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BANDING AND NESTING STUDIES OF THE CHIMNEY SWIFT, 1944–1968[1]

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ABSTRACT

Over 25 years 1700 chimney swifts were banded. Of this number, 274 became summer residents in 38 air-shafts located in four buildings at Kent State University. Returns averaged 41.5 per year (total of 996 return records by 318 birds). As many as 55 returns from 11 year-classes were recorded annually. Known ages ranged from one to 13 years (average 4.6); 19 swifts lived 10 years or more. Sex ratios and body weight (aver. 24.45 gm) were equal by sex. Twelve recoveries were made, including reciprocal recoveries from Chattanooga, Tennessee, and Rome, Georgia. Tables and charts give data on the annual cycle, nesting groups and their changes from year to year, and analysis of nesting behavior.

The swifts distribute themselves as widely as conditions permit, tend to remain mated to previous mate if both return, and tend to nest in same shaft from year to year. The nest is made at an average depth in the air-shaft of 22 ft, most often on the wider wall, with a preference for south and west walls, and the nests, one in a shaft, are never successfully used the following year. Six breeding histories are briefly sketched, including two pairs which remained mated to each other for over eight and nine years respectively.

BANDING PROCEDURES AND RESULTS

Introduction and Methods

Over a period of 25 years (1944–68), I have studied the life history of Chimney Swifts (*Chaetura pelagica* L.) living on the campus of Kent State University at Kent, Ohio. Four of the older campus buildings (Kent Hall, the Administration Building, Merrill Hall, and Franklin Hall) have a total of 86 air-shafts as part of the ventilation systems for those buildings. Figures 1 and 2 show the position of each air-shaft on Kent Hall and on the Administration Building. On Merrill Hall there is a single shaft (U), and on Franklin Hall there are only two separate shafts (V and W). Of these, 38 shafts have been utilized by the Chimney Swifts for nesting at one time or another. These air-shafts are ideal in size and construction for roosting flocks of migrating swifts, and for nesting sites by those which remain in residence. The birds have been captured by the standard Chimney Swift trap used by all students of that species (See figure 3 and Dexter, 1950a). In addition, some birds, especially many juveniles, were captured with a box trap consisting of a small metal box suspended by a long cord, a technique developed by Fischer (1951). The regular traps were set at night while the birds were sleeping, but the box traps could be operated either day or night. All captured swifts were banded with U.S. Government bird-bands, and those which

