BIRD-BANDING

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. XXXVII OCTOBER, 1966 No. 4

STUDIES OF THE ACADIAN FLYCATCHER IN MICHIGAN

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During the early 1950's I became interested in the small Michigan *Empidonax* flycatchers, all of which are much alike in color but much different in breeding habits. Consequently, I began studying the four species found in Michigan. One of these is the Acadian Flycatcher (*Empidonax virescens*).

Although I have mist-netted two Acadian Flycatchers outside of dense woodlots, along tree and shrub-grown fence rows, near dense woodlots where they occurred, most all have been found throughout the entire summer inside the dense unpastured woods. However, these woodland habitats have varied considerably. All study areas have been in southwestern and south-central Michigan.

The Michigan breeding range extends northward to Oceana (my own observations), Montcalm, (specimen U.M.M.Z.), Saginaw (Wood, 1951) and Tuscola counties.

THE AREAS STUDIED

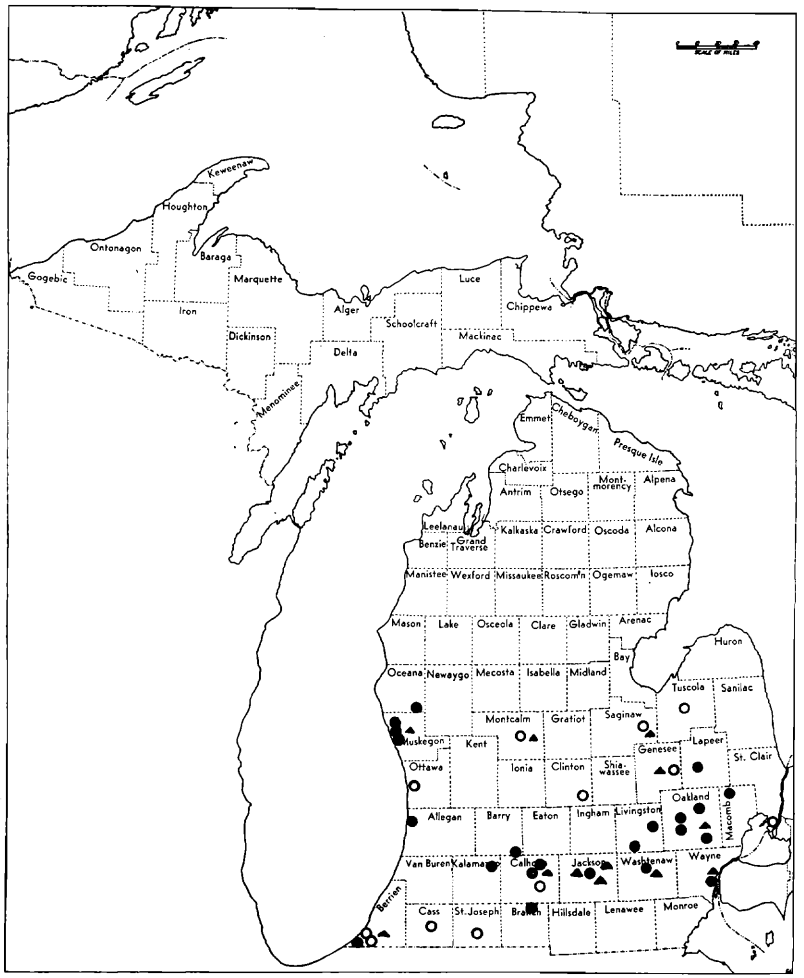
The most northern woods where I have found the Acadian Flycatcher in Michigan was along the White River in Oceana County. This was a bottomland habitat, grown chiefly to maple (*Acer*), in some places hemlock (*Tsuga canadensis*), and in others elm (*Ulmus* sp.). The only nest that I found in the region was built in an oak on a level sand plain covered chiefly with white oak (*Quercus alba*), and cherries (*Prunus* sp.) above the bottomland woods.

All Muskegon County woodlands studied were quite similar. They consisted of unpastured forests of beech-hemlock-maple, with some yellow birch (*Betula lutea*), white oak, red oak (*Quercus rubra*) and black oak (*Quercus velutina*). These forests were lumbered during the late 1800's but little since. The main study area in Laketon Township, Sections 5 and 6, still has elm (*Ulmus americana*) (some now dying from Dutch elm disease.), beech (*Fagus grandifolia*), yellow birch, oaks, maples, etc. up to 1 m d.b.h. with hemlocks up to 2/3 m d.b.h.

The bottomland woods along the Battle Creek River, Convis Township, Calhoun County, was much like that along the White River, Oceana County, lacking hemlocks. Maples (*Acer saccharinum*) (*A. rubrum*), ash (*Fraxinus americana* and *F. nigra*) and basswood (*Tilia americana*) were the predominant trees.

The study woods in Section 21, Convis Township, Calhoun

FIGURE 1. 1965 — Distribution of the Acadian Flycatcher in Michigan.
○ — Summer sight record.
● — Nest record.
Triangle — specimens.



County was higher with little dampness except two small bordering leatherleaf (*Chamaedaphne calyculata*) bogs. In this woods there was little beech but more maple (*Acer saccharum* and *A. rubrum*), oaks (*Q. alba, rubra* and *velutina*) and scattered aspens (*Populus tremuloides*), many cherries (*Prunus serotina*), and sassafras (*Sassafras varifolium*). The understory was small trees of the above species with one clump of witch hazel (*Hamamelis virginiana*). The tree canopy, as in other Acadian woodlots, was almost completely and solidly closed throughout.

The study area in Section 1, Emmett Township, Calhoun County was a dry woodland, much drier than the other study areas, with no standing water or marsh, no chance of being flooded at all. Here grew beech, maple, oaks, cherry, hickory, some elm, a few hawthorns (*Crataegus* sp.) and an understory of small trees including a number of flowering dogwood (*Cornus florida*). Beneath these were found other shrubs and vines including poison ivy (*Rhus toxicodendron*), Virginia creeper (*Psedera vitacea*), blackberry, black raspberry (*Rubus* sp.) and even many smaller annual plants such as sweet cicely (*Osmorhiza* sp.).

ARRIVAL

Acadian Flycatchers have been studied during time of arrival for many years. The first bird has always been a singing male. Following are records of these early dates:

Calhoun County (Convis Twp.,-C) (Emmett Twp.,-E) (Newton Twp.,-N): 26 May 1929 (C), 13 May 1932 (N), 18 May 1933 (N), 16 May 1937 (C), 17 May 1938 (C), 14 May 1942 (C), 14 May 1944 (C), 21 May 1946 (C), 26 May 1948 (C), 20 May 1954 (E), 12 May 1955 (E), 13 May 1956 (E), 15 May 1957 (E), 18 May 1959 (E), 20 May 1960 (E), 23 May 1961 (C), 15 May 1962 (C), 6 May 1964 (C).

Muskegon County early dates were (Laketon Twp.): 24 May 1953, 22 May 1955, 26 May 1956, 25 May 1957, 17 May 1958, 24 May 1959, 23 May 1964 (building nest).

SONG AND CALLS

Mumford (1964) gave descriptions of the calls and songs of this species. Much confusion on calls in the literature amongst writers seems to be the difference in their interpretation of the calls or songs. What a certain call sounds like to me may sound different to someone else. Mumford described the advertising song as *Tee-chup* and it has been described differently by other authors. The call of the female I have described as *Qweep*. Mumford described this call as *peet*, *wseet*, *speet*, or *pseet*. Mumford also presented audiospectographs of both the male advertising song and the female *peet* call.

Mumford also published the rate of singing, showing that it was much faster at daylight, when a combination of songs was uttered, averaging about 67.8 notes per minute. In the dusk of evening, the male gave a different call or songs much higher in the trees but at a slower rate, 5.8 to 44 (average 32) per minute. My own observations indicate the normal advertising song during mid-day is given three to five times per minute. Mumford gave the average as 3.7 to 3.8 times per minute.

The twittering call of the male, described by Mumford and others as the flutter call, is one similar to that given by *Empidonax minimus* and *Empidonax flaviventris*. I have seen males of all three species give this call especially when they were trying to chase their mate away from some enemy or me, apparently fearing that she might give away the location of the nest.

TABLE 1. RETURNS OF BANDED ACADIAN FLYCATCHERS, MUSKEGON COUNTY

Band number Male and female listed by pairs	Sex	Year banded and nest numbers	Second year and nests	Third year and nests	Fourth year and nests	Fifth year and nests
61-81436	F	1959 (64)				
not banded	M					
61-81428	M	1959 (60, 65)	1960 (66, 73, 75)			
63-27805	F		,, ,, ,, ,,			
32-33130	M	1961 (89)	1962 (96, 109)	1963 (113)	1964 (124, 128)	
32-33132	F	,, ,,	,, ,, ,,	1963 (112)	1964 (125, 129)	
32-33131	F	1961 (80)	1962 (97)	1963 (113)	1964 (124, 128)	
(male unbanded)	M					
104-36174	M			1963 (112)	1964 (125, 129)	
32-33167	M	1961 (88)	1962 (102)	1963 (114)		
32-33166	F	1961 ,,	,, ,,			
???? (not banded)	F			1963 (114)		
103-98730	M		1962 (none found)			
70-84778	M				1964 (126, X, 130)	
70-84782	F				1964 (120, X)	
71-82781	F				1964 (127, 131)	

TABLE 2. RETURNS OF BANDED ACADIAN FLYCATCHERS, CALHOUN COUNTY, EMMETT TOWNSHIP BANDED AS ADULTS

Band number Listed by pairs	Sex	Year banded and nest numbers	Second year and nests	Third year and nests	Fourth year and nests	Fifth year and nests
24-82728 (mate unbanded)	F	1957 (33, 38, 41)	1958 (48, 55)	1959 (61)	.....	.....
63-27724	F	1960 (71)	.....	.....	.....	.....
63-27798	F)	1960	1961	1962	1963	.....
	)	(68, 76)	(82, 86, 90)	(98, 100, 107)	(yg. out)	
63-27726	M)	,, ,,	,, ,, ,,	,, ,, ,,	,, ,,	1964 (134, 135)
63-27797	F)	1960 (67, 74)	.....	.....	.....	.....
63-27799	M)	,, ,, ,,	1961 (83)	1962 (104, 108)	.....	.....
66-33512 (mate unbanded)	F	1961 (91)				
33-16972	M)	1961 (85, 87)	1962 (99, 103)	.....	.....	.....
33-16966	F)	1961 ,, ,,	.....	.....	.....	.....
106-98720	F)	1962	1962 ,, ,,	.....	.....	.....

