

OBSERVATIONS ON THE LIFE HISTORY OF THE EASTERN KINGBIRD,

(~~Tyrannus tyrannus~~)

by

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A report of an original field study conducted
as a requirement for Advanced Ornithology
-Zoology 119 -, University of Michigan
Biological Station

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Observations On The Life History Of The Eastern Kingbird
Tyrannus tyrannus. The Vicinity of Douglas Lake
Cheboygan County, Michigan

By

Fred Charles Goodell

Four nests of the Kingbird were kept under observation from June 24th. to July 23rd. Further observations were made of the birds until July 31st. Original nesting observations totaled 48 hours.

The Eastern Kingbird is one of the most frequently seen Flycatchers in Michigan. Little information on the life history of this interesting Flycatcher is available. Houseman - 1925 - has given individual treatment on the utterances of the Kingbird. Barrows - 1912 - has given data on the economic importance of the Kingbird.

Acknowledgements are made to Dr. Olin Sewall Pettingill, Jr., Carleton College, Northfield, Minnesota, for corrections and aids given the paper, also for other valuable suggestions which have been helpful. To Dr. Theodora Nelson, Hunter College of the City of New York, for suggestions which have proven valuable during the course of study. To Dr. Herbert Hungerford, University of Kansas, Lawrence, Kansas, for identifying the Rose Chafer, Macrodactylus spinosus this was an important diet of the Kingbird. To members of the class of Ornithology 119, for assistance in locating nests, banding birds, and other valuable aids. To Maxine Smith, James Smith, and Robert Serfling for the pictures of the Eastern Kingbird.

Part 1.

The Habitat.

The Eastern Kingbird inhabits a wide range of territory, being observed along roadsides, open meadows, and near water sites. He is considered an arboreal bird living in a transitional zone. This is usually characterized by sparse growths of hardwood association, consisting mostly of Birch, Oaks, and Maples, and Aspens. The birds are not easily seen because they rarely perch in concealed places. Their favorite perching places being telegraph wires or poles, dead limbs or branches of some tree that overlooks an open field, lake or river.

Part 2.

Description.

The upper parts of the Kingbird are dark slaty grey. The wings are dusky black with greyish edgings. The head is dark, very blackish. The tail is black, except the outer white tip which readily distinguishes the Kingbird from the other Flycatchers. The breast is greyish and the under parts white. The bill and feet are black. The bright orange colored spot on the crest of the adult Kingbird is hard to see even when the crest is ruffed. The fully grown Kingbird in his juvenal plumage is very much like the adult, except the under parts are whiter and the body parts above are less dark. No orange crest is visible on the young. Roberts - 1932 - states the male Kingbird is larger than the female. While observing Nest no. 2 the male had darker upper parts than the female. On the neck of the female was seen a speckling of faded brown color, which I noticed on the second day of observation. As to size, the male bird appeared longer than the female as they stood side by side at the nest. The casual observer of the Kingbird will see little difference between sexes.

Part III.

a. Location of the nest.

The Kingbird selects his nest near the open, this permits easy access to fly catching. Number 1 nest was located in a compound crotch of a White Birch, Betula alba, ten feet above the ground near cross walk of State Street at the University of Michigan Biological Station, Douglas Lake. The nest was in front of Dr. Theodora Nelson's residence house no. 9. Number 1 nest was an estimated 30 yards south of Fish Tail Bay at Douglas Lake.

Number 2 nest was approximately 100 yards west of number 1 nest, and centrally located on State Street. This nest was located in a Soft Maple tree, Acer rubrum, just 7 feet off the ground. This nest was about 20 yards south of Fish Tail Bay. It seemed partially concealed with leaves, and was located on a branch, 6 feet from the main trunk. The limb that supported the number 2 nest was 1 inch in diameter and was prevented from swaying by additional support and anchorage of a Cedar pole. Attached to the top of the Cedar pole was an ariel wire, this extended approximately 50 feet across an open space. The wire perch was an estimated 20 feet high and seemed an excellent place for the Kingbird to sight insects and guard the nest.

Nest number 3, was located at the north east corner of Burt Lake on the south east corner of Reeses Bog, in a scrubby White American Elm - Ulmus americanus - The tree was small and scraggly, its height being about 25 feet. The nest was 8 feet 6 inches from the ground, on a small open limb which measured 2 and $\frac{1}{2}$ inches in diameter and was exposed to the sun. The territory around the nest - was open, the

nearest tree being 20 paces away.

Nest number 4 was located one mile north east of the Station an estimated 75 yards from Fish Tail Bay shore. The nest was situated in a small 6 inch Red Oak tree - Quercus ruba - 16 feet from the ground and suspended by an inch and a half diameter limb. The nest was three and one-half feet from the trunk of the tree. The territory of the nest consisted of open forest which provided an excellent feeding range for the Kingbird.

b. Nest materials.

The Kingbird nest is characterized by its oval shape and its looseness of construction. Small sticks and roots form the outside of the nest which is usually wound or supported with string, cord or hair. The sticks on the outside are loosely arranged and range from 2 to 6 mm in diameter, the roots 1 to 2 mm in diameter form the inside structure of the nest. Nests of the Douglas region have been lined with fine grass, cotton down, thistle down, milk weed down, horse hair and pearly everlasting. At Black River marshes of Black Lake Vicinity, the Kingbird nests were lined with cat tail and thistle down. All materials of the Kingbird nest are found in or near the nesting area. The elevation of the nests above the ground ranged from 6 to 20 feet. The number of shaded and unshaded nests were about equal. Some nests found in the Black River vicinity were entirely exposed to the sun's rays and plainly visible. On a Black River trip, one nest consisting of one young was being shaded by the parent who stood with spread wings over the sunny nest. It is believed the Kingbird can equally defend their nest from other birds. There are no records of Cowbird eggs being laid in the nests of the Kingbird in the Douglas Lake vicinity. Other nests found in the Kingbird territory are as follows : Cedar Waxwing, Chipping Sparrow,

Red Eyed Vireo, Robin, Hummingbird, Martins, Spotted Sandpipers and Oven birds.

c. Nest measurements and weights of Kingbird nests. - The nests were thoroughly dried when weighed.

Table 1.

