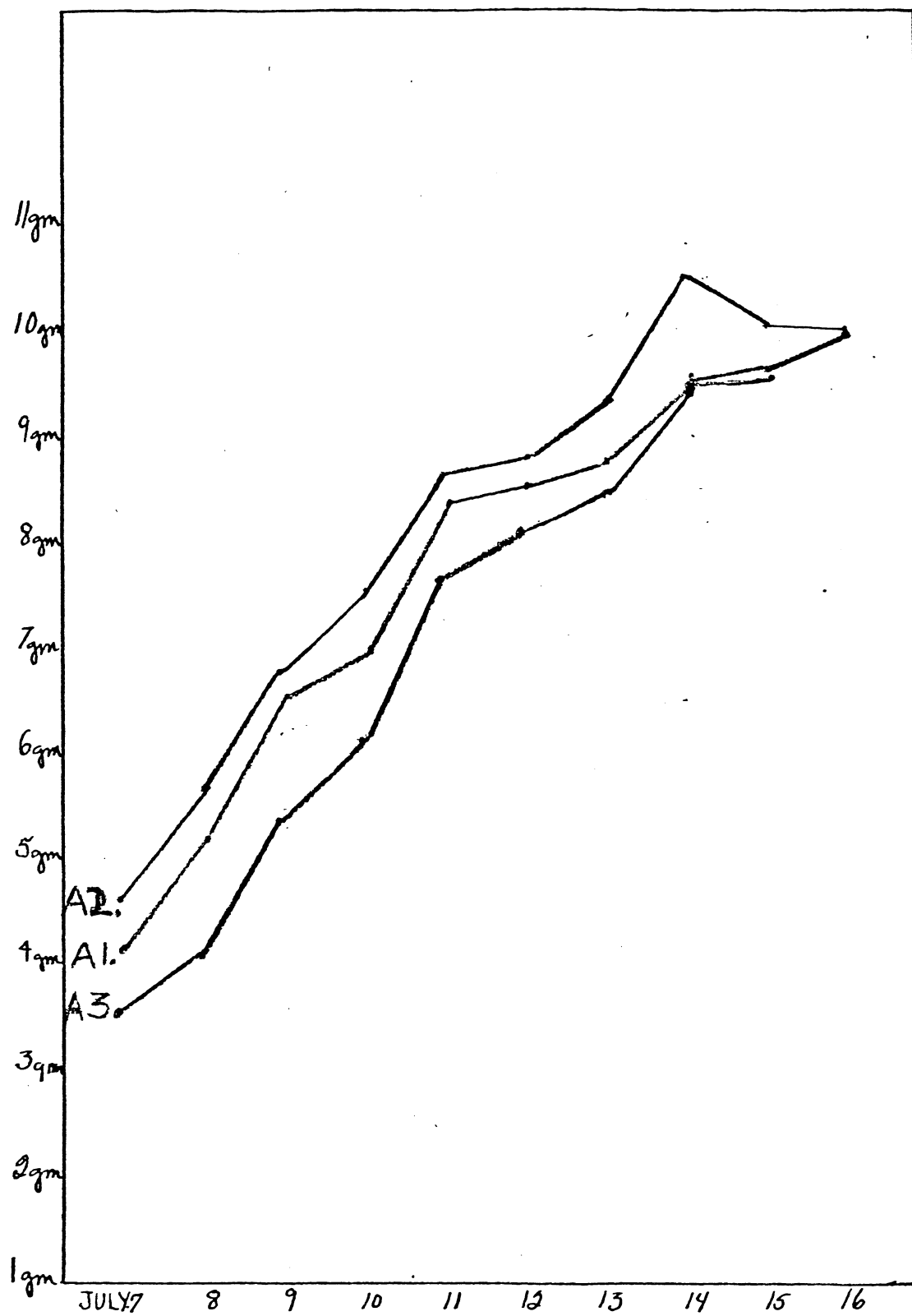
In the morning I placed the cage outside and just as I started out to feed the birds I noticed a Least Flycatcher perched near by the nest calling to the young. The cage was placed near a group of white birch and aspens behind the cabin and was an ideal spot for the Flycatcher. As I watched the cage I noticed the adult attempting to feed the young but was unsuccessful because of the fine screening. To force the young to the end of the cage where the wire mesh was large enough for the birds' bills to go through, I placed paper on the sides of the cage so that the young could not see out, and would move to the wider screening. Soon the adult was