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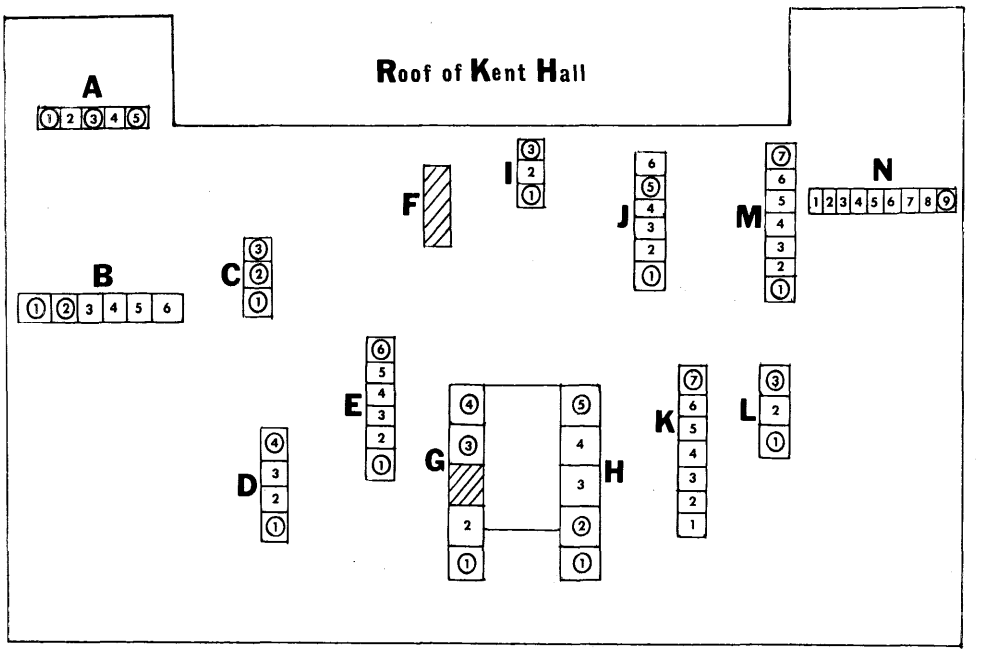
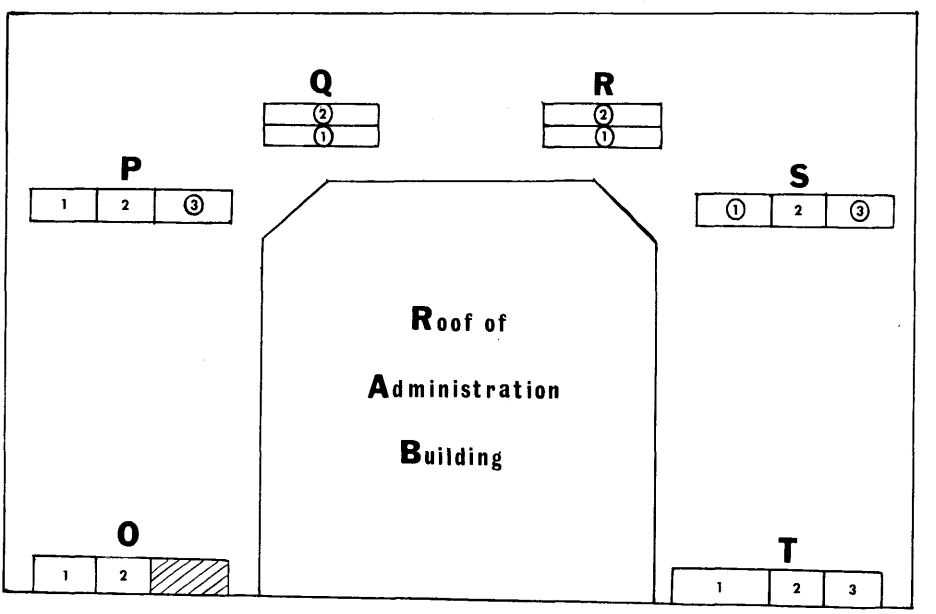
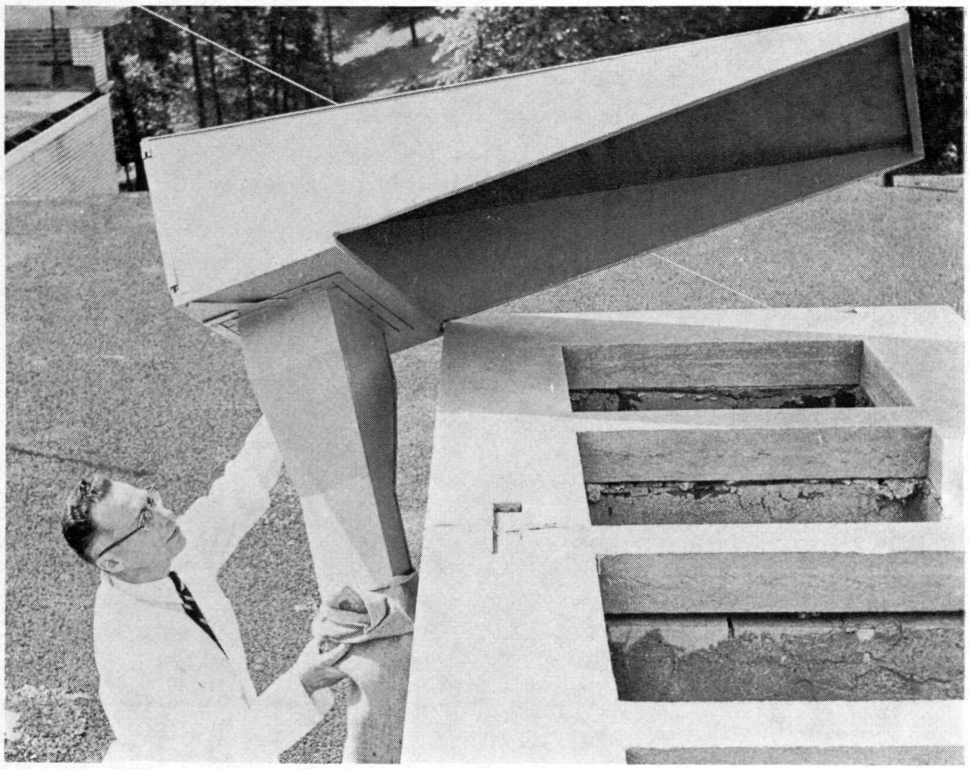
became residents were painted with different colors and body markings with fast-drying paints for subsequent recognition without the necessity of retrapping. With a flashlight at night and a mirror by day, painted birds could be identified and studied as individuals.



Legend for Figures 1 and 2. Diagrams of roof tops of Kent Hall and the Administration Building. Blocks of air-shafts are lettered and each shaft is numbered within the block. Circled numbers indicate shafts used for nesting at one time or another.



During the 25 years of this study, a total of 1700 Chimney Swifts was banded. Of these, 274 (16.1 percent) were resident birds, consisting of 241 banded as adults and 33 banded as juveniles. Also banded were 174 juveniles which did not become residents and 68 swifts which were present as casual visitors. The great majority of the banded birds 1184 (69.7 percent) consisted of migrants passing through the area in the spring and fall seasons.



Legend for Figure 3. The author setting a Chimney Swift trap over an air-shaft on the roof of Kent Hall. Photo by Richard P. Goodrick.

Analysis of Returns

The number of returns from each year-class of banding from 1945–68 is shown in Table 1. For the first five years the original birds banded in 1944 predominated in the returns, as would be expected, but over the next four years they gradually disappeared from the colony. A summary analysis of returning birds has been published annually for the years 1951–67 (Dexter, 1952c, 1953, 1954, 1956b, 1960a, 1962a, 1964, 1966, and 1968a). After the original group of banded swifts had largely disappeared, the largest number of returns for any year-class was, with few exceptions, from the most recent group banded. The total number of returns over 25 years was 996, with an average of 41.5 and an annual range of between 28 and 55. Altogether 318 birds were involved in the return records. The year 1959, sharing the greatest number of returns with 1955, had the greatest number of year-classes (11) in the returning population. Since 1963 there has been a gradual decline of both returning birds and resident birds.