Number	Outside Diameter	Inside Diameter	Inside Depth	Total Depth	Weight
1	114mm	82mm	63mm	126mm	36gm
2	120mm	86mm	55mm	78mm	46gm
3.	113mm	76mm	44mm	88mm	35gm
4	110mm	60mm	55mm	75mm	29gm
5.	112mm	75mm	54mm	77mm	31gm

Size Ranges of Nests.

Outside diameter 120mm to 114mm

Inside diameter 60mm to 82mm

Inside depth 44mm to 63mm

Total depth 75mm to 126mm

6.

Nest number 1 had the greatest inside and total depth, which was much greater than nests number 2 - 3 - 4 - 5. The location of nest number 1, in the crotch of a White Birch tree -Betula alba - explains its greatest depth. The other nests were suspended by single limbs. The exact location of a nest partly determines its diameter and total depth. The weights of the nests varied from 29 to 46.5 grams. The great difference seemed to be due to the variation of materials. The lightest nests possessed much down.

Part IV

The Egg.

The color of the Kingbirds egg varies slightly. The background being of a light cream or white covered with dark brown spots. The dark brown spots were most numerous on the large end of the egg. The size of the egg varies, possibly depending upon a number of factors, as age and size of bird and the time of the laying. Eggs measured varied from 23 to 26 mm in length, and 17.5 to 19 mm in width. The number of Kingbird eggs in a full clutch varied from 3 to 4. However W.P. Barrows -1912- names 4 to 6 eggs as common. W.E. Clyde Todd -1940- indicates eggs vary 3 to 5 per nest. R.W. Chaney of Hamilton -quoted from Barrows 1912 - insists there are always 3 eggs per nest.

Table 11.

Egg Measurements and Per-cent of Hatched Eggs.

Nest Number	Number of eggs in clutch.	Length	Width	Per-cent of eggs that hatched.
1	4 3 had hatched 1 left in nest.	24 mm	17.5 mm	75 per-cent
2	4	24 mm 23.5 mm 24 mm 23.5 mm	19 mm 18 mm 19 mm 18 mm	100 per-cent
3	3	26 mm 26 mm 1 egg broken	18 mm 18 mm	66 $\frac{2}{3}$ per-cent
4	3	23 mm 24 mm 23.5 mm	19 mm 18 mm 19 mm	100 per-cent

14 eggs hatched - 87.7%

Data was lacking for a study of the incubation period. of the Eastern Kingbird egg. Roberts -p.5 - quotes Forebush, stating, the incubation period for eggs range from 12 to 16 days. While Bergtold's- p.96 - figures indicate. the greatest number of Eastern Kingbird nests. incubate in 14 days.

Table 111

Nest No. 3
DateDaily Weight Chart of Eggs
No. of Egg Weight of Egg

Nest No. 3 Date	No. of Egg	Weight of Egg
6 - 26 - 40	No. 1	3.81 gm.
6 - 26 - 40	No. 2	3.79 gm.
6 - 27 - 40	No. 1	3.85 gm - Error, Scales not level.
6 - 27 - 40	No. 2	3.91 gm. - Scales not level.
6 - 29 - 40	No. 1	3.70 gm.
6 - 29 - 40	No. 2	3.69 gm.
6 - 30 - 40	No. 1	3.66 gm.
6 - 30 - 40	No. 2	3.65 gm.
7 - 1 - 40	No. 1	No record taken
7 - 1 - 40	No. 2	No record taken
7 - 2 - 40	No. 1	3.53 gm.
7 - 2 - 40	No. 2	3.48 gm.
7 - 3 - 40	No. 1	3.45 gm.
7 - 3 - 40	No. 2	3.39 gm.
7 - 4 - 40	No. 1	Hatched
7 - 4 - 40	No. 2	Hatched

Range of weight lost during last 6 days of incubation
 No. 1 3.81 to 3.45 gm. Net loss 36 gm.
 No. 2 3.79 to 3.39 gm. Net loss 40 gm.

Table IV

Data from Nesting Observations

Nest No.	Date Hatched	Date Left Nest	Number of Days in Nest	Number of Days Fed by Adults after Leaving the Nest.	Date of Young Feeding Themselves.
1	June 24	July 13	18 days	10 days	July 23
2	June 26	July 12	16 days	12 days	July 24
3	July 4	1 bird gone, 1 bird dead in nest, Causes of death and nest desertion unknown.			
4	July 6	July 23	17 days	Not observed	Not observed

The length of time young Kingbirds stay in their nests range - on the nests observed, from 16 to 18 days, which is considerable greater than the time of many Passerine birds.

Table V
Brooding, Feeding Rate by Sex, and Temperature

Age of Young	Time of Observation	Average Feedings per Hour	Average No. Feedings by Male per Hour	Average No. Feedings by Female per Hour	Length of Time Gone from Nest	Amount of Time Spent Brooding	Temperature	
							Max.	Min.
1 day	Not recorded	Estimated 1 or 2	Sex not known	Sex not known	2 minutes	Practically all day	64° F Cold	53° F
2 day	9 to 10:30	3 times	1	2	4 minutes	86 min.	71° rain - cold	55°
3 day	9 to 11:45 1:30 -4:15	9 times	3	6	157 min.	63 min.	72°	56°
4 day	9:30-11:45 1:15 -2:30	9 times	3	6	117 min.	55 min.	69°	52°
5 day	8:00 -9:50	12 times	5	7	57 min.	33 min.	68°	56°
8 day	10:00-11:16	14 times	6	8	69 min.	9 min.	76°	54°
11 day	7:00-10:07	20	11	9	187	No brooding	88°	57°
14 day	8 -10:00	20	8	12	120	No brooding	83°	62°