DATE	WEIGHT IN GRAMS		PLUMAGE CHANGES	BEHAVIOR
	B1.	B2.		
7/18/41	1.40	1.10	Eyes closed, with down on feather tracts, no down on ventral tracts only on dorsal feather tracts.	Little activity, birds respond to loud noises, legs have no grasping power
7/19/41	1.95	1.56	Eyes closed, down longer	Little movement
7/20/41	3.00	2.30	Eyes closed dark spots appearing on feather tracts.	Birds developing grasping ability, beginning to gain associations to female.
7/21/41	4.30	3.37	Eyes closed, feather tracts becoming more prominent.	
7/22/41	5.32	4.45	Eyes closed, feather tubes barely coming out, appear black.	Young now know females call moving about the nest and giving peep like calls
7/23/41	6.72	5.62	Eyes closed, down being pushed out by feather tubes. Legs have developed grasping powers	Birds hanging heads out of nest, weather very hot.
7/24/41	7.88	6.51	B 1. eyes opening, B 2. eyes closed feather tubes appearing on both birds about 15 m m. Tail beginning	Birds hanging heads out of nest to avoid sun hitting directly at nest. A well developed grasping power.
7/25/41	8.70	7.55	Eyes open on both birds, feathers beginning to come out of feather tubes alar tract farthest advanced.	Young stretching heads out on sides of nest with their mouths open, very hot. Bird hold on too inside of nest when picked up.
7/26/41	9.55	8.55	Eyes almost entirely open, ventral feather tracts developing, feathers beginning to cover capital, spinal, and alar feather tracts.	Birds constantly moving in nest and hanging heads over the side of the nest.
7/27/41	10.46	9.57	Feather tracts well developed, 2 wing bars present. Feathers out $\frac{1}{4}$ inch Median apertium uncovered, feathers just showing on ventral tracts	Birds active in nest.
7/28/41	10.90	10.15	Eyes completely open, eye ring present tail 8 m m. long	Birds active in nest.
7/29/41	11.9	10.20	Primaries 15 m m. long Secondaries 11 mm. long Birds well feathered	A great deal of activity, birds continually moving. alert to motion in blind.
7/30/41	11.13	10.52	completely feathered, a few pieces of down left sticking to capital tract and spinal tract. complete juvenal plumage	Young attempting to fly by raising up on nest and flapping their wings. preening feathers.



A COMPARISON OF WEIGHTS OF NESTLINGS
IN NEST I

B1.  From hatching
B2. 



COMPARISON OF GAIN IN WEIGHT
OF NESTLING IN NEST II

STARTING ON 3RD DAY

feeding them constantly.

I noticed two birds this time both feeding the young. The first day of captivity the young sat quietly on the bottom of the cage. The next day they were lively and giving the familiar chweep note for the first time. Suddenly a chipmunk jumped up onto the cage trying to get at the young and the noise that ensued was astonishing. Two of the adult birds flew at the chipmunk and then sat near by giving sharp chebeck calls with their tails flared out like a Redstart nervously flipping it up and down. This was too much for the chipmunk and it left the cage.

As I watched the caged birds I heard a new call given by the adult. It was a series of notes giving in flight, similar to a Kingfisher rattle but in a softer tone.

I do not believe that either bird attending the cage was the bird originally at the blind. The calls and actions of the adults were entirely different. During the summer there have been a group of Least Flycatcher about the cabin, and I believe they came down to feed the young.