TABLE 1

Return pattern of banded chimney swifts on K.S.U. campus, 1945–68
(No. of returns from each year-group of banding)

Year of Return	Year-Group																							Total Returns
	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	
1945	32																								32
1946	30	5																							35
1947	26	2	6																						34
1948	21	2	6	16																					45
1949	18	1	4	7	15																				45
1950	11	1	3	6	12	12																			45
1951	6	1	1	5	9	10	13																		45
1952	4	1	1	5	2	8	7	12																	40
1953	1	1	1	4	1	6	6	9	16																45
1954				3	1	6	6	6	10	14															46
1955				3	1	5	6	7	8	14	11														55
1956				2		4	2	4	3	10	10	13													48
1957				1		3	2	2	1	6	5	9	8												37
1958				1		2	3	4	2	6	4	7	6	16											51
1959				1		1	2	2	2	4	3	6	5	13	16										55
1960								1		1	3	5	3	8	12	12									45
1961								2		1	1	4	2	6	8	13	9								46
1962											1	2	1	5	6	9	6	10							40
1963											1	1	1	6	5	9	3	5	12						43
1964											1	1	1	4	5	5	2	3	8	8					38
1965											1		1	4	5	3	2	1	6	5	6				34
1966													1	4	4	3	1		4	2	5	9			33
1967														4	2	3	1		2	1	4	6	8		31
1968														2	1	1		1	2	1	3	7	6	4	28

No. of birds involved—318; Aver. no. returns—41.5; Total returns—996

Longevity

The last column of Table 4 gives the minimum longevity for the 274 resident swifts. Ages for birds, other than those banded as juveniles, have been determined by reckoning from the time of first nesting. It is known from the banding of immature Chimney Swifts that they do not breed until two years of age. Hence a swift is at least two years old when it is found nesting for the first time. Known ages ranged from one to 13 years. In a sample of 129 swifts banded between 1945–56 and traced through 1966, the average known life span was 4.6 years. Fifty-one of those, known to be males, had an average minimum longevity of 5.5 years, while 52 known to be females averaged 4.8 years. The oldest individuals in the colony, however, consist of both males and females in fairly equal numbers, so both sexes probably have essentially similar longevities. In the same sample, the total number (129) averaged 3.4 years in residence; the 51 males averaged 4.3 years in residence, while the 52 females averaged 3.4 years. One swift had a known life history of at least 13 years, equalling the earlier published longevity record for the Chimney Swift (Dexter, 1968b). Three other swifts lived at least 12 years, five for 11 years and 10 for at least 10 years.

Recoveries and Foreign Recoveries

Data on Chimney Swifts banded at Kent, Ohio, and recovered elsewhere, and those recovered at Kent which had been banded by other workers is presented in Table 2. The total of such recoveries is not large. Accounts of the more interesting recoveries have already been published (Dexter and Hight, 1954; Dexter, 1955). Of special interest are the reciprocal banding and recovery records

TABLE 2

Recoveries and foreign recoveries of chimney swifts trapped at Kent, Ohio

Band No.	Chart No. (if Resident)	Date of Banding at Kent, Ohio	Date and Place of Recovery	Recovered by	Distance and Direction	Notes
I. Recoveries						
21–194777	188	8–10–56	5–14–66 at Ravenna, Ohio	Mrs. L. M. Hill	6 miles, east	Found dead. Nested for 8 years with same mate in shaft S1.
21–128654		5–6–56	5–25–56 at Hiram, Ohio	L. C. Pettit	15.5 miles, northeast	Trapped both times in migratory flocks.
21–194602		5–20–56	5–12–57 at Hudson, Ohio	George Towner, Jr.	7 miles, northwest	Killed in basement of home. Banded as a migrant.
42–196940		7–25–44	4–14–49 at Chagrin, Falls, O.	Helene Glick	20 miles, north	Found dead in fireplace. Banded as a juvenile.
42–188588	77	5–28–49	9–19–54 at Chattanooga, Tenn.	Clive E. Smith	436 miles, southwest	Trapped and released. Nested for 6 years. See Dexter, 1955.
21–128595		5–13–54	9–19–54 at Rome, Ga.	G. L. Hight, Jr.	480 miles, southwest	Trapped and released. See Dexter and Hight, 1954.
20–188672	119	7–20–52	9–19–54 at Rome, Ga.	G. L. Hight, Jr.	" "	Trapped and released. Nested 4 years. See above reference.
20–188666		5–28–52	9–27–53 at Rome, Ga.	G. L. Hight, Jr.	" "	Trapped and released. See above reference.

Band No.	Date and Place of Banding	Date of Recovery at Kent, Ohio	Banded by	Distance and Direction	Notes
II. Foreign Recoveries					
53–128163	9–10–53 at Hiram, Ohio	5–20–56	L. C. Pettit	15.5 miles, southwest	Trapped and released from migratory flocks.
141–9050	9–14–41 at Knoxville, Tenn.	5–13–46	Mrs. F. C. Laskey	356 miles, northeast	Trapped and released from migratory flocks.
54–30371	10–4–53 at Chattanooga, Tenn.	5–12–58	Clive E. Smith	436 miles, northeast	Trapped and released from migratory flocks.
52–88053	9–27–53 at Rome, Ga.	5–13–54	G. L. Hight, Jr.	480 miles, northeast	Trapped and released from migratory flocks.

between Kent and Hiram, Ohio; Chattanooga, Tennessee; and Rome, Georgia. Unfortunately, there have been only a few investigators who have made a practice of trapping Chimney Swifts. The lack of recoveries in recent years reflects the decline of swift-trapping activity in eastern North America. Notable results have been published by Green (1930; 1940), Coffey (1936; 1958), Peters (1937), Calhoun (1938), Calhoun and Dickinson (1942), Lowery (1943), Hitchcock (1945), Bowman (1952), and Goehring (1956).