TABLE 3. RETURNS OF BANDED ACADIAN FLYCATCHERS, CALHOUN COUNTY, CONVIS TOWNSHIP BANDED AS ADULTS

Band number Male and female listed by pairs	Sex	Year banded and nest numbers	Second year and nests	Third year and nests	Fourth year and nests	Fifth year and nests
103-98717	M)		1962 (101)	196. (117, 118)	1964 (122, 132)	
66-33581	F)	1961 (78, 79, 93)	,, ,,	,, ,, ,,	,, ,, ,,	
66-77559	M)	1963 (115, 119)	1964 (121, 133)			
66-77552	F)	,, ,, ,,				
71-82785	F)		1964 ,, ,,			
71-82787	M)	1964 (123, 136)				
71-82789	F)	,, ,, ,,				

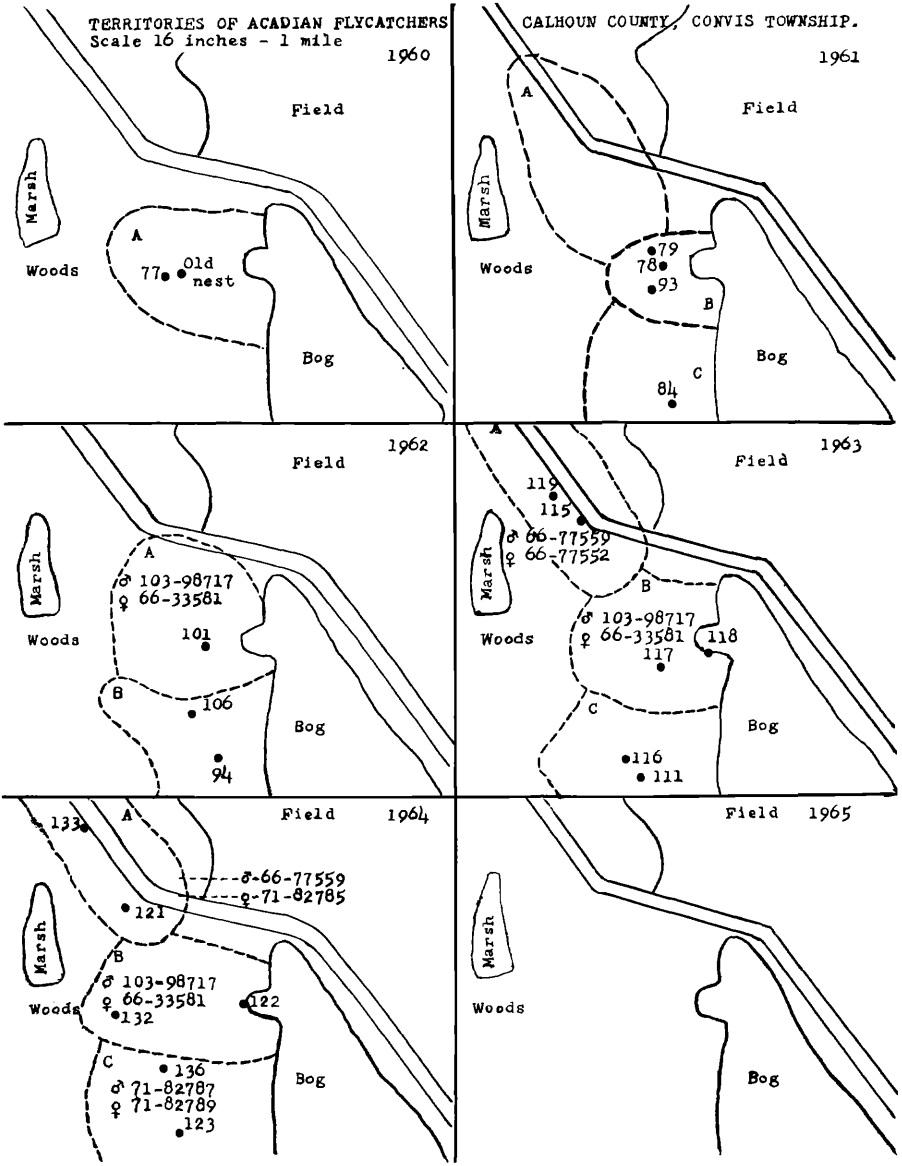


FIGURE 2.

Even one-day-old young in the nest gave a low twittering. When they left the nest, they gave a double-syllabled *Chip-chup* for a food call. When well fed they seldom gave this call.

BANDING

During 1957 I caught by hand an adult female Acadian Flycatcher at her nest. Banded and released, she returned immediately to peck at my hand when I touched her nest. During 1958 I began using mist nets and since then have banded and captured banded birds with nets regularly in all three study woods. The results of these bandings are given in Tables 1 to 3. A total of 103 nestlings (Muskegon County, 57; Calhoun County, Emmett Township, 27; Convis Township, 19) have been banded since 1953. No young have ever been found any year after banding.

All adults, both male and female, have returned to their same or adjacent territories. Only one pair has not mated for life. That pair mated for at least two years then separated, each joining a different mate during the next two years. Sometimes territories have changed somewhat because neighboring banded males did not return. In this case those that did return usually expanded their territories. Sometimes a new male settled into these unoccupied territories. During drought conditions, which affected the Calhoun County, Emmett Township woods considerably, no new males moved into the woods. Here the only surviving old male has had a much enlarged territory. A summary of the territory sizes is given in Table 5.

TERRITORY

Male Acadian Flycatchers apparently maintain their summer territories during their lifetime. Eight males (66.67 per cent) of 12 returned to their same identical territories the year after banding,

TABLE 4. ACADIAN FLYCATCHER RETURNS ALL BANDED AS ADULTS

Sex	Year banded (At least one year old)	2nd year	3rd year	4th year	5th year
Calhoun County, Convis Township					
Male	3	2	1		
Female	4	1	1	1	
Calhoun County, Emmett Township					
Male	3	3	2	1	1
Female	7	2	2	1	
Muskegon County, Laketon Township					
Male	6	3	2	1	
Female	8	3	2	2	
Total					
Male	12	8	5	2	1
Female	19	6	5	4	
Total all	31 (–6)	14	10	6	1

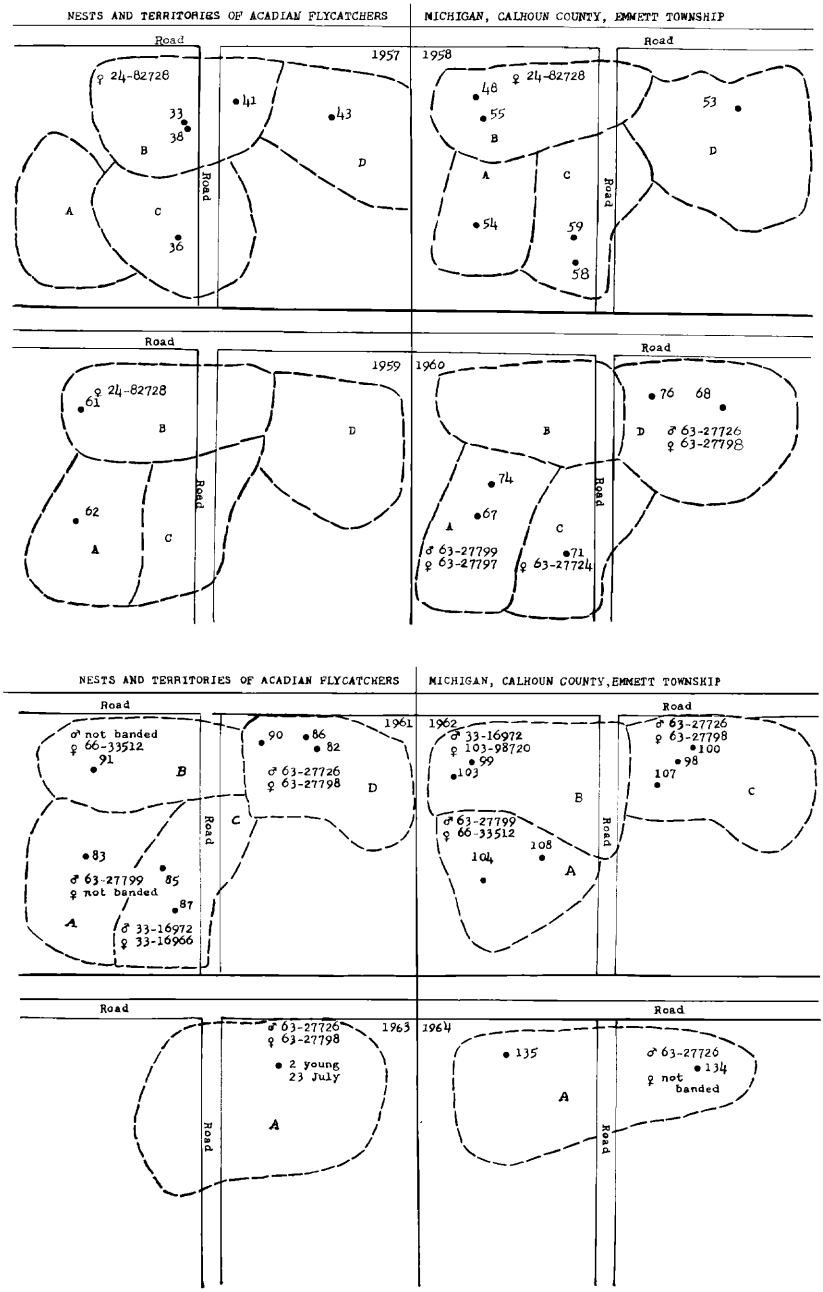

NESTS AND TERRITORIES OF ACADIAN FLYCATCHERS
MICHIGAN, CALHOUN COUNTY, EMMETT TOWNSHIP
Road
1957
♀ 24-82728
33
38
41
43
B
D
A
C
36
Road
1958
♀ 24-82728
48
55
53
B
D
A
C
54
59
58
Road
1959
♀ 24-82728
61
B
D
62
A
C
Road
1960
76
68
B
D
♂ 63-27726
♀ 63-27798
74
67
A
C
♂ 63-27799
♀ 63-27797
71
♀ 63-27724
Road
NESTS AND TERRITORIES OF ACADIAN FLYCATCHERS
MICHIGAN, CALHOUN COUNTY, EMMETT TOWNSHIP
Road
1961
♂ not banded
♀ 66-33512
91
B
90
86
82
♂ 63-27726
♀ 63-27798
D
C
83
♂ 63-27799
♀ not banded
85
87
A
♂ 33-16972
♀ 33-16966
Road
1962
♂ 33-16972
♀ 103-98720
99
103
B
♂ 63-27799
♀ 66-33512
108
104
A
Road
♂ 63-27726
♀ 63-27798
100
98
107
C
Road
1963
♂ 63-27726
♀ 63-27798
2 young
23 July
A
Road
1964
135
A
Road
♂ 63-27726
134
♀ not banded
Road

FIGURE 3.