Total Average for all the Days

11

5.2

6.0

Total Min.
713

Total Min.
246

Table VI
Feeding Observations on Nests 1 - 2 - 3

Kinds of Food	Times Fed of Diet	General
<u>Macroductylus spinosus</u> Rose Chafer	28 times 16.7%	Are very plentiful in Douglas Lake area. Live on wild rose bushes. For the first three days many Rose Chafers were fed which were identified after the 3rd. day. Fed often until the 8th. day.
<u>Calliphora Vomitoria</u> Fish or Blow Fly	36 times 21.6%	The Fish Flies were especially numerous during an accumulation of dead May Flies on Douglas Lake beach.
<u>Musca Domestica</u> House Fly	12 times 7.2%	These flies were small and hard to see, perhaps more were fed.
<u>Sub-order Anisoptera</u> Dragon Flies	16 times 9.5%	The Dragon Flies were fed frequently after the 7th. day.
<u>Sub-order Zygoptera</u> Damsel Flies	10 times 5.9%	The Damsel Flies were fed often after the 7th. day.
<u>Meanoplus Femur Rubrum</u> Grasshopper	3 times 1.2%	The common Grasshopper inhabits the region of Douglas Lake.
<u>Gyrillus Assimilus</u> Common Cricket	2 times 1.1%	Crickets did not seem numerous at time of feeding in Douglas Lake territory.
<u>Sombuscus Pacemosa</u> Common Red Elderberry	None, but	2 regurgitations of adults of nest 1 had Adults ate 48 Red Elderberry seeds. Later adults were berries. observed feeding on Red Elderberry. This was strange for a Flycatcher. Regurgitations of female of Nest 2, the first 3 days of feeding consisted almost entirely of legs of the <u>Macroductylus spinosus</u> which were identified by Dr. Fungörford of the Entomology Department
Insects not identified	60 times 35.3%	
		Note the total number of observed feedings was 167. Some insects unidentified had lacy wings.

Feeding Observations and Sanitation

- a. The feeding territory of Nests no. 1 - 2 - 3 ranges from 50 to 75 yards.
- b. Both adult birds fed the young. The female, however, fed more frequently than the male. The male fed the female many times as she brooded her nest.
- c. Both adults ate the fecal sack for the first 6 days. After the 6th. day the fecal sack was carried away from the nest by both parents, and usually dropped in the lake, as observed on nests 3 and 4.
- d. The total average feedings for 4 young in nest no. 2 was 11.1 per hour.
- e. After the 7th. day the feedings consisted of more Dragon and Damsel Flies.
- f. The maximum rates of feeding per hour occurred from the 11th. day until the young left the nest. The maximum feeding rates per hour was 20 times.
- g. Feeding of juvenal birds by adults continues 10 to 12 days as observed on Nests 1 and 2.
- h. No bees were observed to be fed.
- i. Adult Kingbirds of Nests 1 and 2 were observed to regurgitate indigestible chitinous material as often as twice from 7:00 to 11:00 A.M.
- j. On the 13th. day adult Kingbirds of Nests no. 2 adopted a young two-thirds grown orphan Kingbird, which was brought from near Black Lake. The baby bird was placed in the nest at 7:00 P.M. The male fed a Dragon Fly to the calling orphan at 7:15 P.M. and repeated the feeding with a Damsel Fly at 7:30 P.M.
- k. The male fed the largest insects more often than the female. On the third day he tried to feed the young a Dragon Fly and failed because

of its size. The female arrived at the nest, seemed very disgusted with her mate and pulled part of the Dragon Fly from him. He ate the rest.

1. On the 27th. and 29th. days of age the young of Nests 1 and 2 were catching their own food.

14

The Young
Measurements and Weights

Table VII

Nest number 2 - Bird 1.

Date	Body Length	Wing Extension	Right Wing	Tarsus	Bill	Tail	Weight
6 - 26 - 40	39mm	32mm	7mm	7mm	5mm	0mm	2.20gm
6 - 27 - 40	45mm	40mm	9mm	7.1mm	6mm	0 mm	4gm
6 - 28 - 40	50mm	45mm	10mm	9mm	8mm	0 mm	6gm
6 - 29 - 40	55mm	50mm	11mm	10mm	8mm	0 mm	8.10gm
6 - 30 - 40	56mm	55mm	14mm	11mm	9mm	0 mm	10.20gm
7 - 2 - 40	75mm	82mm	19mm	15mm	10.5mm	1mm	20.00gm
7 - 3 - 40	80mm	85mm	24mm	16mm	11mm	5mm	23.35gm
7 - 4 - 40	83mm	125mm	31mm	17mm	11.5mm	8mm	27.40gm
7 - 5 - 40	90mm	145mm	40mm	17.5mm	12mm	10mm	27.85gm
7 - 6 - 40	96mm	165mm	46mm	18.5mm	13mm	14mm	31.00gm
7 - 7 - 40	104mm	192mm	59mm	20mm	13mm	16mm	33.65gm
7 - 8 - 40	112mm	210mm	60mm	21mm	13mm	20mm	36.15gm
7 - 9 - 40	118mm	225mm	63mm	21.5mm	13.5mm	27mm	35.80gm
7 - 10 - 40	125mm	242mm	70mm	21.5mm	13.5mm	30mm	35.50gm
7 - 11 - 40	126mm	250mm	71mm	22mm	13.5mm	32mm	35.51gm

Table VIII

Nest number 2 - Bird 2.

Date	Body Length	Wing Extension	Right Wing	Tarsus	Bill	Tail	Weight
6 - 26 - 40	38mm	34mm	7mm	7mm	5mm	0 mm	2gm
6 - 27 - 40	43mm	36mm	8mm	7.5mm	6mm	0 mm	2.70gm
6 - 24 - 40	42mm	40mm	10mm	9mm	8mm	0 mm	4.20gm
6 - 29 - 40	50mm	43mm	10mm	9mm	8.5mm	0 mm	5.85gm
6 - 30 - 40	60mm	60mm	11mm	10mm	9.5mm	0 mm	11.08gm
7 - 2 - 40	70mm	85mm	19mm	15mm	10.5mm	1mm	18.20gm
7 - 3 - 40	77mm	100mm	24mm	16mm	11.5mm	5mm	21.10gm
7 - 4 - 40	82mm	130mm	31mm	16mm	11.5mm	6mm	24.75gm
7 - 5 - 40	89mm	142mm	40mm	17mm	12mm	7mm	26.77gm
7 - 6 - 40	110mm	160mm	48mm	19.5mm	13mm	11mm	30.38gm
7 - 7 - 40	115mm	185mm	54mm	19.5mm	13mm	10mm	32.56gm
7 - 8 - 40	115mm	210mm	60mm	20mm	13mm	21mm	35.60gm
7 - 9 - 40	117mm	225mm	65mm	21mm	13mm	26mm	35.75gm
7 - 10 - 40	130mm	230mm	70mm	21mm	13mm	28mm	35.20gm
7 - 11 - 40	136mm	238mm	72mm	21mm	13.5mm	26mm	34.40gm

Table II.