OBSERVATIONS ON NESTING

General Comments

The annual cycle of Chimney Swifts while in residence on the Kent campus is outlined on Table 3. The range of first dates, and the median date, are given for

TABLE 3

Annual cycle of chimney swifts at Kent, Ohio

Event	Range of Dates	Median Date
First arrivals	April 17–28	April 21
Start of nest building	May 9–31	May 23
First egg	May 14–June 9	May 29
(incubation period, 20 days)		
First fledging	July 4–Aug. 5	July 14
Last departure	Sept. 23–Oct. 14	Oct. 6
Length of residence	159–178 days	168 days

the day of returning, the start of nest building, the appearance of the first egg, the time of leaving the nest, and the duration and final day of residence. Fischer (1958) has published in detail the breeding biology of this species. Many swifts return, on the first day of their arrival, to the same air-shaft where they had previously nested. Mates are often reunited immediately upon return of both individuals. Others, however, especially two-year-old birds which have not previously nested or birds whose mates did not return, may change location from time to time, going from one shaft to another over a period of a few weeks. By the end of May, nearly all of the individuals are paired, or attached to some pair forming a three-some or a four-some. Each pair or group of three or four occupies a separate shaft, where a single nest is constructed each year. Figures 4 and 5 diagram the nesting combinations each year (1944–68), and indicate duration of residence and any changes in residence or in the mating combinations. Sex was determined by dissection of birds found dead, by a few females which had been abandoned by their mates and had deposited eggs in isolation, and indirectly through the known mating combinations during the life time of those individuals for whom sex was known. Table 4 gives the basic information on the 274 swifts included in figures 4 and 5 (two others, nos. 160 and 161, were not captured).

Territoriality

Chimney Swifts nesting on the roofs of Kent Hall and the Administration Building tended to select air-shafts located at the ends of blocks of shafts, and to spread out over the roof tops as far as conditions would permit. They also tended not to nest in adjacent air-shafts. The circled numbers on the roof diagrams (figures 1 and 2) indicate shafts used for nesting.

There are a few exceptions to the above statements, which are as follows. Shaft A3 in the middle of block A was used only once (1953) and, during that year, the ends of block A were not used. Shaft C2, likewise a middle shaft, was chosen only twice (1953 and 1954) and, during those two years, swifts were not nesting in the end shafts. In 1955 the pair which had nested in C2 moved to the end shaft (C1), nested there in 1955 and 1956, and in 1957 nested at the other end of the block (C3), where they remained as mates for three years. Shaft B2 was utilized only one year (1962), at a time when B1 was not occupied (it is possible this pair moved into B2 for nesting after roosting for a time in B1 because of repeated disturbance). They returned to B1 after nesting was completed. Shaft G3 was occupied for only two years (1949 and 1950), these cases being two of the three exceptions where a pair of swifts nested in a shaft adjacent to one occupied by another pair. Shaft H2, similar to B2, was occupied at a time (1951, 1962, and 1963) when H1 was not occupied by a nesting pair. Again, it may have been disturbance which caused these birds to use H2 rather than H1 at the end of the block. Because J6 is a shallow shaft, nesting swifts occupied J5, rather than J6, which is at the extreme end of the block.

On the roof of the Administration Building, blocks O and T are too close to an overhanging roof immediately above them to attract birds for nesting, although, on occasion, swifts did roost briefly in shafts of the T block. Air-shaft Q1 was used only once for nesting and this was by a four-some in 1947, even though another four-some occupied adjoining shaft Q2. This was the third and remaining exception of finding two nesting groups in adjacent shafts. Shaft R1 was occupied by nesting birds on five occasions, but in each instance, at times when the adjoining shaft R2 was not occupied. Shaft R2 was occupied nearly three times as often, but because both R1 and R2 are both end shafts, there is virtually no difference between them.

While swifts have been found roosting at one time or another in the great majority of air-shafts available to them, a few are too shallow to attract nesting birds. These are A2, E2, G2, J4, J6, M5, M6, N2, N3, and N5.

Mating Combinations, 1944–68

The combinations of all pairs, three-somes, and four-somes nesting in the campus air-shafts during the term of this study are shown in Figures 4 and 5. Altogether 274 swifts are known to have been occupants of the air-shafts during the nesting season over the period of 25 years. Table 4 gives the essential data for each bird; table 5 summarizes the data; and table 6 presents an analysis of mating combinations and duration for the 129 swifts banded between 1945–56 and followed through 1966, when all of them had completed their life duration. Those banded in 1944 are not used in the analysis, because their ages are not known and cannot be estimated with confidence, and the year-classes of those banded after 1956 cannot be used because some individuals in each year-class have not yet completed their life spans.

From the charts and tables it can be seen that chimney swifts tend to nest in the same shaft as in the previous year (486 cases), and if both mates return they

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EXPLANATION OF FIGURES 4 and 5

Legend for Figures 4 and 5 (Nesting Charts) on the following pages. Each resident bird is given an arbitrary number in sequence. Data for each are given in table 4. The solid dots indicate that the same bird nested in the same shaft as in the previous year. Slanting lines indicate a change of nesting location from one year to the next. Dash lines indicate a temporary movement. Parentheses indicate birds which were visitors with a mated pair.