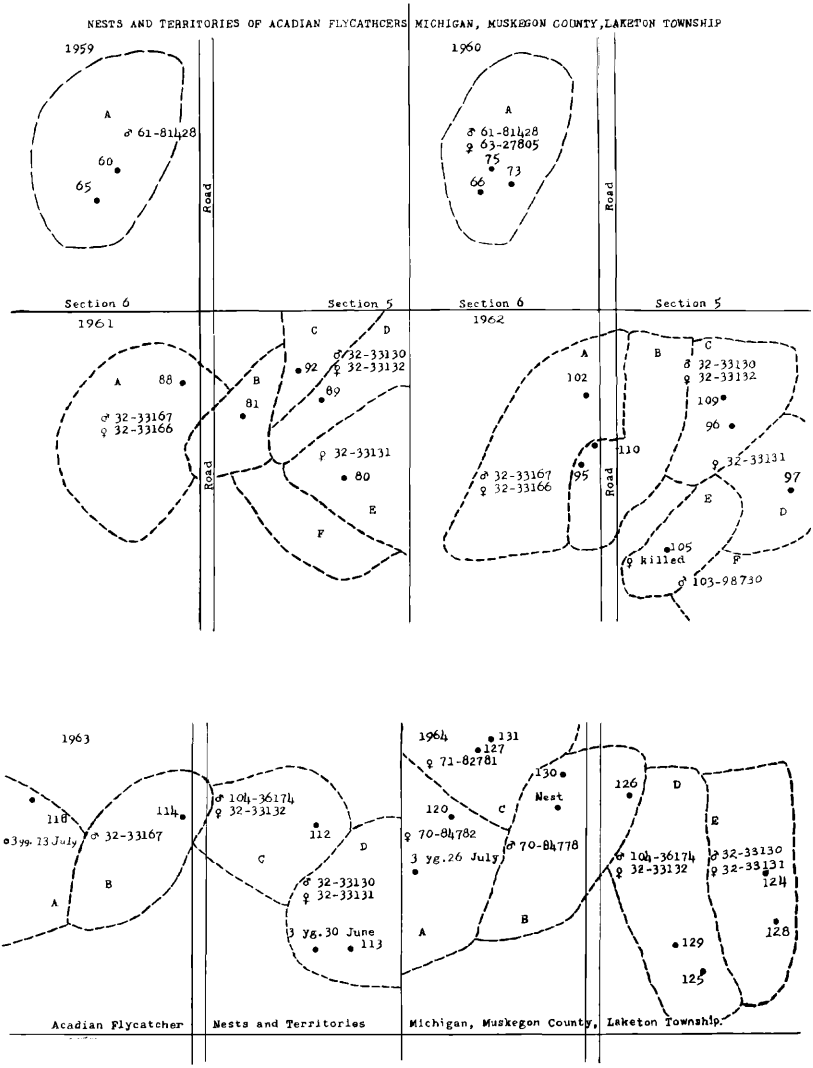

NESTS AND TERRITORIES OF ACADIAN FLYCATHCERS MICHIGAN, MUSKEGON COUNTY, LAKETON TOWNSHIP
1959
A
♂ 61-81428
60
65
Road
1960
A
♂ 61-81428
♀ 63-27805
75
73
66
Road
Section 6
Section 5
Section 6
Section 5
1961
A
88
B
81
92
C
D
♂ 32-33130
♀ 32-33132
89
♂ 32-33167
♀ 32-33166
♀ 32-33131
80
E
F
Road
1962
A
102
B
C
♂ 32-33130
♀ 32-33132
109
96
110
♀ 32-33131
97
♂ 32-33167
♀ 32-33166
95
Road
E
D
105
♀ killed
F
♂ 103-98730
1963
118
114
♂ 104-36174
♀ 32-33132
3yg. 13 July
♂ 32-33167
112
C
D
♂ 32-33130
♀ 32-33131
A
B
3 yg. 30 June
113
1964
131
127
♀ 71-82781
130
Nest
126
D
E
120
C
♀ 70-84782
♂ 70-84778
3 yg. 26 July
♂ 104-36174
♀ 32-33132
♂ 32-33130
♀ 32-33131
124
A
B
128
129
125
Acadian Flycatcher
Nests and Territories
Michigan, Muskegon County, Laketon Township.

FIGURE 4.

on my three study woodlands. Five (41.67 per cent) returned the next year but one shifted to a territory adjacent to the one which he occupied formerly. The next year, two (16.67 per cent) returned to their same territories. The fifth year, one (8.33 per cent) maintained even a larger territory than it had formerly but kept all of its original land.

Of nineteen banded females, six (31.58 per cent) came back the next year to the same territory, all mating with their original mates. The next year five (26.3 per cent) returned to their original territories, the one mentioned above changing to a new mate. Four (21.05 per cent) returned the next year, all to their original mates insofar as I was able to ascertain. The results of banding are given in Table 4.

All territories required tall trees in a solid forest where there was a closed canopy over smaller trees and shrubs. Some took in a trail or highway running through the woodland but none included either fields or shrub-grown areas.

Size of territories are given in Table 5, showing them to be a little larger than those listed by Mumford (1964). However, some of these territories were during drought seasons, 1961-1964, when they became larger. Some of this was caused by loss of old males without new ones taking over in especially dry woods. In damper woods there seemed to be an increase in pairs during the same period.

TABLE 5. TERRITORY SIZES OF ACADIAN FLYCATCHERS

Size of Territory (Acres)	Muskegon County, Laketon Township, Section 5 and 6	Calhoun County, Emmett Township, Section 1	Calhoun County, Convis Township, Section 21	Total
1.8	2			2
1.9	1			1
2.0	1			1
2.1	1	1	1	3
2.2	2	2		4
2.3		1		1
2.4	1		1	2
2.5	1	4	3	8
2.6	1	2	4	7
2.7	1	1		2
2.8	2	4		6
2.9	4	4		8
3.0	2	3		5
3.1	1	1		2
3.2	3	4	1	8
3.3	1			1
3.6	1			1
3.7	1			1
3.8	6		2	8
3.9	1	1		2
4.0	1	2		3
4.1	2			2
4.2	1	1		2
Total	37	31	12	80
Average	3.07	2.92	2.76	2.97

Nesting

Actual nesting dates and locations in Michigan which I have observed were as follows:

Oceana County, Section 33 (T13N, R17W): 19 July 1958.

Muskegon County, Fruitland Township, Section 12 (T11N, R17W): 13 June 1953, 24 June 1954, 10 July 1955, 23 July 1955, Laketon Township, Sections 5 and 6 (T10N,R17W): 11 July 1954, 1 August 1954, 9 July 1955, 24 July 1955 (2), 30 July 1955, 9 June 1956 (2), 21 July 1956 (3), 6 July 1957, 14 July 1957, 20 July 1957, 31 May 1958 (2), 22 June 1958, 7 July 1959, 26 July 1959, 11 June 1960, 3 July 1960, 31 July 1960, 17 June 1961 (2), 30 June 1961 (2), 23 July 1961, 9 June 1962 (3), 7 July 1962, 13 July 1962 (2), 27 July 1962 (2), 10 August 1962, 6 July 1963, 13 July 1963 (2), 28 July 1963, 24 May 1964, 31 May 1964 (4), 16 June 1964 (W. A. Dyer), 5 July 1964, 7 July 1964, 11 July 1964.

Laketon Township, Section 21: 12 June 1954, 28 July 1957, 5 July 1959, 24 July 1959, 12 June 1960.

Allegan County, Ganges Township, Section 5 (T2N,R16W): 4 August 1957.

Barry County, Assyria Township, Section 19 (T1N, R7W): 25 July 1955, 12 June 1958 (2).

Kalamazoo County, Ross Twp., Sherman Lake (T1S, R9W), Section 29: 7 July 1931, 5 August 1949.

Calhoun County, Emmett Twp., Section 1 (T2S, R7W): 12 June 1949, 5 June 1954 (2), 21 July 1954 (2), 4 August 1954, 2 June 1955, 12 July 1955, 25 July 1956, 4 June 1957, 9 July 1957 (2), 11 July 1957, 24 July 1957, 4 June 1958, 5 June 1958, 7 July 1958 (2), 11 July 1958, 18 July 1958, 31 July 1958, 29 June 1959 (2), 9 June 1960 (2) 16 June 1960, 26 July 1960, 2 August 1960, 18 June 1961 (3), 19 June 1961, 26 June 1961, 29 June 1961, 20 July 1961 (2), 13 June 1962 (2), 12 July 1962 (2), 20 July 1962 (3), 6 August 1964 (2).

Emmett Twp., Section 25: 9 June 1957.

Convis Twp., Section 7: 8 July 1938, 30 May 1945.

Convis Twp., Section 14 (T1S, R6W): 30 July 1954, 2 August 1956.

Convis Twp., Section 21: 11 August 1960, 2 June 1961, 6 June 1961, 18 June 1961, 15 August 1961, 6 June 1962, 30 June 1962, 18 July 1962, 2 July 1963, 16 July 1963, 18 July 1963 (2), 23 July 1963, 24 July 1963, 26 May 1964 (3), 14 July 1964, 17 July 1964, 6 August 1964.

Newton Twp., Section 12 (T3S,R7W): Observed June, July 1932, 1933.

Jackson County, Spring Arbor Twp., Section 1 (T3S,R2W): 17 June 1960 (W. Powell Cottrille).

Branch County, Union City: 7 July 1957, 9 June 1958 (W. A. Dyer).

TABLE 6. NESTING TREES USED BY ACADIAN FLYCATCHERS

Kind of tree	Calhoun Co., Convis Twp., Sects. 7, 14.	Calhoun Co., Convis Twp., Section 21.	Calhoun Co., Emmett Twp., Section 1.	Muskegon Co., Laketon Twp., Sects. 5, 6.	Sect. 21.
Tsuga canadensis	NP	NP	NP	30 (61.11%)	3
Betula lutea	NP	NP	NP	1	
Fagus grandifolia	1	LP	41 (93.18%)	14 (31.49%)	3
Quercus alba			1		
Quercus velutina		2			
Hamamelis virginiana	NP	4 (18.18%)	NP		1
Prunus serotina		1			
Acer saccharum	3	15 (68.18%)	2	2	
Acer sp.					
Totals	4	22	44	47	7

NP—None present in woods; LP—Very little present.