Nest number 2 - Bird 3.

Date	Body Length	Wing Extension	Right Wing	Tarsus	Bill	Tail	Weight
6 - 26 - 40	40mm	32mm	6.5mm	8mm	5mm	0 mm	2.20gm
6 - 27 - 40	45mm	40mm	9mm	8mm	5mm	0 mm	3.40gm
6 - 28 - 40	50mm	43mm	10mm	9mm	7mm	0 mm	5.70gm
6 - 29 - 40	55mm	50mm	11mm	10mm	8mm	0 mm	8.10gm
6 - 30 - 40	56mm	54mm	11mm	11mm	9.5mm	0 mm	8.20gm
7 - 2 - 40	61mm	74mm	15mm	13mm	10mm	0 mm	12.60gm
7 - 3 - 40	65mm	80mm	19mm	14mm	11.5mm	1mm	14.50gm
7 - 4 - 40	80mm	105mm	24mm	14.5mm	11.5	4mm	19.80gm
7 - 5 - 40	83mm	120mm	30mm	17mm	12mm	8mm	22.14gm
7 - 6 - 40	90mm	140mm	35mm	17.5mm	12mm	10.5mm	22.00gm
7 - 7 - 40	92mm	155mm	43mm	18mm	12mm	14mm	24.10gm
7 - 8 - 40	96mm	180mm	50mm	19mm	12mm	16mm	22.21gm
7 - 9 - 40	102mm	190mm	58mm	19mm	12mm	21mm	27.10gm
7 - 10 - 40	102mm	210mm	59mm	19mm	12mm	22mm	27.70gm
7 - 11 - 40	105mm	212mm	61mm	19mm	12mm	25mm	26.80gm

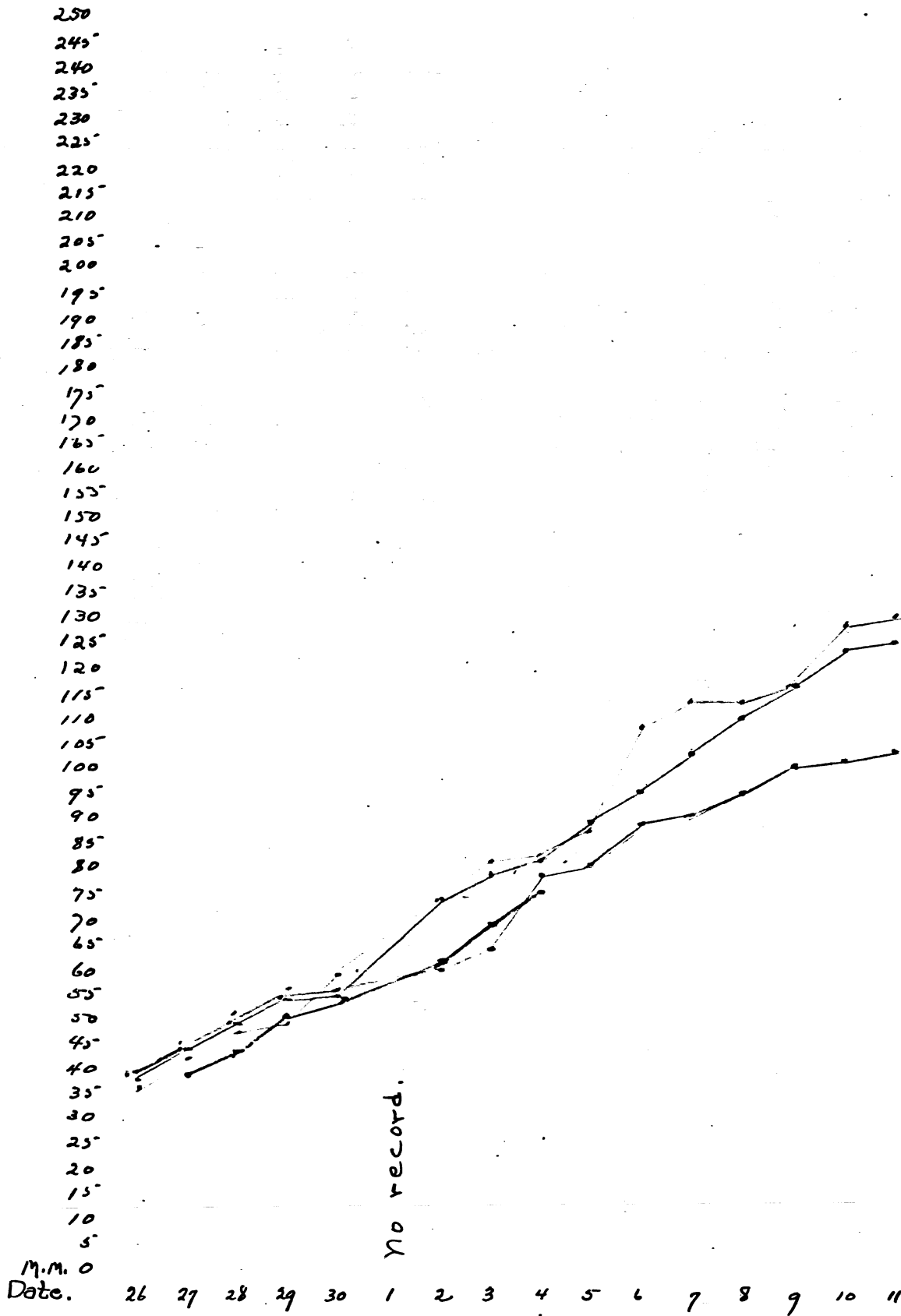
Table II.