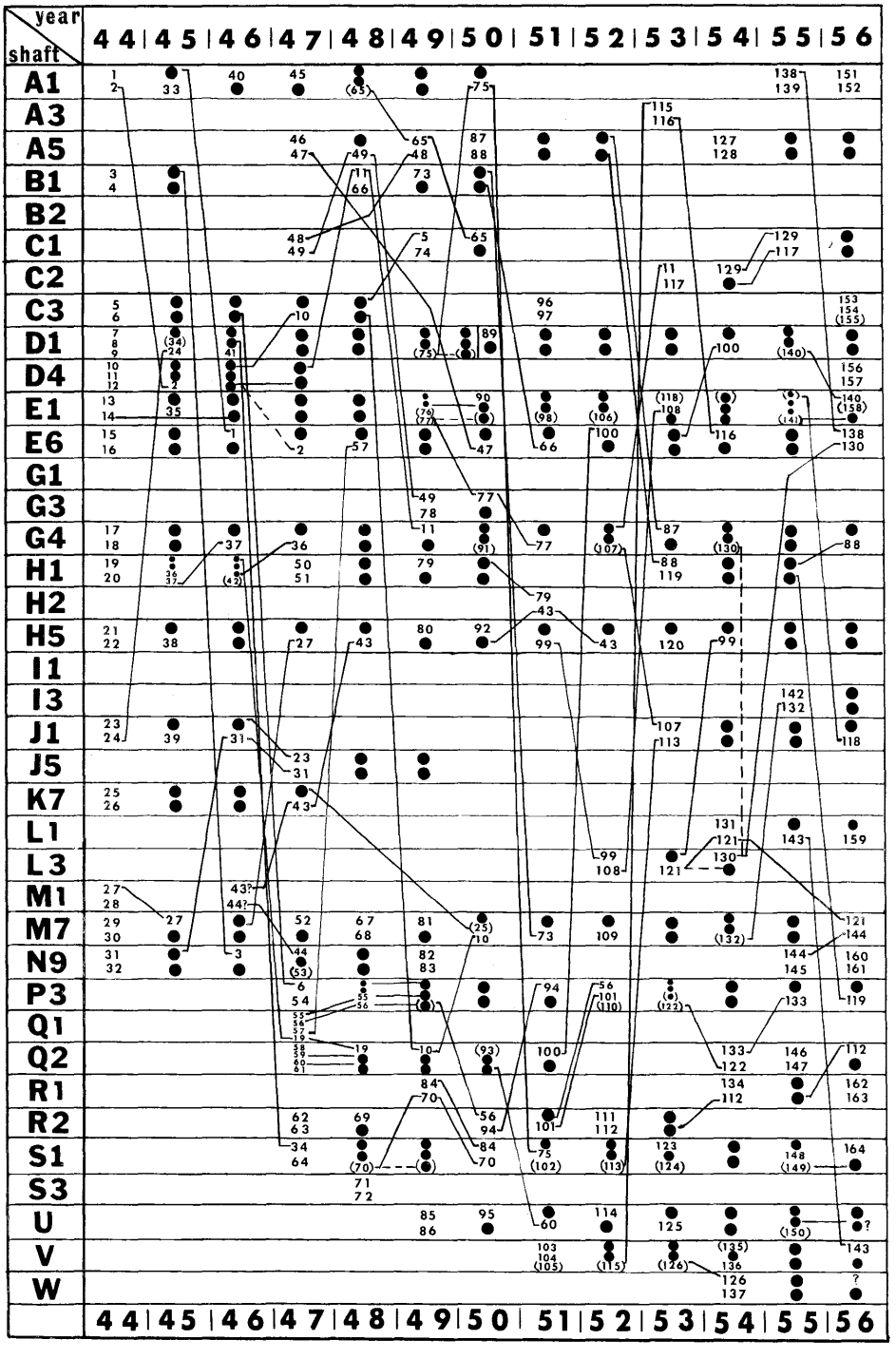
year
shaft
44 45 46 47 48 49 50 51 52 53 54 55 56
A1
A3
A5
B1
B2
C1
C2
C3
D1
D4
E1
E6
G1
G3
G4
H1
H2
H5
I1
I3
J1
J5
K7
L1
L3
M1
M7
N9
P3
Q1
Q2
R1
R2
S1
S3
U
V
W

FIGURE 4

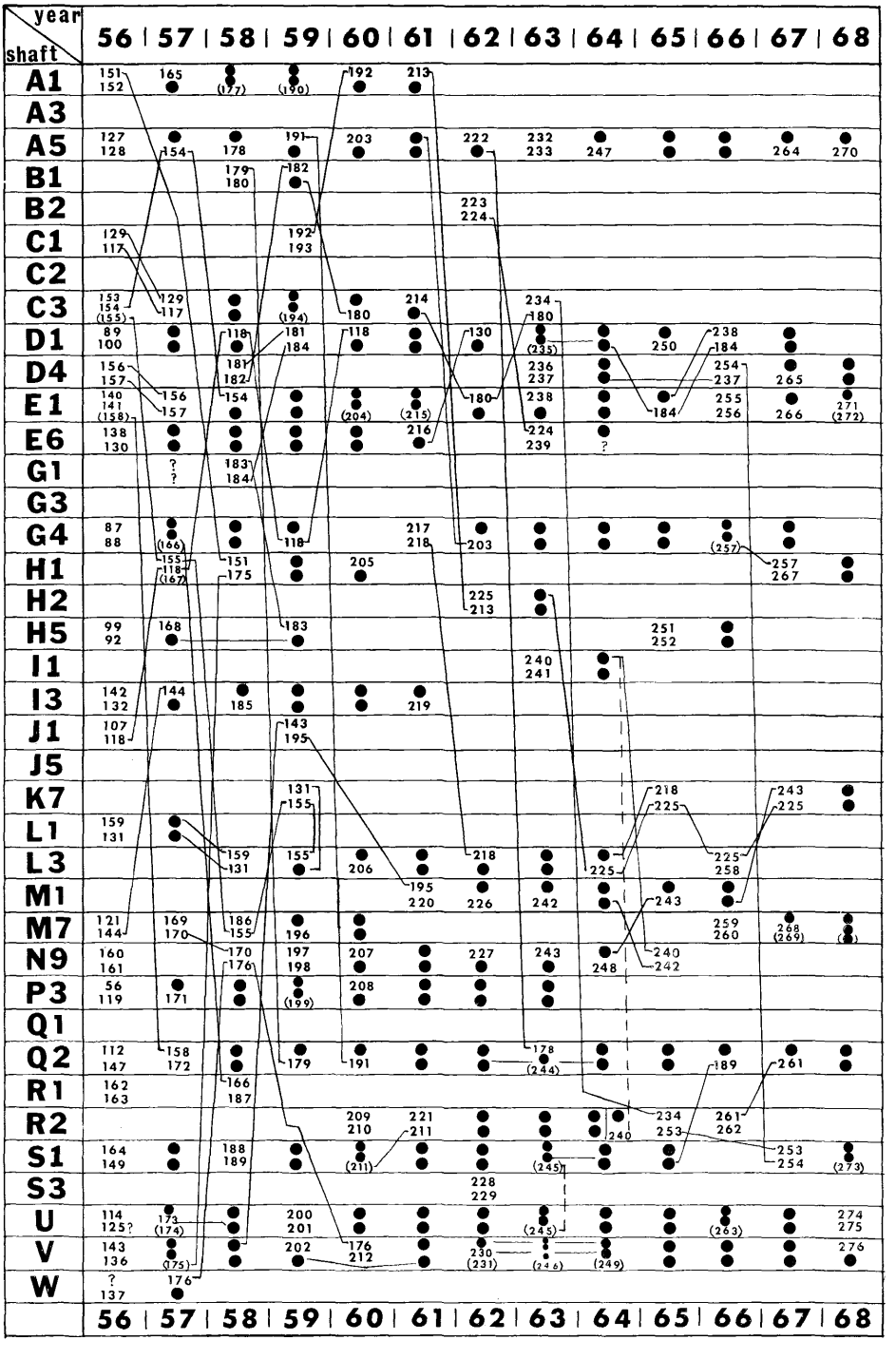
year
shaft
56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68
A1
A3
A5
B1
B2
C1
C2
C3
D1
D4
E1
E6
G1
G3
G4
H1
H2
H5
I1
I3
J1
J5
K7
L1
L3
M1
M7
N9
P3
Q1
Q2
R1
R2
S1
S3
U
V
W