(In Oceana County, one nest was in *Quercus alba*; in Allegan County, one in *Tsuga canadensis*; in Barry County, two nests in *Carpinus caroliniana*, one in *Tilia americana*; in Jackson County, one in *Crataegus* sp.; in Branch County, two in *Acer* sp.; in Kalamazoo County one in *Acer saccharum* and one in *Fagus grandifolia*. In Fruitland Township, Muskegon County, three nests were located in beech; one in yellow birch.)

TABLE 7. NESTING OF THE ACADIAN FLYCATCHER. TREES FOUND IN 21, 10 METER QUADRATS WITH NEST USED AS CENTER

MICHIGAN, CALHOUN COUNTY, CONVIS TOWNSHIP, SECTION 21

Tree and number of times used as a nest site in parentheses	Number of quadrats in which tree was found and extremes of numbers found	Total number of trees found in all 21 quadrats	Average number of trees in quadrat	Average tree size	Extremes in size
Acer saccharum (15)	20 (0-14)	94	4.47	3.2″	¼-24″
Carya glabra (0)	2 (0-1)	2	.09	1.25″	1-1½″
Fagus grandifolia (0)	0 (near)				
Hamamelis virginiana (3)	3 (0-8)	24	1.14	1.5″	1-2″
Ostrya virginiana (0)	2 (0-1)	2	.09	3″	3″
Populus tremuloides (0)	7 (0-6)	22	1.05	8.7″	4-11″
Prunus serotina (1)	19 (0-12)	79	3.79	6.3″	½-10″
Quercus alba (0)	16 (0-5)	42	2.00	5.4″	1-22″
Quercus velutina (2)	19 (0-6)	57	2.70	7.8″	1-16″
Quercus rubra (0)	1 (0-1)	1	.05	11.0″	11″
Sassafras varifolium	5 (0-4)	13	.62	2.9″	1-9″
Average & Total	21 (7-29)	336	16	5.2″	¼-24″

All measurements in inches.

TABLE 8. NESTING OF THE ACADIAN FLYCATCHER
SHRUBS AND TREES FOUND IN 40, 10 METER QUADRATS
WITH NEST USED AS CENTER
MICHIGAN, CALHOUN COUNTY, EMMETT TOWNSHIP, SECTION 1

Trees in 10 m quadrats and number of times used as nest site in parentheses	Number of quadrats in which tree was found and extremes in numbers found	Total number of trees found in all 40 quadrats	Average number of trees in quadrat	Average tree size	Extreme in size
Acer saccharum (2)	13 (0-46)	261	6.52	.96″	¼-3″
Carya glabra (0)	22 (0-35)	86	2.15	5.22″	1-16″
Cornus florida (0)	17 (0-25)	113	2.83	.98″	½-2″
Crataegus sp. (0)	1 (0-4)	4	.10	1.25″	1-2″
Fagus grandifolia (37)	39 (0-11)	165	4.12	4.97″	½-16″
Prunus serotina (0)	36 (0-8)	134	3.35	6.36″	1-18″
Quercus alba (1)	34 (0-17)	164	4.10	6.70″	1-20″
Quercus rubra (0)	25 (0-6)	62	1.55	14.65″	1-22″
Quercus velutina (0)	34 (0-8)	162	4.05	10.92″	3-22″
Sassafras varifolium	27 (0-25)	149	3.72	3.21″	½-12″
Ulmus americana (0)	7 (0-3)	14	.35	5.36″	2-22″
Zanthoxylum americanum	7 (0-71)	227	5.67	.48″	¼-½″
Average and Total	40 (17-95)	1541	38.52	4.46″	¼-22″

Measurements taken in inches 2 to 3 ft. above ground.

Of 140 Acadian Flycatcher nests that I have observed in southern and western Michigan, 63 (45 per cent) were in beech (*Fagus grandifolia*), 34 in hemlock (*Tsuga canadensis*) (24.28 per cent), 25 in maple (*Acer saccharum* and *Acer* sp.) (17.85 per cent), and 5 (3.57 per cent) were in witch hazel (*Hamamelis virginiana*), for 90.7 per cent of all observed nests. Two nests each were found in: yellow birch (*Betula lutea*), white oak (*Quercus alba*), black oak (*Q. velutina*) and blue beech (*Carpinus carolinians*); and one each in black cherry (*Prunus serotina*), hawthorn (*Crataegus* sp.), and basswood (*Tilia americana*).

Trees used as nest sites are shown in Table 6. In each woodland there seemed to be one favorite. In all Muskegon County woods, hemlock, beech and maple were found in considerable amounts, yet here hemlock was used the most commonly (61.11 per cent), beech second (31.49 per cent) and maple third (3.7 per cent). Nineteen of first nests were built in hemlock and 12 second nests, showing that the size of leaves on deciduous trees had little effect on the nest site. In the Barry County woods, two of three nests were in blue beech. In the Emmett Township, Calhoun County woodland, 41 (93.18 per cent) of 44 nests were in beech trees. In the Convis Township, Calhoun County woods, beech was scarce. Here the birds used chiefly maple (68.18 per cent) but one pair that had a large clump of witch hazel in their territory built four nests in these. Whereas there was witch hazel in all Muskegon County woods, it was used only once.

TABLE 9. NESTING OF THE ACADIAN FLYCATCHER SHRUBS AND TREES FOUND IN 47, 10-METER QUADRATS WITH NEST USED AS CENTER MICHIGAN, MUSKEGON COUNTY, LAKETON TOWNSHIP, SECTIONS 5, 6

Trees in 10 m quadrats and number of times used as nest site in parentheses	Number of quadrats in which tree was found and extremes in numbers found	Total number of trees found in all 47 quadrats	Average number of trees in quadrat	Average tree size	Extremes in size
Acer saccharum (2)	46 (0-34)	330	7.02	6.32″	1-26″
Benzoin aestivale (0)	12 (0-5)	39	.83	.47″	¼-½″
Betula lutea (1)	30 (0-7)	98	2.09	7.70″	¼-13″
Fagus grandifolia (14)	36 (0-21)	265	5.64	4.69″	¼-22″
Fraxinus americana (0)	21 (0-5)	43	.92	10.34″	2-12″
Pinus strobus (0)	1 (0-1)	1		1.0″	1″
Prunus serotina (0)	17 (0-5)	32	.68	4.28″	1-12″
Hamamelis virginiana (0)	5 (0-5)	13	.28	.69″	¼-1″
Quercus alba (0)	19 (0-6)	54	1.15	8.69″	½-40″
Quercus rubra & (0) *Q. velutina*	12 (0-11)	40	.85	12.2″	½-28″
Sassafras varifolium	3 (0-8)	18	.38	3.72″	2-11″
Ulmus americana (0)	1 (0-2)	2		2.5″	2-3″
Tsuga canadensis (30)	35 (0-24)	336	7.15	4.72″	½-18″
	47 (15-42)	1271	27.04	5.75″	¼-40″

Measurements taken on trees in inches 2 to 3 feet above ground.

Using each nest site as the center, the trees in 10 meter quadrats are listed in Tables 7, 8, and 9. In the Convis Township study area maples were found in 20 of the 21, wild cherry in 19 and black oak in 19, yet 15 nests were located in maple, 1 in black cherry and 2 in black oak.

In the Emmett Township woodland, beech was found in 39 of 40 quadrats, wild cherry in 36, and both white and black oak in 34, yet 37 nests were located in beech and only one in the other three. Maple, here, was much scarcer, found in only 13 quadrats.

In the Muskegon County study area maple was found in 46 of 47 quadrats but only two nests were placed there. Beech was found in 36, where 14 nests were located; in only 35 quadrats was hemlock present, yet 30 nests were built in hemlock.

The height of nests is given in Table 10. The average height of 138 nests was 405.5 cm. (13 ft., 3.6 in.) with extremes of 107 cm up to 1,676 cm (3 ft. 6 in. up to 54 ft. 10 in.), both very extreme. Heights of beech nests averaged 397.3 cm; hemlock, 377.9 cm; and maple nests, 410 cm.

The distance from the tree trunk averaged 326.6 (24.4-558)cm; the distance from the end of the usual long sweeping branch, 84.3 (31-129) cm. Most nests have been located in the middle or lower forest story, but one in 1964 was about 55 feet above ground, well

TABLE 10. HEIGHT OF ACADIAN FLYCATCHER NESTS IN MICHIGAN

Tree in which nest was found	Calhoun Co., Convis Twp., Sects. 7, 14.		Calhoun Co., Convis Twp., Section 21.		Calhoun Co., Emmett Twp., Section 1.		Muskegon Co., Laketon Twp., Sects. 5, 6.		Muskegon Co., Laketon Twp., Section 21. Fruitland Twp. Section 12.	
Acer saccharum	5	459.5	14	525.1	2	488.0	3	532.0		
Acer sp.										
Betula lutea							1	378.0	1	670.0
Fagus grandifolia	1	367.2			41	355.3	15	547.9	6	308.0
Hamamelis virginiana			4	281.6					1	214.2
Prunus serotina			1	671.0						
Quercus alba					1	731.0				
Quercus velutina			2	903.0						
Tsuga canadensis							28	380.1	3	358.0

Measurements in centimeters.
Nine other nests averaged 329.3 centimeters.
The average of 138 nests, 405.5 (107-1,676) centimeters.

up in the upper story. This pair had lost two lower nests in the middle story, possibly to a Barred Owl pair which was nesting there. They then moved their nest above the usual Barred Owl activities.

Sometimes nests have been found over trails, over shaded roads, or over shady streams. Mumford (1964) found the birds often nested over a clear spot so they could more easily reach the nest by flying from beneath up to it. This habit also probably accounts for the use of beech and hemlock most often because few shrubs or small trees grow beneath them.

THE NEST

Many Acadian Flycatcher nests appear very weak; others are beautiful structures. Some are still hanging almost intact the year following use. In most cases, they are so thin that the eggs can be counted from underneath if a light spot of sky shows overhead. On two occasions I found nests where eggs had fallen through the bottom.