Nest number 2 - Bird 4

Date	Body Length	Wing Extension	Right Wing	Tarsus	Bill	Tail	Weight
6 - 27 - 40	40mm	34mm	6mm	7mm	5mm	0 mm	2.60gm
6 - 28 - 40	45mm	40mm	10mm	9mm	7mm	0 mm	4.20gm
6 - 29 - 40	52mm	48mm	10mm	8.5mm	7.5mm	0 mm	5.70gm
6 - 30 - 40	55mm	50mm	11.5mm	10mm	9mm	0 mm	7.40gm
7 - 2 - 40	62mm	66mm	17mm	12mm	10mm	0 mm	13.70gm
7 - 3 - 40	70mm	86mm	20mm	15mm	11mm	1mm	17.20gm
7 - 4 - 40	78mm	110mm	25mm	15.5mm	11mm	5.5mm	19.70gm

Birds of this nest were banded. Later in the day, after banding, number 4 bird fell out of the nest and was killed. Later the same day the male bird was observed trying to take the red bands off the legs of the young. He succeeded in pulling Number 3 bird out of the nest. This bird fell to the ground uninjured. The male was observed July 5th. to make 5 attempts to pull the bands off the legs of the young.

Body Length Kingbird

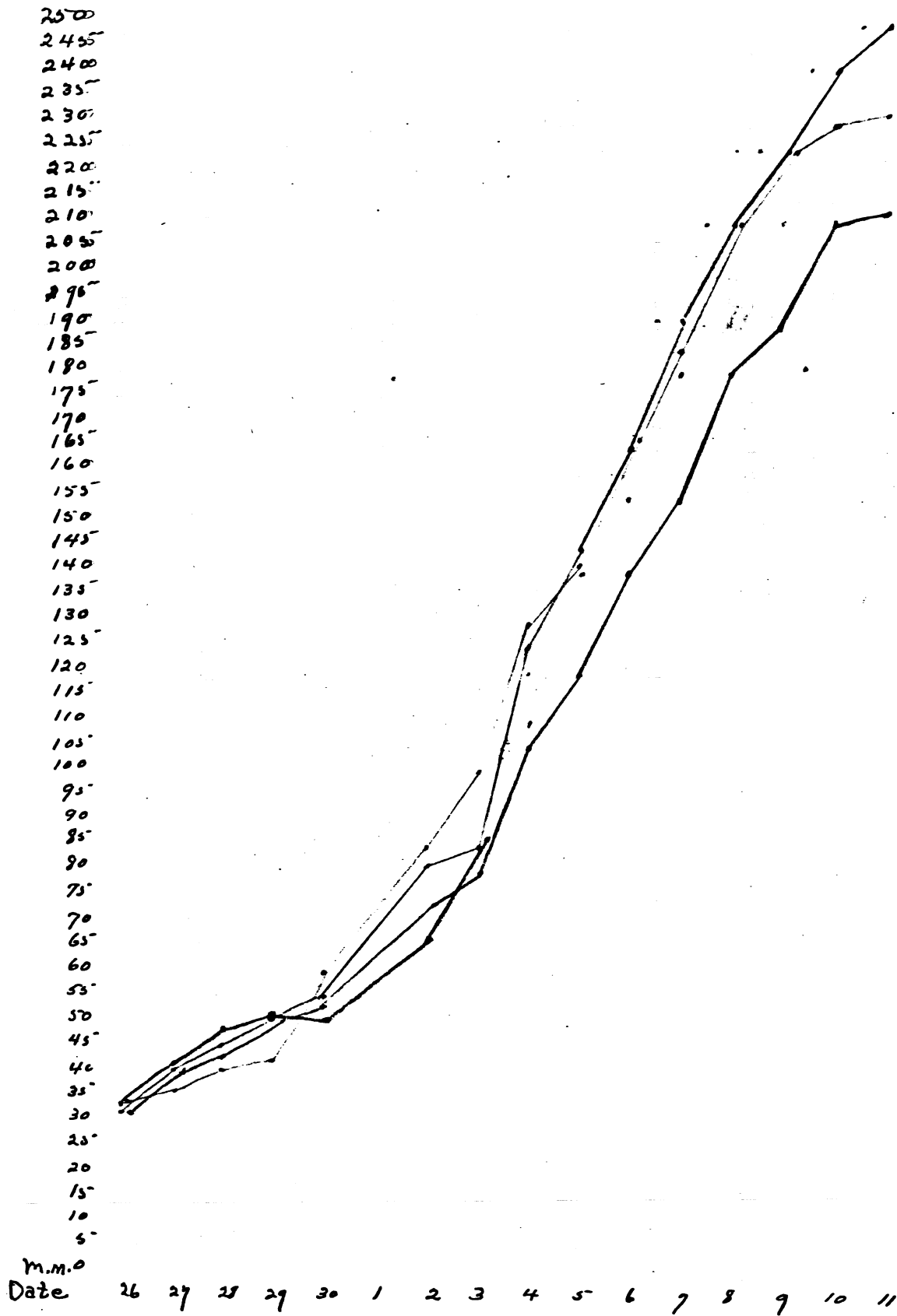


No record.

Bird no. 1 —
 Bird no. 2 —
 Bird no. 3 —
 Bird no. 4 —

Bird no. 4. fell out of nest June 7, was killed.
 159 = 5 m.m.

Wing Extention King bird



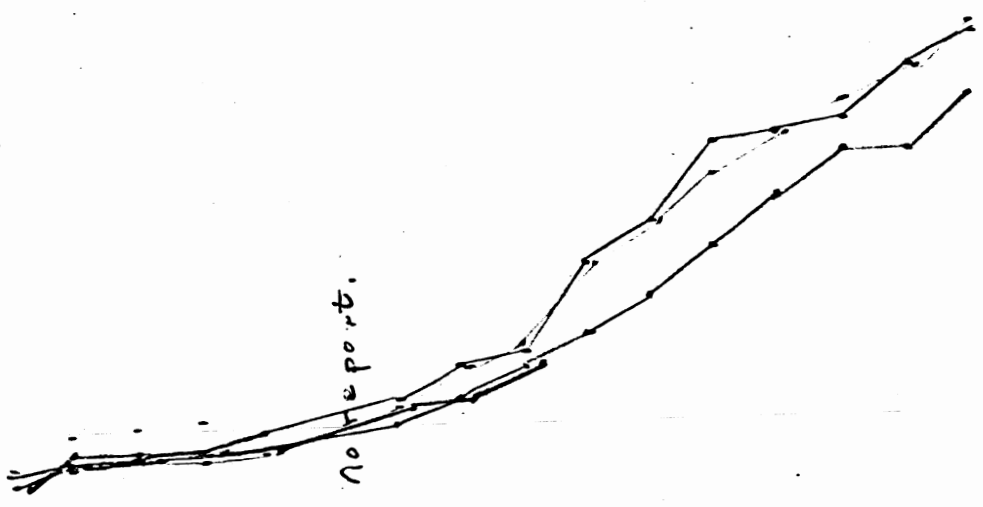
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Date 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10 11