FIGURE 5

TABLE 4

Data on chimney swifts included in figs. 4 and 5

Bird No.	Sex	Date Banded	Shaft of Banding	No. Years Captured	No. Years in Residence	Minimum Longevity
1	F	6-17-44	A1	8	8	9
2	M	6-17-44	A1	4	4	5
3	F	6-16-44	B1	4	3	5
4	M	6-16-44	B1	2	2	3
5	M	6-15-44	C3	6	6	7
6	F	6-20-44	C3	8	7	9
7	M	6-21-44	D1	7	7	8
8	—	6-25-44	D1	1	1	2
9	—	6-25-44	D1	1	1	2
10	F	6-18-44	D4	7	7	8
11	F	6-18-44	D4	10	10	10
12	M	6-18-44	D4	1	1	2
13	F	6-19-44	E1	6	6	7
14	M	6-26-44	E1	8	8	10
15	F	6-20-44	E6	2	2	3
16	M	6-26-44	E6	3	3	4
17	F	6-27-44	G4	5	5	6
18	M	6-28-44	G4	2	2	3
19	F	6-29-44	H1	5	5	6
20	M	6-29-44	H1	3	3	4
21	F	6-27-44	H5	5	5	6
22	M	6-27-44	H5	1	1	2
23	M	6-22-44	J1	6	6	7
24	F	6-23-44	J1	3	2	4
25	F	6-23-44	K7	7	5	8
26	M	6-27-44	K7	4	3	5
27	M	6-24-44	M1	4	4	5
28	F	6-24-44	M1	1	1	2
29	M	7- 4-44	M7	1	1	2
30	F	7-17-44	M7	4	4	5
31	F	7-15-44	N9	6	6	7
32	M	7-27-44	N9	6	5	7
33	M	9-25-44	U1	7	5	7
34	M	7-24-44	E1	6	5	6
35	M	7-28-44	E1	2	1	2
36	M	7-25-44	H1	7	6	7
37	M	5-20-45	C3	2	2	2
38	M	9-25-44	U1	3	2	3
39	F	6-18-45	J1	1	1	2
40	F	5-26-46	A1	1	1	2
41	F	10- 5-45	B1	9	8	8
42	—	5-31-46	H1	1	1	1
43	M	7-27-44	D4	9	7	8
44	F	6-10-45	L1	4	3	4
45	F	6- 5-46	A5	5	4	5
46	F	5-29-47	A5	2	2	3
47	M	6- 8-47	A5	3	2	5
48	F	5-27-47	C3	3	2	4
49	M	6- 5-46	A5	5	3	5
50	F	6- 5-46	L1	3	2	3
51	M	5-15-47	G4	4	4	5
52	M	5-26-46	G4	2	1	2
53	—	6-21-47	N9	1	1	1
54	M	6-28-47	P3	2	2	3
55	M	9-26-44	U1	7	5	7
56	M	7- 1-47	Q1	13	13	13
57	M	7- 1-47	Q1	3	3	4
58	—	7- 2-47	Q2	1	1	2
59	M	7- 2-47	Q2	5	5	5
60	M	7- 5-47	Q2	7	6	7

TABLE 4—(*Continued*)