In Fruitland Township, Muskegon County the birds used a type of grass (*Panicum* sp.) which was very flimsy, yet they managed to raise at least one young in each of four nests. In the usual woods where hemlock was found the best constructed nests were found, however. Here they used cobwebs and hemlock twigs then lined the nest with fine grasses. One such nest in August 1959 consisted of 154 dead hemlock twigs (3.1 grams), 52 pieces of coarse grass (.3 grams) and many fine cobwebs (.3 grams). The total weight was 4.5 grams, the total items, 233 plus cobwebs. Another Muskegon

FIGURE 5. Nest and eggs, 16 June 1954, Calhoun Co., Michigan.

County nest in 1960 consisted of mostly hemlock twigs interwoven with cobwebs and many flowers of oak and maple trees.

In Calhoun County, nests were built chiefly of vegetable fibers and a few cobwebs. One 1960 nest consisted of 189 pieces of sweet cicely (1.4 grams), 22 black oak flowers (.3 grams), 13 pieces of grape bark and 11 pieces of other fine bark (.4 grams), cobwebs (.55 grams), 2 small dead leaves plus 22 pieces of unknown plants (.25 grams). The total weight, 2.9 grams; total pieces, 259 plus cobwebs.

The average weight of 14 Muskegon County nests was 4.65 grams and 9 in Calhoun County, 3.4 grams, when dry and after use. The average weight of 23 nests was 4.15 grams. The outside diameter of 30 nests averaged 80.5 mm.; the depth, 44.1 mm. The inside diameter of 35 nests was 48.2 (43-59) mm and the depth, 27.1 (18-36) mm. Often long pieces of nest material hung from the bottom of the nest in haphazard fashion, making it appear like a mass of leaves or trash hanging from the branch.

Nests built by banded individuals showed that they did not all build nests of equal architecture, nor each nest by the same bird. Often the first spring nest was much better built than later ones; again the second nest was built as well or better.

THE EGGS

Acadian Flycatcher eggs are white or creamy colored, wreathed with black or brown spots at the larger ends. The spots vary from one-half to about three mm in diameter and are often at the widest part of the egg. Spots number from 7 to 67 or more. When the spots are larger, there are usually fewer in number. Eggs, ovate in shape, are not very glossy. The average measurements of 106 eggs was 18.64 X 13.99 mm and the average weight, 1.85 g. The largest egg measured 21.2 X 14.9 mm, and the smallest 17.3 X 13 mm.

Following were the measurements of 11 marked sets, given in the order of which the eggs were laid:

Nest 36: First egg laid, 10 July 1957. Eggs measured: 18.2 X 14.6, 18.4 X 14.6, and 17.9 X 14.4 mm.
Nest 38: First egg, 13 July 1957: 19.0 X 14.4, and 19.1 X 14.4 mm.
Nest 41: First egg, 25 July 1957: 18.7 X 14.6, and 19.0 X 14.5 mm.
Nest 47: First egg, 4 June 1958: 18.8 X 14.8, and 19.1 X 14.2 mm.
Nest 48: First egg, 9 July 1958: 19.0 X 14.6, and 20.0 X 14.4 mm.
Nest 54: First egg, 10 July 1958: 19.8 X 14.9, 19.3 X 14.9, and 19.0 X 13.7 mm.
Nest 57: First egg, 19 July 1958: 18.7 X 14.0, and 19.2 X 14.5 mm.
Nest 58: First egg, 20 July 1958: 18.0 X 14.0, and 18.0 X 14.0 mm.
Nest 59: First egg, 31 July 1958: 17.8 X 14.0, and 17.8 X 14.0 mm.
Nest 80: First egg, 22 June 1961: 19.5 X 14.0, 19.0 X 14.0, and 20.0 X 13.8 mm.
Nest 113: First egg, 13 July 1963: 19.0 X 13.7, 19.5 X 13.7, and 19.6 X 14.2 mm.

First-laid eggs averaged 18.77 X 14.35; second-laid eggs, 18.94 X 14.31 mm; and third-laid eggs, 18.72 X 14.4 mm.

The average of 95 unparasitized Michigan Acadian Flycatcher egg sets was 2.937 eggs. Following were the size of sets on the three study areas:

	Muskegon County, Laketon Township, Sections 5 and 6.	Calhoun County, Convis Township, Section 21.	Calhoun County, Emmett Township, Section 1.
First sets	3.045 (1X4, 21X3)	3.00 (4X3)	2.923 (1X4, 10X3, 2X2)
Second sets	2.929 (26X3, 2X2)	2.875 (7X3, 1X2)	2.80 (12X3, 3X2)
Average	2.980	2.916	2.857

Indications are that first sets are larger than second sets and that egg sets farthest north are the largest.

Females lay one egg daily until the set is complete. First and second eggs are usually laid prior to 0800, third eggs between 0900 and 1200 noon.

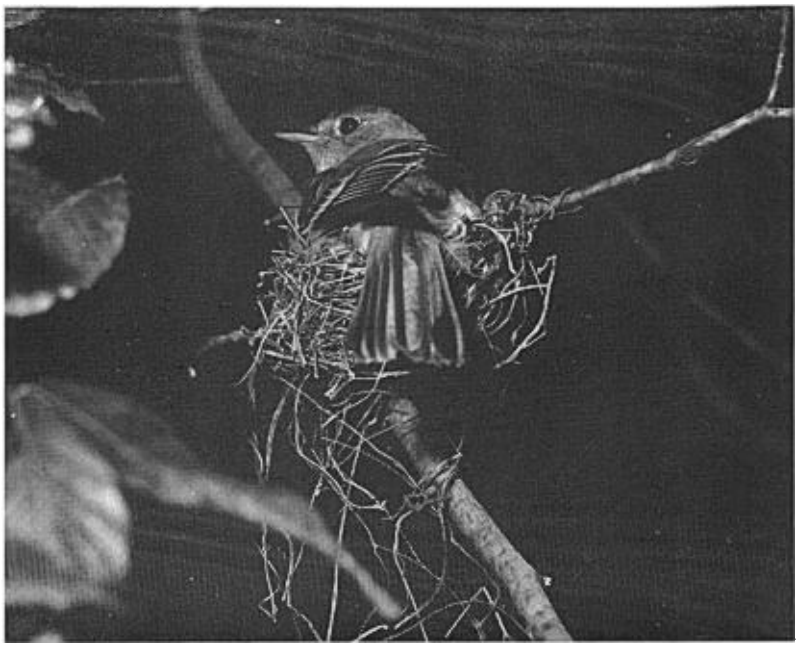


FIGURE 6. 7 August 1954, Emmett Twp., Calhoun Co., Mich.

HISTORIES OF INDIVIDUAL BIRDS

Some histories of the different nestings of individually banded Acadian Flycatchers are given here: (Calhoun County, Emmett Township.).

Female, 24-82728:

Nest 33. 4, 5, 6 June 1957, 3 eggs laid (no. 1 disappeared.).
18, 19 June, 2 eggs hatched (G. Thomas, R. Tompkins).
2 July, 2 young left nest (G. Thomas).

Nest 38. 11 July 1957, Nest completed 3 m directly above nest 33, in same tree. 13, 14, 15 July, 3 eggs laid (two eggs measured 19.0 X 14.4, 19.1 X 14.4, mm.). 18 July, eggs taken by predator.

Nest 41. 24 July 1957. New completed nest found 56 m E of nests 33 and 38. 25, 26 July, 2 eggs laid (measured, 18.7 X 14.6, 19 X 14.5 mm.). 9,10 August, 2 eggs hatched. 22 August, 2 young left nest.

Nest 47. 4 June 1958, nest found 61.2 m from first 1957 nest, 1 egg.
5 June, 2nd egg laid (eggs measured 18.8 X 14.8, and 19.1 X 14.2 mm.). 19 June, 5 a.m., 1 young; 7 p.m., 2 young.
7 July, young left nest. Female snapped bill at me when I stood under old nest.

Nest 55. 11 July 1958, new nest found, 28 m. SE of nest 48.
12, 13, 14 July, 3 eggs laid (measured 18.0 X 14.3, 18.5 X 14.3, and 18.0 X 13.7 mm.). 28 July, last egg hatched.
14 August, 3 young left nest.

Nest 61. 29 June 1959, nest found 5 m from nest 55 site. 1 egg (measured, 20.5 X 14 mm.). 7 July, only the one egg and one Cowbird egg. Deserted. I never saw this bird again.

In 1957, she laid 8 eggs, fledged 4 young; during 1958, 5 eggs, and fledged 5 young.

In the same Emmett Township woods a pair nested during 1957, 1958 and 1959. I was unable to capture them but did so in 1960. The male returned through 1964, the female through 1963. Following is their history. During 1957, birds not banded, a Cowbird was fledged on 9 July. In the next tree, I found a nest with two eggs (measured 17.3 X 13.0 and 18.0 X 13.7 mm.), and one Cowbird egg, 7 July 1958, from which later a Cowbird fledged. Although there were birds here during 1959 I did not find their nests. During 1960 the following occurred:

Male, 63-27726; female, 63-27798.

Nest 68. 9 June 1960, nest found with two Acadian Flycatcher eggs (measured 17.3 X 14.0, 18.7 X 14.7 mm.), and 1 Cowbird egg.
16 June, Cowbird egg hatched. Cowbird fledged 11 days later.

Nest 76. 2 August 1960, nest found with 1 infertile egg (measured 18 X 14 mm.), and 2 small young, 75 m west of nest 68. Young left nest about 12 August.

Nest 82. 18 June 1961, female building nest 110 m E of nest 68.
19, 20 June continued building then deserted it.

Nest 86. 26 June 1961, completed nest found 65 m NNW of nest 82.
29 June, still empty. 6 July, 1 broken Acadian egg underneath nest on ground; 1 Cowbird (bill-punctured) egg in nest, deserted.

Nest 90. 20 July 1961, Nest found in same tree as nest 68, 1 egg (measured 18.7 X 14.4 mm.), 1 Cowbird egg. One Acadian egg found broken beneath nest on ground. 8 August, both Acadian Flycatcher and Cowbird egg discovered infertile. Nest soon deserted.

Nest 98. 13 June 1962, Nest found with 2 eggs (measured 17.0 X 14.0, 17.5 X 13.7 mm.), and 1 newly hatched young. This was the only egg that hatched. 24 June, nest all torn to pieces.

Nest 100. 30 June 1962, new nest found with 2 eggs (16.8 X 13.5, and 16.8 X 13.4 mm.), and 1 Cowbird egg. 9 July, all torn to pieces and apparently female used this nest in building a new one. Nest 98 was in same tree as nest 68; nest 100, in the next tree 30 m from nest 98.