Bird no. 1 —
 Bird no. 2 —
 Bird no. 3 —
 Bird no. 4 —

Right Wing King bird

250
245
240
235
230
225
220
215
210
205
200
195
190
185
180
175
170
165
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155
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M.M.O
Date. 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10 11

Bird no. 1 —
Bird no. 2 —
Bird no. 3 —
Bird no. 4 —

Tarsus King bird

250
245
240
235
230
225
220
215
210
205
200
195
190
185
180
175
170
165
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155
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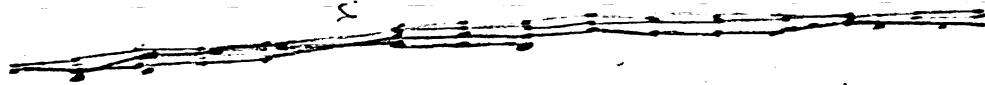
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Date. 26 27 28 29 30 1 2 3 4 5 6 7 8 9 10 11

Bird No. 1. —
Bird No. 2. —
Bird No. 3. —
Bird No. 4. —

Bill King bird

250
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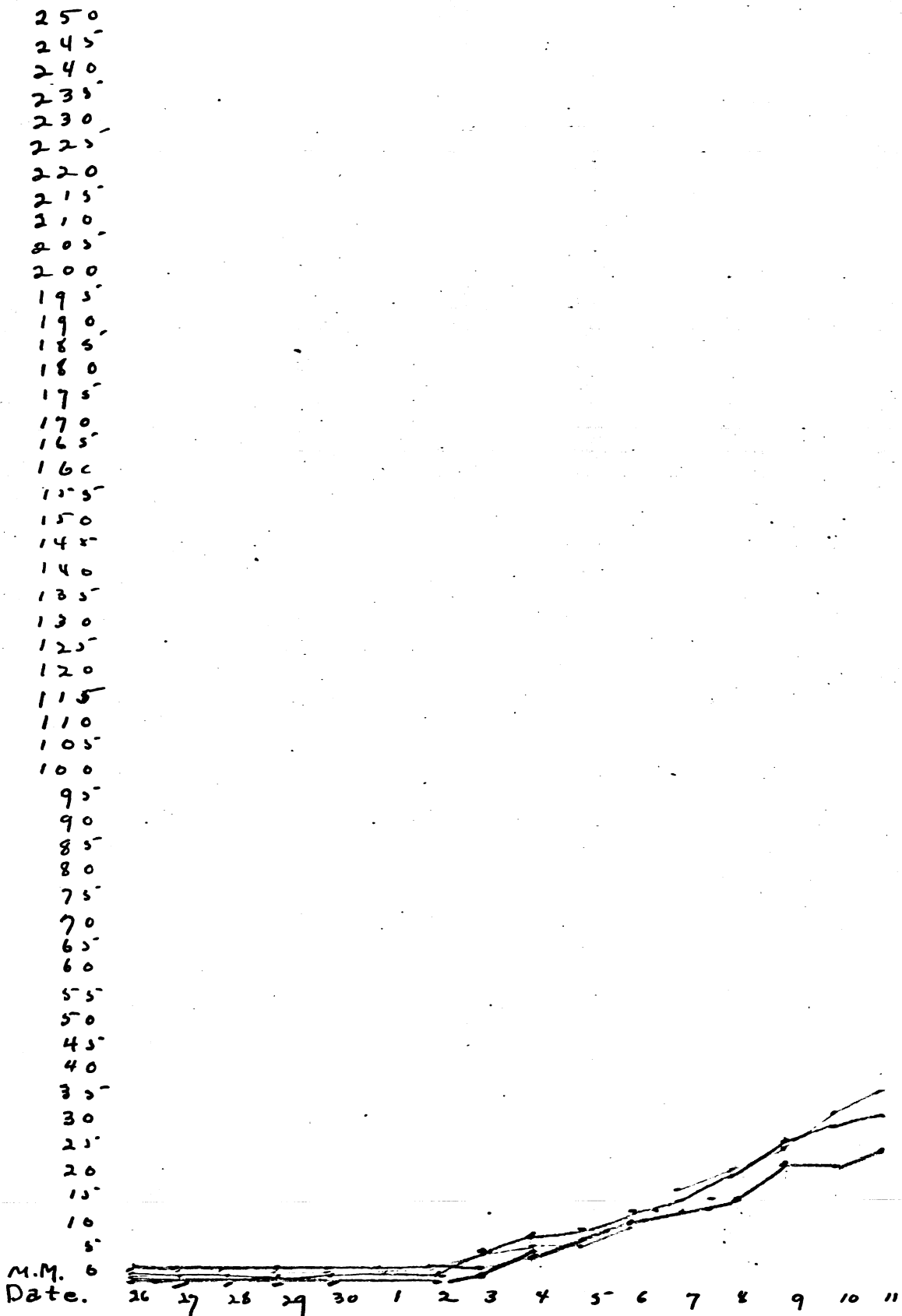
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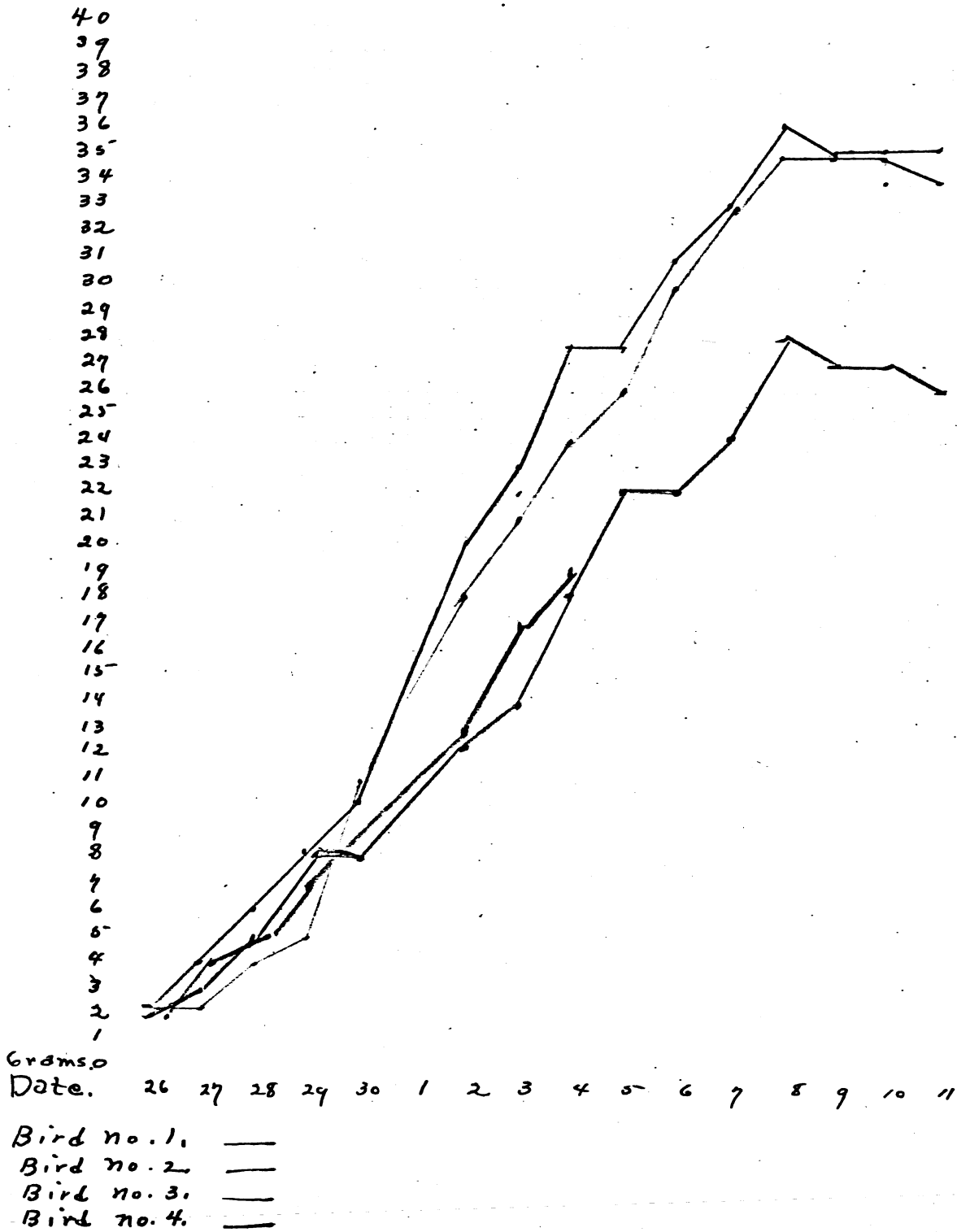
Bird no. 1 —
Bird no. 2. —
Bird no 3. —
Bird no 4. —