The birds died the morning of August 4 after being in captivity three days. The general loss of weight was the cause of their death, as the young could not get adequate food through the cage from the adult birds.

Summary

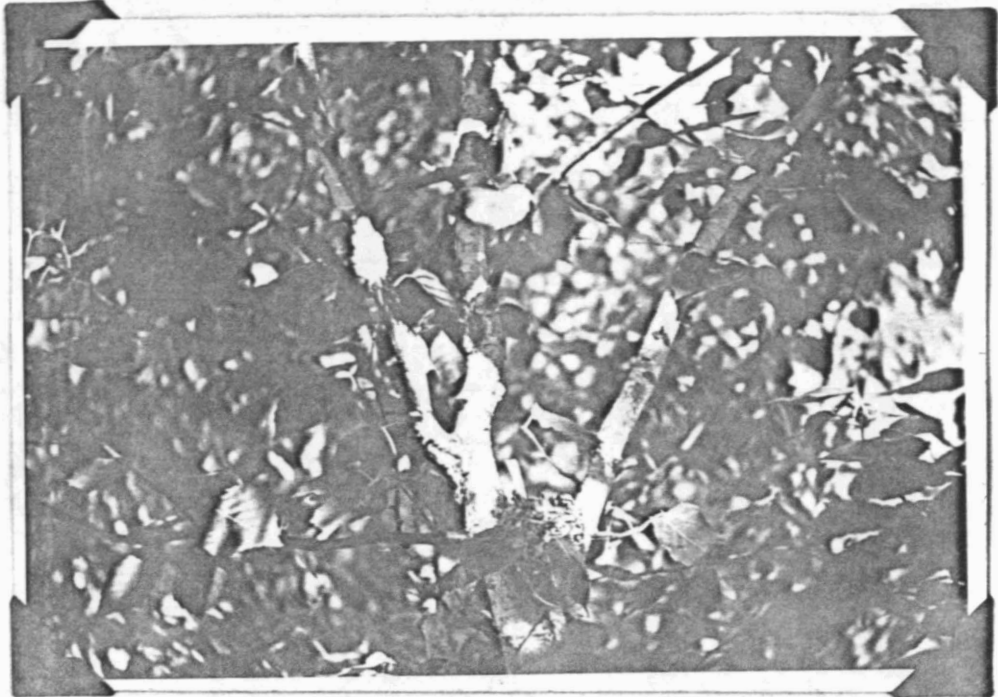
1. Incubation began after the first egg was layed and covered a period of 16 days.
2. The nest contained 3 eggs. All three eggs hatched and one disappeared from the nest on July 17.
3. Only one bird, a female, carried on all nesting activity.
4. As incubation progressed more time was spent in incubation,

the maximum period of 54 minutes out of an hour was reached on the last day.