Nest 107. 20 July 1962, nest found in oak, 98 m SW of nest 100. Female incubating 3 eggs. 15 August 3 young out of nest.

During 1963 this pair had 2 young out of nest on 23 July but I could never find any new nest. During 1964, the male was there but I never found the female. I found two old nests on his territory in early August.

A female was banded in Calhoun County, Convis Township, in 1961. Her mate was banded in 1962 and they both returned during 1963 and 1964. Following is their history:

Female, 66-33581 (Male after 1962, 103-98717).

Nest 77. A nest was found here in 1960 from which 3 young fledged 12 August.

Nest 78. 2 June 1961, completed empty nest found 10 m. from nest 77.
5 June, 1 egg (measured 18.2 X 14.0 mm.). Deserted.

Nest 79. 6 June 1961, new completed nest found 6 m from nest 78.
12, 13, 14 June eggs laid. 27 June, 6 a. m., 2 young, 1 egg.
28 June, 6 a. m. 3 young. 11 July, 3 young fledged.

Nest 93. 15 August, 1961, nest found 36 m S of nest 79, 2 small young.
Between 22 and 29 August, 2 young left nest.

Nest 101. 30 June 1962, nest found with 3 eggs (measured 18.0 X 14.1, 17.6 X 13.8, and 17.5 X 13.7 mm.). 2 m from nest 78 site. 14 July 2 eggs hatched and left nest about 27 July. Seen with parents up until 7 August, parents did not renest.

Nest 117. 28 June 1963, at least 2 young just out of maple nest near site of nest 93.

Nest 118. 24 July 1963, nest found in maple along edge of leatherleaf bog. Contents and number of young reared were not known.

Nest 122. 21 May 1964, female building nest which was completed 26 May. This was 10 m from nest 118. 28, 29 May, 2 eggs laid (measured 17.8 X 13.8, 17.5 X 13.5 mm.). (Later a Cowbird egg was laid in nest but only 1 Acadian Flycatcher fledged about 26 June.—W. A. Dyer).

Nest 132. 14 July 1964, empty completed nest found 42 m from nest 122. 16, 17, 18 July, 3 eggs laid. 6 August, 3 young in nest. 15 August (estimated) one young left nest, others had disappeared.

In this same woods another pair was captured in 1963.

Male, 66-77559, female, 66-77552.

Nest 115. 28 June 1963. 3 young just out of nest near road.

Nest 119. 16 July 1963. Nest found 22 m from nest 115, 2 eggs (measured 18.6 X 13.6, 19.2 X 13.5 mm.), and 1 Cowbird egg. 29 July, 7 p. m., 1 young; 30 July, 7 a. m. 2 young. Cowbird egg failed to hatch. Estimated young left nest 10-11 August.

This male had a different mate, 71-82785, in 1964. Her 1964 history was:

Nest 121. 26 May 1964, partially completed nest found 18 m. from nest 115. 29 May, 1 egg (18.0 X 13.2 mm.). (Three eggs laid; three young fledged).

Nest 133. 17 July 1964. Nest found over road, 110 m NW of nest 121, 3 eggs. 29 July, 3 young in nest. 11 August, last young left nest when I looked at it with a mirror on a pole.

In Laketon Township, Muskegon County, I found the following pairs throughout different summers:

Male 61-81428 (1959, 1960); female 63-27805, 1960:

Nest 60. 7 June 1959. Nest on small branch of small beech well beneath the forest canopy. A Cowbird egg was built into the nest bottom and the nest contained three eggs (18.2 X 13.5, 18.2 X 13.5 and 18.2 X 13.2 mm.). Both birds were scolding a Barred Owl. 3 July, two young left nest. Cowbird egg still in bottom.

Nest 65. 26 July 1959. Nest found again in small beech 100 m SW of Nest 60. Three newly hatched young. Three young left nest between 2 and 8 August.

Nest 66. 5 June 1960. Nest found in small beech, 12 m from nest site 65, 1 egg. 11 June 3 eggs (18.0 X 13.0, 17.6 X 13.2, 18.0 X 13.3 mm). Nest destroyed shortly after this.

Nest 73. 3 July 1960. Nest found 50 m N of nest 66. 2 eggs, 1 Cowbird egg. One young Acadian Flycatcher left this nest 17 July. This nest 6 m. up in beech.

Nest 75. 31 July 1960. Female building new nest 4 m up in terminal parting of beech branch. 4 August, 2 eggs in nest. 20 August, 2 young in nest. 1 September, 2 young just out of nest.

During 1959 the female of this pair laid 6 eggs and fledged 5 young. During 1960, female 63-27805 laid at least 7 eggs and fledged 3 young.

Female 32-33131 (During 1963, 1964 male, 32-33130):

Nest 80. 17 June 1961. Empty nest found 4 m up on horizontal hemlock branch. 23 June, 8 a. m. 2 eggs, 7 p. m., 3 eggs. 4 July, 6 p. m., 3 eggs. 7 July, 7 p. m., 3 young. 19 July, young gone.

Nest 97. 9 June 1962. Nest 5 m up on horizontal hemlock branch, 65 m from site of nest 80. 1 egg in nest. 25 June, 1 egg, 1 young in nest, 1 egg foung underneath on ground. 26 June, 2 young. 2 young left this nest shortly after 7 July. Not seen later.

Nest 113. 13 July 1963. Nest 3 m up on horizontal hemlock branch, 1 egg. 14 July, 2nd egg laid, the third probably the next day. (19.0 X 13.7, 19.5 X 13.7, 19.6 X 14.2 mm., egg measurements.). 28 July, 5 p. m. still 3 eggs. 3 August, 2 young about 5 days old. They left the nest about 11, 12 August. (W. A. Dyer found this pair with a hemlock nest 30 June where three young were just out of the nest.)

Nest 124. 31 May 1964. Female building nest 2½ m up in hemlock. 3, 4 June 2 eggs laid. 5 June, eggshells on ground beneath nest.

Nest 128. (16 June 1964. Nest found 4 m up on small spindly horizontal maple branch, 2 eggs, W. A. Dyer). 10 July, 3 young about 9 days old. 18 July, young out of nest.

Thus during the four summers I found or saw five nests of this female. She raised during 1961, 1 young; during 1962, 2 young; during 1963, 5 young; during 1964, 2 young. She had at least two different mates but used the same territory during the four summers. During the last two summers she was missing part of her right foot. During these same summers she laid, 1961, at least 3 eggs, 1962, at least 3 eggs, 1963, 6 eggs; 1964, 5 eggs.

Female 32-33132 (During 1961, 1962, male 32-33130; during 1963, 1964, male 104-36174).

Nest 89. 30 June 1961. Nest found 4 m up on lowest hemlock branch, 3 young. 9 July, I captured both adults and was banding them beneath the nest when I heard the young calling. I looked up and a male Cowbird was pecking them very severely. They all flew out into the forest. I did not find a second nest.

Nest 96. 9 June 1962. Nest found 1½ m up on hemlock branch, 3 eggs (eggs measured, 18.8 X 14.6, 19.0 X 13.5, 19.0 X 13.5 mm.) 25 June, eggs gone. This female was captured.

Nest 109. 27 July 1962. Nest found 4½ m up on hemlock branch 4 m from three trunk, 3 eggs.
3 Aug, still 3 eggs. 10 August, 3 half-grown young.
Female captured again. 26 August, 3 young found outside nest being fed by both parents.

Nest 112. 6 July 1963. Nest found 3 m up on hemlock branch, 3 young nearly ready to fly. 9 July, male captured and banded; female captured again. 13 July, 3 young out of nest. Both birds were found with young for some time and apparently female did not renest.

Nest. 125. 31 May 1964. Completed empty nest found 3½ m up on hemlock branch. 2, 3 June 2 eggs; 4 June, 3 eggs. (17, 18 June eggs hatched and young left nest alright—W. A. Dyer).

Nest 129. 5 July 1964. Nest found 4 m up on hemlock branch, 3 eggs.
18 July, 7 a. m. still 3 eggs. 23-24 July, 3 young.
31 July, 3 young left nest when I looked in it with mirror.

This female, during four summers laid: 1961, at least 3 eggs; 1962, at least 6 eggs; 1963, 3 eggs; 1964, six eggs. She raised, 3, 3, 3, and probably 6 young each year, respectively.

Female, 32-33166, male, 32-33167.

Nest 88. 30 June 1961, Nest found 4 m up in small maple, 3 eggs (eggs measured 21.0 X 13.8, 20.4 X 13.8, and 20.0 X 14.1 mm.). 7 July, 7 p. m., 3 eggs 9 July, 7 a. m., 3 young. 22 July, young left on own accord. Both parents caught, banded.

Nest 102. 7 July 1962, nest found 4½ m up in beech tree. Male and female identified. 3 eggs in nest.
13 July, only 2 eggs now in nest. 21 July, 2 young.
29 July, 2 young. 3 August, young out of nest.

Nest 114. 13 July 1963, nest found with 3 young just out. Nest 5 m up on hemlock branch. Male identified, female ??

Female, 71-82781.

Nest 127. 31 May 1964, female building nest 2 m up in small beech tree. 1 June, 1 egg; 2 June, 2 eggs (3 June, 10:05 a. m., 2 eggs, 4 June, 9.45 a. m., 3 eggs (2 eggs measured 17.6 X 13.5, 18.0 X 14.1 mm.). 17 June 1 egg hatched (the only one that did hatch.). 1 young left nest 1 July. W. A. Dyer.)

Nest 131. 11 July 1964, female had completed new nest 4 m up in beech tree branch. She used most of the material from nest 127 which was only 22 m away. 12 July, 1st egg laid. 18 July, 3 eggs in nest. 26 July, still 3 eggs but 31 July, 3 young about 4 days old. 8 August, nest empty and apparently young taken by predator.

FIGURE 7. August 1959, Muskegon Co.

THE NESTING SEASON

From the records of banded individuals one notes that the average breeding season for the Acadian Flycatcher begins in late May during warmer years, early June during cooler years, then lasts until mid-August or September in Michigan. One must realize that these records are (especially in Muskegon County) at the northern edge of the range of this species. In Calhoun County the average first laid egg for five banded females was 1 June (28 May to 5 June);

in Muskegon County the average was 3 June (31 May to 9 June) for seven records. If young are fledged from the first nest by 20-25 July the birds will usually attempt a second brood even in Michigan. Consequently, farther south the species should be double-brooded always. The latest record of young leaving a second nest came 29 August in Calhoun County, 31 August in Muskegon County. The average of last nest terminated for Calhoun County was 11 August and for Muskegon County, 8 August (See Table 11.). The average period between the laying of the first egg in summer until the last nest was terminated in Calhoun County was 76 days; Muskegon County, 63 days. One Muskegon female in 1964 laid her first egg 2 June. She fledged 3 young from this nest by late June and she laid eggs in her new nest by 2, 3 and 4 July from which the 3 young left 31 July-1 August.