Tail Kingbird



Bird no. 1 —
 Bird no. 2 —
 Bird no. 3 —
 Bird no. 4 —

Weight in grams.
King bird



Deductions from Graphs of Nest Number 2.

1. Body Length.

The greatest body length occurred just before the birds left the nest. The greatest length being 132 mm. Even though the weight decreased in the final stages of development, the body length increased.

2. Wing Extension.

The greatest wing extension of the nesting birds when they left the nest, ranged from 212 to 250 mm.

3. Right Wing.

The maximum extension of the right wing taken by straight wing measurement was 72 mm. On the 16th. day the birds had the greatest measurement of right wing.

4. Tarsus.

The greatest growth on the Tarsus was recorded on the 16th. day, being 22 mm. The Tarsus of the bird had a steady period of growth from birth.

5. Bill.

The greatest length of the Kingbirds bill was 13.5 mm. with the most rapid development occurring the first six days.

6. Tail.

The tail feathers of the Kingbirds did not show until the 5th. and 6th. days of age. Growth from the 7th. to the 16th. days was uniform, yet rapid. The greatest tail measurement was 26 mm on the 16th. day.

7. Body Weight.

A constant gain in weight for all birds is recorded until the 13th. day of age. A loss of weight occurred after the 13th. day. The

greatest period of weight is recorded for all birds on the 13th. and 14th. days after hatching. The greatest weight being 36.15 gm for number 1 bird, 35.75 gm for number 2 bird, and 28.21 gm for number 3 bird.

Part VIII.

Growth and Development of the Young Kingbird.

1. When hatched the young birds are naked except for a growth of grey down on the dorsal feather tracts of the upper half of the body.

2. The opening of the mouth was evident the first day when they were touched gently on regions near the head. This indicated a reflex of the mouth to tactile stimuli. The opening and closing of the toes was evident when the young were taken out of the nest the first day, this indicated a grasping reflex.

3. On the 6th. day of age the eyes were open for the first time. The young also responded when the parent approached the nest by opening their mouths. The feather tracts were lined with small pin feathers and the tail measured 1 mm in length.

4. On the 7th. 8th. 9th. and 10th. days the young spent much time preening their feather tracts with their bills. They also would rise in the nest, stretch their bodies and flutter their wings.

5. From the 1st. to the 7th. day the young would sit facing the nest with backs to the outside. After the 7th. and 8th. days they would face the outside of the nest, constantly looking for food.

6. When hungry the birds kept their mouths open and their necks stretched for food. After eating a large Dragon Fly, the individual would sit very still in the nest for about 20 minutes.

7. On the 11th. day the pinfeathers started feathering at the tips and the natal down was rapidly being replaced by the juvenal plumage. The young also responded readily to sight and sound of the adults.

8. The young on the 13th. day exhibited fear when taken out of the nest. They would struggle and try to get away. This was noticeable until the young left the nest for flight.