Bird No.	Sex	Date Banded	Shaft of Banding	No. Years Captured	No. Years in Residence	Minimum Longevity
61	—	7- 5-47	Q2	2	1	2
62	F	7- 3-47	R2	1	1	2
63	M	7- 3-47	R2	3	2	11
64	F	9-25-44	U1	4	3	5
65	M	6- 8-47	A1	3	3	3
66	M	6- 6-48	B1	9	8	9
67	M	6-21-47	M1	2	1	2
68	F	6- 4-48	M1	2	2	3
69	F	5-13-46	B1	3	1	4
70	M	6-26-48	S1	3	3	3
71	F	6-11-46	B1	3	1	3
72	M	6-25-48	S3	2	1	3
73	F	6-20-48	D4	4	3	4
74	F	6-17-48	P1	3	2	3
75	M	5-28-49	D1	6	5	6
76	—	9-19-48	S1	2	1	1
77	M	5-28-49	E1	7	7	7
78	F	6- 3-49	I2	2	2	3
79	F	5-31-48	C1	4	3	4
80	F	6- 3-49	H5	1	1	2
81	M	5-13-48	A5	8	7	8
82	—	8-10-48	N9	2	1	2
83	—	5-31-49	N9	1	1	2
84	F	8-12-48	P3	5	4	5
85	F	5- 5-49	Q2	1	1	2
86	M	5-26-46	G4	4	2	5
87	F	8- 4-49	B1	11	10	11
88	M	8- 8-49	H1	10	9	10
89	M	8- 4-49	B1	9	8	9
90	F	6-23-49	A3	4	3	4
91	—	6-10-50	G4	1	1	1
92	F	6-29-50	H5	10	9	11
93	F	6-20-48	Q1	4	1	4
94	F	8-27-48	P3	4	2	3
95	F	6-15-48	P3	3	2	4
96	—	7-31-49	A1	3	1	2
97	—	8- 4-49	P3	3	1	2
98	M	8-12-50	S1	2	1	1
99	M	8-12-49	M7	8	6	7
100	F	6- 1-50	D4	9	8	9
101	F	6- 8-50	L1	5	4	5
102	—	9-21-50	Hallway	2	1	1
103	M	5-13-46	B1	4	3	8
104	F	9-23-47	G4	6	5	8
105	M	6-20-51	V1	1	1	1
106	M	8- 3-51	E1	11	10	10
107	M	7-30-51	G4	6	5	5
108	F	8- 3-50	C1	6	4	5
109	F	5-30-50	B5	6	4	6
110	—	5-28-52	P3	2	2	2
111	—	8-16-50	M7	4	2	3
112	—	5-23-52	R2	4	4	5
113	F	7-28-51	S1	6	5	5
114	F	6-30-51	S1	5	4	5
115	M	6- 5-52	V1	2	2	2
116	F	8-17-52	D1	4	3	4
117	M	8- 6-52	V1	8	7	8
118	—	8- 2-52	E1	5	3	4
119	F	7-20-52	G4	5	4	5
120	M	8-11-51	U1	3	1	2
121	F	8-11-51	U1	6	3	5
122	M	7-24-52	P3	3	2	2

TABLE 4—(*Continued*)

Bird No.	Sex	Date Banded	Shaft of Banding	No. Years Captured	No. Years in Residence	Minimum Longevity
123	F	5- 2-52	P3	4	3	4
124	M	7-31-52	S1	3	2	2
125	M	5- 5-53	U1	6	6	7
126	M	6- 7-53	V1	6	5	6
127	F	8- 2-53	E1	7	5	7
128	M	8-20-53	P3	4	3	4
129	F	5-25-54	Q1	7	7	8
130	M	6- 5-54	G4	12	11	12
131	M	8-27-53	G4	7	6	7
132	M	8-13-53	M7	4	3	3
133	F	7-22-52	E1	4	2	3
134	—	7-26-53	V1	4	3	4
135	—	5-23-52	D4	4	1	4
136	M	7-30-51	G4	9	7	10
137	F	5-20-50	N9	3	2	6
138	F	5-27-54	C1	7	6	7
139	M	5-29-54	D3	2	1	2
140	—	8- 2-53	E1	4	2	3
141	—	7-24-54	D1	3	2	2
142	F	8-28-54	M7	4	3	4
143	F	8-20-53	E1	7	5	6
144	M	8- 1-53	H5	9	7	8
145	F	8- 1-53	P3	3	1	2
146	—	8-15-53	D1	3	1	2
147	—	8-28-54	S1	3	2	3
148	M	7-24-54	D1	3	1	2
149	F	6-15-55	T1	3	3	3
150	—	9-16-54	E1	4	1	4
151	—	6-15-55	G1	5	3	5
152	M	8- 6-55	G4	7	6	7
153	F	6- 3-56	A1	1	1	2
154	M	8- 3-56	C3	6	5	6
155	F	6-15-55	K1	7	6	7
156	M	7-24-54	J1	4	2	3
157	F	6-15-55	D4	10	9	10
158	M	9-18-55	E1	8	7	7
159	F	7-27-55	E1	4	3	4
160	—	Not Captured	—	—	—	—
161	—	Not Captured	—	—	—	—
162	—	10- 2-54	A5	2	1	2
163	—	5-18-55	S1	2	1	2
164	M	6-15-55	T1	3	2	3
165	F	5-18-57	B1	4	3	5
166	—	9-29-56	G4	3	2	2
167	—	5-14-57	A1	1	1	1
168	M	6- 2-56	C1	2	1	2
169	F	5-14-57	A1	1	1	2
170	M	6-18-57	M7	3	2	4
171	F	9-16-56	Q1	4	2	4
172	F	5-21-57	Q1	2	2	3
173	F	5-25-57	U1	2	2	3
174	—	5-25-57	U1	1	1	1
175	—	5-14-57	A1	4	4	4
176	F	5-25-57	W1	11	10	12
177	—	5-20-58	A1	2	1	2
178	M	9-16-57	E6	12	11	12
179	F	7- 2-57	B1	3	2	3
180	M	9-14-57	D1	7	6	7
181	M	9-14-57	D1	3	2	3
182	F	7-18-57	E1	3	2	3
183	M	7-25-55	J1	6	2	5
184	F	6-22-57	R1	11	10	11

TABLE 4—(*Continued*)