The periods between the fledging date in the first nest and the first laid egg in the next nests in four other cases were 11, 5, 8, and 15 days (average, 10 days). Two periods between the loss of eggs from predation and the laying of the first egg in the next nest, were 7 and 10 days.

INCUBATION PERIODS

Incubation periods have been obtained at the following nests:

(33) 4-6 June 1957 (3 eggs laid), 3rd egg hatched 19 June —	13 days.
(36) 10-12 July 1957 (3 eggs laid), 2 eggs hatched 25 July —	13 or 14 days.
(41) 25-26 June 1957 (2 eggs laid), both eggs hatched 9 August —	14 days.
(47) 4-5 June 1958 (2 eggs laid), both hatched 19 June —	14 days.
(54) 11 July 1958 (3rd egg laid), 3rd egg hatched 26 July —	15 days.
(55) 14 July 1958 (3rd egg laid), 3rd egg hatched 28 July —	14 days.
(57) 19-20 July 1958 (2 eggs laid), both hatched 3 August —	14 days.
(79) 12-14 June 1961 (3 eggs laid), 3rd egg hatched 28 June —	14 days.
(80) 23 June 1961 (3rd egg laid), 3rd egg hatched 7 July —	14 days.
(84) 24 June 1961 (3rd egg laid), 3rd egg hatched 8 July —	14 days.
(97) 11 June 1962 (3rd egg laid), 3rd egg hatched 26 June —	15 days.
(125) 4 June 1964 (3rd egg laid), 3rd egg hatched 18 June —	14 days.
(127) 4 June 1964 (3rd egg laid), 1 egg hatched only, 17 June —	13 or 14 days.

Thus there were one period of definitely 13 days, 8 of 14 days and two of 15 days and two either 13 or 14 days.

Female Acadian Flycatchers are sometimes quite tame and on at least two occasions I have had to push the birds off the nest to see what was in it. One bird came back and sat on an empty nest as I weighed and measured her eggs below her. I had to push her off the nest to replace the eggs.

The female does all of the incubating and at times begins the day the first egg is laid. In Muskegon County, 21 July 1956, during 106 minutes, the female incubated 90 minutes (1 period) and was away during periods of 5 and 11 minutes. At the same nest 29 July, she incubated 169 minutes (8-35) and was away 33 (1-5) minutes. The average period on the nest for these two days (10 periods) was 25.9 (8-90) minutes; the average period away (12 periods) was 4.1 (1-11) minutes for 15.9 per cent of the time. She incubated for the remaining 84.1 per cent of the time. Her periods away from the nest were spent chiefly in search of food. Once I saw the male feed her after

TABLE 11(A) BREEDING SEASON OF INDIVIDUAL FEMALE ACADIAN FLYCATCHERS

CALHOUN COUNTY

Female	Year	First egg laid	Last nest terminated	Number of days	Eggs laid Sets	Eggs laid Total	Young fledged	Young fledged Total
Emmett Township								
24-82728	1957	4 June	22 August	79	3, 3, 2	(8)	2, 0, 2	(4)
,,	1958	4 June	14 August	71	3, 2	(5)	3, 2	(5)
,,	1959	? June	??	—	1-1C, ?	(?)	0, ?	(?)
63-27798	1960	2 June E	12 August	71 E	2-1C, 3	(5)	1C, 2	(2)
,,	1961	? June	10 August	—	1-1C, ?, 1-1C	(2)	0, 0, 0	(0)
,,	1962	28 May E	15 August	79 E	3, 2,-1C, 3	(8)	0, 0, 3	(3)
63-27797	1960	1 June E	30 July	59 E	3, 3,	(6)	?, 3	(3)
Convis Township								
66-33581	1961	4 June	29 August	86	1, 3, 2	(6)	0, 3, 2	(5)
,,	1962	? June	26 July	—	3, ?	(3)	2, ?	(2)
,,	1963	? June	? August	—	2, ?	(?)	2, ?	(?)
,,	1964	28 May	6 August	70	2-1C, 3	(5)	1, 1	(2)
66-77552	1963	? June	11 August	—	3, 2-1C	(5)	3, 2	(5)
71-82785	1964	29 May	11 August	74	3, 3	(6)	3, 3	(6)
Average		1 June	11 August	74		(6)		(3.3)

TABLE 11 (B) BREEDING SEASON OF INDIVIDUAL FEMALE ACADIAN FLYCATCHERS

Female	Year	First egg laid	Last nest terminated	Number of days	Eggs laid in Sets	(Total)	Young fledged	(Total)
			MUSKEGON COUNTY					
63-27805?	1959	5 June	6 August	62	3-1C, 3	(6)	2, 3	(5)
63-27805	1960	5 June	31 August	87	3, 2-1C, 2	(7)	1, 2	(3)
32-33131	1961	? June	? July	—	3	(3?)	1	(1)
,,	1962	9 June	? July	—	3	(3?)	2	(2?)
,,	1963	31 May E	11 August	73 E	3, 3	(6)	3, 2	(5)
,,	1964	3 June	18 July	45	2, 3	(5)	0, 3	(3)
63-33132	1961	??	??	—	?, 3	(3)	?, 3	(3)
,,	1962	4 June E	25 August	82 E	3, 3	(6)	0, 3	(3)
,,	1963	??	13 July	—	?, 3	(3)	?, 3	(3)
,,	1964	2 June	31 July	59	3, 3	(6)	3, 3	(6)
32-33166	1961	??	22 July	—	3, ?	(3)	3, ?	(3)
,,	1962	??	2 August	—	3, ?	(3)	2, ?	(2)
71-82781	1964	1 June	2 August	62	3, 3	(6)	1, 0	(1)
Average		3 June	8 August	67		(6)		(3.3)

E— Estimated from hatching date.
C— Cowbird egg.

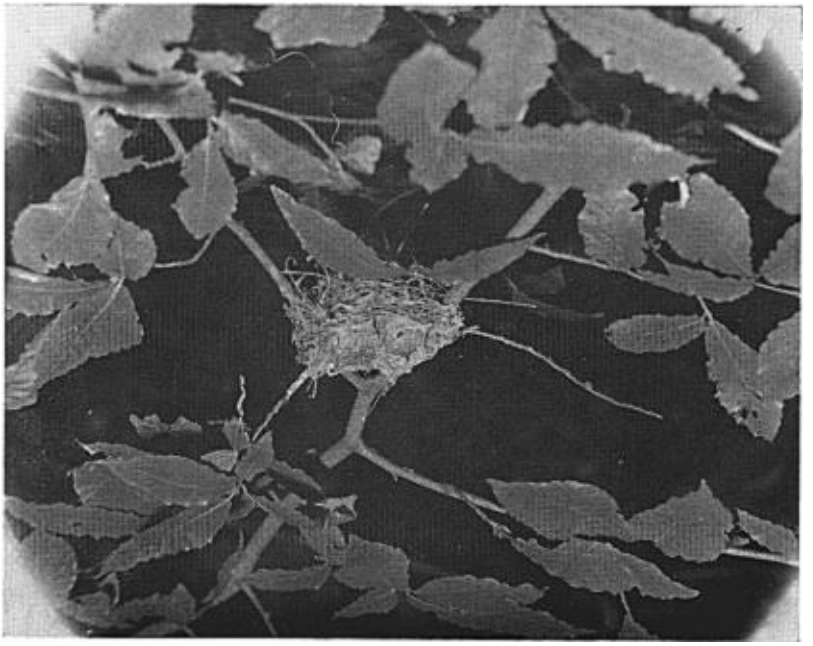


FIGURE 8. 23 July 1954, Calhoun Co.

she left the nest but usually she obtained her own food, flycatching it 45 to 50 m from the nest. On two occasions I observed males feed the female at the nest. At another Muskegon County nest 7 July 1964, female attentive periods were 42, 46, 33 and 42 minutes; periods away from the nest, 3, 3, and 3 minutes. At the same nest 10 July, attentive periods were 28, 45 and 38 minutes; inattentive periods, 3, and 3 minutes. Again 11 July attentive periods were 49, 48 and 31 minutes, with periods away 3, 8, 4, and 9 minutes. The average attentive period for this 1964 nest was 40.2 minutes (28-49) and the average period away 4.3 (3-9) minutes. The percentage of attentiveness, 91.13 per cent; away, 8.87 per cent.

THE YOUNG

Mumford (1964) gave descriptions of newly hatched and young birds throughout their nestling life. The pink or flesh-colored skin together with the short white down on newly hatched Acadian Flycatchers are distinctive for this species. The down on the other *Empidonax* flycatchers in Michigan is gray or mouse-gray. At hatching time 8 young averaged in weight 1.33 grams, from 1.2 grams up to 1.6. Wings averaged 6.3 mm in length, tarsi, 6 mm., and exposed culmens, 3 mm. By 5 days they averaged in weight, 4.7 grams; had wings 10.8 mm long; tarsi, 8.6; and culmens, 5.5 mm. Primaries be-

FIGURE 9. 18 July 1955, Muskegon Co.

gan showing at two or three days. At 10 days of age weights averaged 11.8 grams; wings measured 39.1 mm.; tarsi, 14.5 mm; and exposed culmens, 7.8 mm. By 23 days a hand-reared bird had a wing of 62 mm., tarsus 15.5 and culmen of 9 mm. The tail began to show at 5 days, reached 9.4 mm. at 10 days, 20.5 mm at 15 days, and 37 mm. at 23 days.

When first hatched young show little life but respond immediately when adults return with food. While in a blind I heard a returning male call a low *Puurp* when feeding newly hatched young. They raised their heads, opened their mouths and uttered a low *Zeeep*. At four days they gave this same call when I removed them from the nest to weigh them. At four days they showed much yellow in the breast and had a mottled appearance on the back, much different from other Michigan *Empidonax* flycatchers.

During a period of 185 minutes, parents feeding 3 young, 8 days old, 12:15-2:15 p.m. and 3:25-4:30 p.m., 2 August 1959, the male fed 11 times, the female 17. The average period between feedings for the male was 10.7 (2-26) and for the female, 7.6 (1-28) minutes.