9. On the 11th. day at 9:53 A.M. one of the baby Kingbirds saw a Red Eyed Fly fly past the nest. He opened his mouth and snapped his beak at the fly.

10. Paternal care of the young persists for a duration of nearly two weeks, after they leave the nest. They stay in their territory most of the time.

11. The sex differences of the juvenal Kingbird cannot be determined when they leave the nest.

12. From hatching time the young fledglings will leave their nest from 16 to 18 days - observation of 3 nests - in Douglas Lake territory.

13. The young birds of nests 1 and 2 were catching their own food July 26th. The parents still protected their young and territory from other Kingbirds and Crows.

14. A juvenal bird of approximately 30 days of age had the following measurements :

Length - 198 mm

Wing spread - 35.7 mm

Right wing - 115 mm

Tarsus - 19.5 mm

Tail - 77 mm

Weight - 40.87 mm

This exhibited a much greater growth than the maximum growth of birds of Nest 2 on the 16th. day.

15. Flight of the juvenal Kingbird comes after they are able to venture in and out of the nest. One young bird, the day before flight, ventured out on a limb 2 feet, then returned to the nest. The next day the birds were coaxed out of the nest by incessant calling of the adults and lack of feeding.

Part III.

General Behavior of the Kingbird.

The Kingbird is a tyrant fly catcher, because he is domineering, daring, and independent. Kingbirds strongly object to other birds, especially Crows, Hawks, and other Kingbirds. Often they will go out of their territory shrieking, kieet, kieet, - - kieet, kieet, kieet, kieet, in rapid succession, beating off their opponent on the back with a stiff wing and clicking bill. According to Williams - Auk 52- 1935 - p 89 - the Kingbird attacked a slow Biplane several times as it flew low over a hill to land in a meadow, shrieking its battle cry as it flew. Murie - Auk 51- 1934 - p 231 - states that on July 29th. 1934, at Moorhead, Minnesota, at a bank of the Red River, a Kingbird gave chase to a Spotted Sandpiper, which was flying approximately 3 feet above the center of a stream, after a chase of nearly 10 yards, the Sandpiper dived into the water and remained submerged 4 or 5 seconds, thus eluding the Kingbird.

The adult birds of nest number 1 ~~1~~ guarded their nest and territory, exceptionally well. Many in the University Biological Camp living on State Street, have experienced the violent diving attacks as they have passed by the nest. This nest was located in the White Birch - Betula alba - above the side walk. The case of nest number 1 was exceptional. The young of nest number 2 were handled every day, yet the adult birds never showed the diving tactics of the adults of nest number 1. It is thought that the adults of nest number 1, guarded their nest so well, they often neglected feeding their young. This may also account for the Kingbirds eating the common Red Elderberry - Sambucus racemosa - which is seemingly rare for a Flycatcher.

Both the male and female regurgitated indigestible chitinous material several times. The material is usually a dark brown color and about the size of a white bean. Usually it is composed off legs of insects and sometimes seeds.

When disturbed off the nest, the Kingbird always gives an alarm cry. The female always called to the male when she left the nest. The male spent most of the time sitting on his favorite perch, a dead branch or a wire above the nest.

The flight of the Kingbird is characterized by, a spread tail, stiff wing flight, as the pictures illustrate. Many times such a flight is used to get the insect on wing. Most food of the Kingbird is taken on wing.

On windy days, the female would always come to the nest facing the wind, and would leave the nest in the wind. While brooding, the female would usually face the open side of the nest, and when the wind was strong, she faced the wind.

An interesting fact, is the adoption of the juvenal Kingbird with the three other birds of the nest.

The Kingbirds of Douglas Lake vicinity, no doubt, have one brood a summer. The young, at the present time - July 27th. - are still in the nesting area. Figuring the time it takes to build a nest lay eggs, incubate, and brood the young, it seems improbable the parents will nest again.

Little was observed of the migrations of the Kingbird at Douglas Lake, Michigan. Longstreet - ~~Auk~~ 45 - 1928 - p 230 - observed an estimated 2000 Kingbirds in migration on August 26, 1923 at Daytona Beach, Florida. Some of the birds were seen to light in Foke Ferry bushes. Freedman - Auk - 42 - 1924 p - observed

flocks of Kingbirds on May 11th. and 13th. on Green Island, in lower Rio Grande Valley of Texas, probably migrating north. I observed Kingbirds May 25th. in Montcalm County, at West Lakes, Michigan, which is nearly 200 miles south of Douglas Lake, Michigan.

Summary

Douglas Lake Territory.

1. The Kingbird selects open territory for the nesting site.
2. The sexes are very hard to differentiate.
3. The nest is characterized and recognized by its general looseness.
4. The egg varies in color, size, and weight.
5. Both parents assist in feeding, though the male brings in less food, and larger insects.
6. The female brooded the nest, she was not assisted by the male.
7. The male brought food to the female occasionally as she brooded.
8. Both male and female ate and removed fecal sacks from the nest.
9. Both male and female regurgitate indigestible material.
10. The Kingbird will eat Red Elderberries - Sambucus racemosa and the Rose Chafer - Macrodactylus spinosus - which is considered poisonous to some birds.
11. The young are lined with a grey down when born, this is replaced later by pin feathers which appeared on the 5th. and 6th. day.
12. The eyes of the young were open on the 5th. day
13. Reflexes to tactile stimuli, as opening the mouth, grasping with toes, is present the 1st. day of birth.
14. The maximum feeding rate for the three birds in nest number 5, was 20 times per hour. Feedings consisted chiefly of insects.
15. Young birds lost weight from the 13th. and 14th. days to the 17th. day, while in the nest.
16. The young left the nest in this area from the 16th. to the 17th. day.

17. The fledglings stayed in the nesting territory and were fed by the adults 10 to 12 days after leaving the nest.
18. The Kingbird defends his nesting territory with integrity.
19. Kingbirds are numerous in Cheboygan County, Michigan. 11 were seen while traveling from Cheboygan to the Biological Station. They seemed well distributed along the roadside, one or two were seen each mile.
20. Many destructive insects are eaten by the Eastern Kingbird, this makes him a valuable asset to any community.
21. The only Flycatcher which has a conspicuous white edging on the end of the tail, is the Kingbird - Tyrannus tyrannus.

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