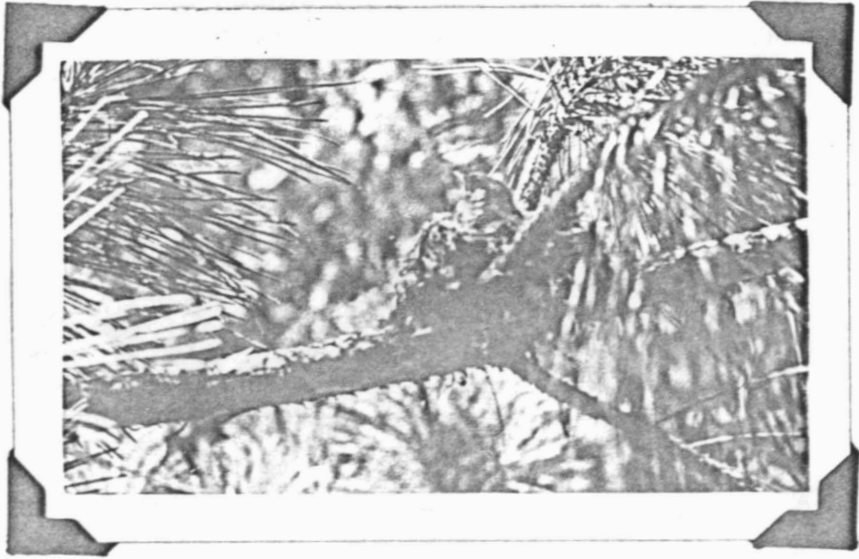
5. Even though the temperature fluctuated from day to day the time spent incubating increased at the end of the incubation period.
6. The greatest feeding time came 7:00-8:00 p.m. and 8:00-11:00 a.m. The greatest number of feedings was 13 during an hour period; the least number during an hour was 1.
7. The female did not feed the young alternately but the one nearest the food.
8. The fecal sacs were removed from the nest, either being eaten or carried away.
9. The greatest gain in weight of the young came during the first six to seven days.
10. A leveling off in weight came on the tenth day. The most rapid increase in plumage came at this period.
11. Although both birds at nest I hatched at the same time, one was a day ahead of the other in weight the entire nesting period.
12. The average gain in weight was .84 gm.
13. The food consisted wholly of insects.
14. The call note of this Flycatcher was a chweep rather than a true chebec.
15. The two young were put in a cage for observation. Two adult Least Flycatchers fed the young through the wire screen on the cage. The original female did not feed the young in the cage. The young died from lack of food.
16. The Least Flycatcher shows great adaptability in its nesting site.

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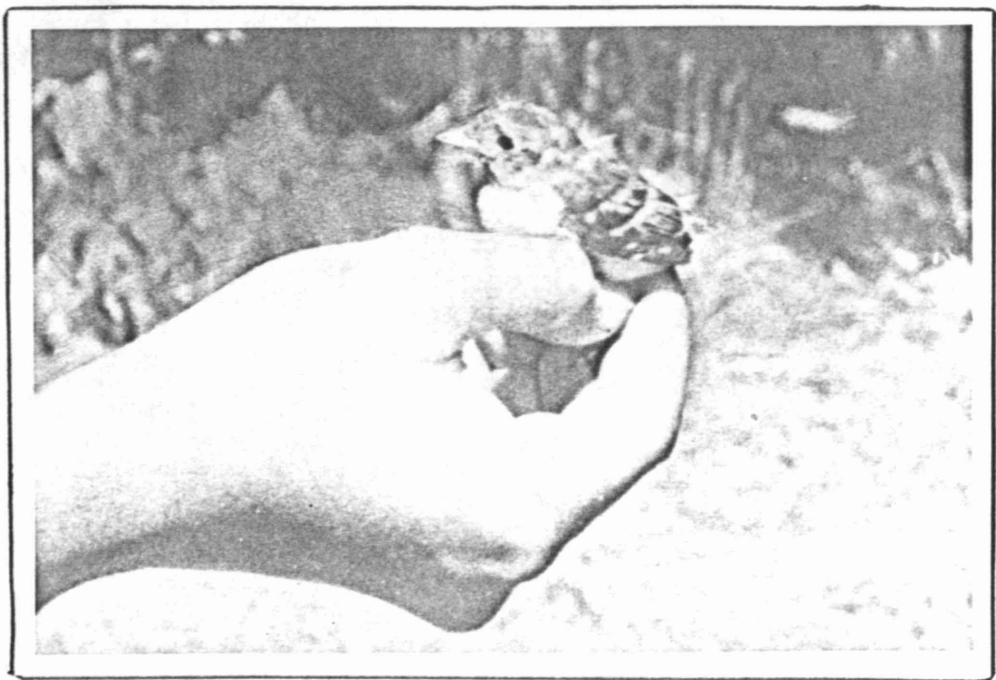
Nest I. Female incubating eggs



Nest II. Young bird just before leaving nest



Nest I. Female at nest just before feeding.



A young Least Flycatcher ready to leave the nest;
notice the down still on the dorsal feather tracts.