Young left nests when the following ages (each family group separated from the next): 14, 14; 14, 14, 13; 14, 14, 13; 15, 15, 15; 14; 14, 14, 13; and 14, 14, 13 days. If disturbed young left the nest when 12 days of age, showing great fear. When 12 or 13 days old

they jumped out of the nest, crawled along on the ground and hid on top of the leaves, later working up a few cm to a perch. When 14 or 15 days old they flew directly out into the woods from 18 to 50 m, the average for 12 young being 30-31 m.

On one occasion I kept a young Acadian for a week then returned him to his home territory. Before I released him, his mother was standing on a branch only about 5 m from me and she fed him very shortly afterwards. At another time I released a young Acadian which I had had for 14 days onto a territory where the young were just leaving the nest. He began begging for food but was attacked by both parents of the territory, the male most strenuously for over an hour. Soon the female fed him. The next morning, both birds were feeding him as well as their own three. He could fly very well and was 28 days old. Usually the male feeds young from the first nest while the female incubates eggs in the second.

Parents normally fed young until they were 25 or more days of age after which they were almost impossible to find. They foraged through the middle and upper story of the trees on their parents' territories.

NEST AND EGG SUCCESS

Of 121 Acadian Flycatcher nests that I observed, 88 had young hatch in them (72.72 per cent) and 78 (64.46 per cent) fledged young. Excluding 25 Cowbird parasitized nests, of 96 nests recorded, 77 (80.21 per cent) had young hatch in them and 68 (70.83 per cent) fledged young. The Emmett Township woods had the poorest success. Here only 19 (63.33 per cent) of 30 unparasitized nests fledged young; 23 of all 44 nests (52.27 per cent). In Convis Township, 11 of 13 nests fledged young (84.61 per cent). In Muskegon County, 42 of 58 (72.41 per cent) nests fledged young.

Young were fledged in 10 (40.00 per cent) of 25 parasitized nests, and 11 (44 per cent) had young Acadian Flycatchers hatch in them.

Of 319 Acadian Flycatcher eggs, 216 (67.7 per cent) hatched and 183 (57.37 per cent) fledged. In unparasitized nests, 193 (71.21 per cent) of 271 eggs hatched and 163 (60.11 per cent) fledged. Of 48 Acadian eggs in parasitized nests, 23 (47.91 per cent) hatched and 20 (41.67 per cent) fledged. (In Emmett Township, 80 eggs were laid in unparasitized nests of which 50 (60.25 per cent) hatched and 41 (51.25 per cent) fledged, while in parasitized nests, only 8 hatched and fledged (30.76 per cent). In Convis Township, 32 of 37 eggs (86.48 per cent) hatched and 24 (75.00 per cent) fledged in all nests. In Muskegon County, of 163 eggs, 119 (73.00 per cent) hatched and 102 (62.57 per cent) fledged.

Of 27 Cowbird eggs laid in 25 different nests, only 8 (29.62 per cent) hatched and 7 (25.92 per cent) fledged. In 24 parasitized nests one egg was laid, in the other three eggs of the Cowbird.

Concerning the 20 Cowbird eggs or hatched young that failed to leave the nest, one was deserted, eight eggs and one young taken by predators, five failed to hatch, two were built in the bottom of the Acadian Flycatcher nests by the female flycatcher, two disappeared (one of which was found beneath the nest on the ground—and one fell through the bottom of the nest.

On only one parasitized nest in which a Cowbird hatched did young Acadian Flycatchers fledge. In this nest the Cowbird egg was laid later and correspondingly hatched later than the Acadians. In one nest, no Acadian eggs were observed at all. In five nests, 3, 2, 2, 3 and 1 Acadian eggs failed to hatch and in one nest, 3 young hatched but died before they were two days old. Apparently the Cowbird was responsible for the loss of these 14 Acadian eggs and young. Besides this loss, 3 Acadian eggs were deserted, 3 fell through the bottom of nests, 14 failed to hatch and 59 eggs were taken by predators, while the destructive factor of 13 was unknown. Concerning the young, 30 disappeared or died because of predators.

During 1965, I observed a banded male Acadian Flycatcher in Emmett Township, Calhoun County, with two mates simultaneously, each of which had a nest and eggs, and each of which fledged one young Cowbird (not included in the nest figures shown elsewhere in this paper).

Although squirrels and chipmunks were common in all woods, they seemed unable to reach the spot where nests were located because of the distance from the trunk and the weakness of the branch at that point. But in all three study woods, Cooper's Hawks nested every year. In one case I felt that one of these birds may have been responsible. In the Convis Township woods, I could see the Cooper's Hawk nest from the site of the Acadian nest regularly. In the Muskegon County woods, Barred Owls nested every year. Two nests were apparently lost to them. During 1964 a Barred Owl had a nest right in the heart of one Acadian territory. The first two Acadian nests met with failure, the next was built 55 feet up in the upper forest story and succeeded.

ADULT WEIGHTS AND MEASUREMENTS

Eleven breeding adult males have been captured, banded, weighed and measured. The average weight was 13.2 (11.9-13.9) grams. The average wing measurement, 75.7 (73-78) mm; tail, 62.5 mm.

Nineteen breeding females have also been banded, etc. The average weight, 12.7 (11.1-13.8) grams. The average wing measurement, 69.9 (67-75) mm; tail, 57.85 (51-63) mm.

SUMMARY

The author has made studies of *Empidonax* flycatchers, including *Empidonax virescens*, in Michigan. This species occurs northward to central lower Michigan during the breeding season, reaching Oceana, Montcalm, and Saginaw counties. I studied the birds in three different woods, one in Muskegon, two in Calhoun counties. The Muskegon forests were mixed hemlock, beech, and maple; those in Convis Township, Calhoun County, maple, cherry, and oak; those in Emmett Township, Calhoun County, beech, maple and oak. In the Calhoun County woods, first Acadian Flycatchers appeared in spring between 6 May (1964) and 26 May (1929, 1948).

On the three study areas 12 adult males were banded, 8 returned the year after banding; 5 the second year; 2 the third year; 1 the

fourth year. Females, 19 were banded, 6 returned the second year; 5 the third; 4 the fourth. In all but one case returning pairs came back to their same mate and territory each succeeding year. Territory sizes in Muskegon County averaged 3.07 (1.8-4.2) acres; in Convis Township, 2.76 (2.1-3.8) acres, and in Emmett Township, 2.92 (2.1-4.2) acres.

Trees used for nest sites in Muskegon County were hemlock (61.11 per cent), maple (3.7 per cent), and beech (31.48 per cent). The most common trees in 10 m quadrats there were *Acer saccharum*, *Tsuga canadensis* and *Fagus grandifolia*. The average number of all trees in 47 quadrats was 27.04 (15-42), ranging between 1/4 and 40 inches in girth. In the Convis Township woods, maple was the chief nest tree (68.18 per cent), and here the most common tree in 10 m. quadrats was *Acer saccharum*, followed by *Prunus serotina* and *Quercus velutina*. Here 16 (7-29) trees were found per quadrat, ranging between 1/4 and 24 inches in girth. In the Emmett Township woods, beech (93.18 per cent) was the most common nest site, and the most common trees in 10 m quadrats were *Acer saccharum*, *Fagus grandifolia*, *Quercus alba*, *Quercus velutina* and *Sassafras variifolium*. An average of 38.52 (17-95) trees were found in each quadrat.

The height of 138 nests averaged 405.5 cm. above ground ranging from 107 up to 1,676 cm, always built out on a long sweeping branch at least 24.4 to 558 (average, 326.6) cm from the tree trunk. One nest in Muskegon County consisted of 233 items, chiefly cobwebs and small dead hemlock twigs; one in Calhoun County consisted of cobwebs and 259 pieces of grass, sweet cicely, and dead leaves.

The average measurements of 106 eggs were 18.64 X 13.99 mm and the average weight, 1.85 g. The average egg set in first Muskegon sets was 3.045, second sets, 2.929; in Convis Township, first sets, 3.0, second sets, 2.875; in Emmett Township, first sets, 2.923 and second sets, 2.800. The nesting season lasted from late May or early June until mid or late August. Most pairs attempted to raise two broods. Incubation required 13 (1), 14 (8), or 15 (2) days and was performed only by the female, who incubated at one nest for 84.1 per cent of the time during 196 minutes on two different days and for 91.13 per cent for short periods on three different days. Both parents feed the young, which remain in the nest 13 to 15 days.

Of 121 Acadian nests, 78 had young fledge in them (64.46 per cent). Of 319 eggs, 216 (67.7 per cent) hatched and 183 (57.37 per cent) fledged. Cowbirds laid 27 eggs in 25 nests, three in one nest, one in each of the rest. These occurred in first nests only, and each Cowbird that hatched was usually fatal to the Acadian eggs (which failed to hatch) or to the young (they starved to death) for the Cowbird usually hatched prior to the Acadian eggs by as much as three days.

Eleven breeding adult males averaged in weight 13.2 (11.9-13.9) g. Their average wing measurements, 75.7 (73-78) mm. Nineteen breeding adult females averaged in weight 12.7 (11.1-13.8) g. Their average wing measurement was 69.9 (67-75) mm.

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1703 Wolverine-Federal Tower, Battle Creek, Michigan

Received February, 1965 (minor revision, December, 1965).

FEATHER DEVELOPMENT AS A MEANS OF AGING YOUNG MOCKINGBIRDS (*Mimus polyglottos*)

By ROBERT H. HORWICH

INTRODUCTION

During the spring and summer of 1963 I made some continued recorded observations on the plumage appearance of young Mockingbirds (*Mimus polyglottos*) as part of a behavioral ontogeny study. These notes enabled me to create a general behavioral ontogeny based on age estimates developed from plumage aspects of laboratory and wild birds of known ages. Although the study was almost entirely on laboratory individuals, some field checks were also made to allow a comparison of field and laboratory conditions. These notes compose a general plumage ontogeny which will aid studies of the Mockingbird by indicating approximate ages of nestlings. This is not a pterylography and neither the text nor the figures should be considered to be more accurate than a description of the general aspect of the birds.

METHODS

Thirty-five individuals were taken as nestlings and put, initially, in cages one foot in width and height by two feet in length. In most cases the whole nest was taken and the siblings were kept in it. In a few cases an artificial cellulose nest was substituted when the original nest had been destroyed. At the age of 11 to 20 days the young were transferred to larger cages (see Horwich, 1965).