Bird No.	Sex	Date Banded	Shaft of Banding	No. Years Captured	No. Years in Residence	Minimum Longevity
185	F	6- 3-56	Q1	5	3	5
186	—	5-22-57	B1	4	3	4
187	—	5-20-58	R2	1	1	2
188	M	8-10-56	Q2	11	8	10
189	F	5-11-58	S1	9	9	10
190	—	6- 7-59	A1	1	1	1
191	F	5-25-58	B1	8	7	8
192	F	8-30-58	U1	4	2	4
193	M	8-30-58	H1	3	1	3
194	—	6- 5-59	C3	1	1	1
195	—	5-25-58	L3	9	7	9
196	—	8-30-58	H1	3	2	3
197	F	6- 3-59	N9	1	1	2
198	M	6- 3-59	N9	5	5	6
199	—	6- 5-59	S3	5	4	5
200	M	9-14-57	P3	12	9	11
201	F	8-30-58	U1	10	9	10
202	F	8- 6-52	V1	2	1	8
203	F	6- 6-60	A5	8	7	8
204	—	7-18-59	E1	2	1	1
205	—	7-17-59	S1	2	1	2
206	M	6- 3-59	N9	5	4	5
207	F	8-30-58	H1	4	2	3
208	—	6- 8-60	P3	4	3	4
209	—	8-30-58	P3	3	1	2
210	—	9-16-60	R2	1	1	2
211	M	9-17-59	S1	6	5	5
212	M	8-30-58	U1	3	1	2
213	—	9-17-59	S1	5	3	4
214	F	9-14-60	E1	2	1	2
215	—	5-20-61	E1	1	1	1
216	F	9-17-59	S1	3	1	2
217	M	9-17-59	S1	9	7	8
218	F	9-20-60	G4	6	5	6
219	F	6-22-61	I3	1	1	2
220	F	9-16-60	N9	3	1	3
221	F	5-30-59	U1	6	4	6
222	F	6-20-61	M7	5	1	5
223	—	7-14-61	B1	2	1	2
224	—	9-22-61	L3	4	3	4
225	M	7-17-59	C3	10	7	9
226	F	9-14-60	E1	3	1	2
227	F	5-11-61	P3	3	1	3
228	—	7-17-59	A1	3	1	3
229	—	6-18-61	S3	2	1	2
230	M	9-24-58	V1	9	7	10
231	—	5-19-62	V1	2	2	2
232	M	6- 3-62	J1	7	6	7
233	F	6- 3-63	A5	1	1	2
234	F	5-25-62	North Hall	4	2	4
235	—	9- 2-62	G4	5	1	4
236	—	8-31-62	E1	3	2	3
237	M	5-15-63	D4	6	4	6
238	M	9-17-59	S1	6	5	8
239	—	5-29-62	D4	2	1	2
240	M	5-24-63	I1	3	3	4
241	F	5-30-63	I1	2	2	3
242	F	6- 3-62	J1	4	3	4
243	F	9-16-62	G4	7	6	7
244	—	9- 2-62	Q2	2	1	2
245	—	5-31-62	R2	5	2	4

TABLE 4—(*Continued*)

Bird No.	Sex	Date Banded	Shaft of Banding	No. Years Captured	No. Years in Residence	Minimum Longevity
246	—	5-18-63	V1	1	1	1
247	F	9-27-63	L3	4	3	4
248	M	5-30-61	D4	4	1	4
249	—	5-18-64	V1	1	1	1
250	F	7-14-63	U1	3	1	2
251	—	6- 7-64	Q1	3	2	3
252	—	6-27-64	P3	3	2	3
253	M	7-21-64	E1	5	3	4
254	F	5-30-65	B1	4	3	4
255	—	9-20-64	L3	4	3	4
256	—	6- 5-66	B6	1	1	2
257	—	9-22-65	G4	4	3	3
258	F	9-22-65	G4	2	1	2
259	M	5-31-65	A5	4	3	4
260	—	5-22-66	M4	1	1	2
261	F	9-17-64	A5	5	3	4
262	M	5-16-66	A1	1	1	2
263	—	6-25-66	U1	1	1	1
264	F	5-16-66	S1	2	1	2
265	F	7-22-66	U1	3	2	3
266	—	7-22-66	U1	2	1	2
267	—	5-18-67	E1	2	2	3
268	—	5-31-66	A1	3	2	3
269	—	6- 1-67	M7	2	2	2
270	F	9-22-65	G4	3	1	3
271	—	7-22-66	J1	3	2	3
272	—	5-10-68	E1	1	1	1
273	—	6- 4-68	S1	1	1	1
274	—	9- 1-67	A5	2	1	2
275	—	6-24-68	U1	1	1	2
276	F	9-28-66	V1	2	1	2

tend to remain mated to each other (177 cases). On the other hand, a few individuals change each year from one place to another (143 cases). On rare occasions both mates return and remain mated, but occupy a new shaft together. On other rare occasions both mates return, but each one acquires a new mate.

From a flock of 119 swifts that were accidentally destroyed, it was determined that the sex ratio was equal (60 males: 59 females), and body weights were equal. Males ranged 21.5–27.5 gm. (aver. 24.6 gm.), while females ranged 21.5–28.0 gm. (aver. 24.3 gm.).

Previously, a number of life histories of certain swifts from the campus colony have been published. Table 7 indicates those 19 which have already been described either partially or for the entire life span. Eight of these are typical life histories, six show unusual behavior, and two are only partial accounts. Two publications are detailed accounts of two swifts over a period of ten years, and one is a detailed life history of the oldest swift known, with an annual account of its breeding history for over 13 years. Also, a special study on nesting by three-some and four-some groups has been published (Dexter, 1952b).

Some Noteworthy Breeding Histories

In addition to those already published, the following sketches of some selected cases illustrate the pattern and variety of life history and breeding behavior of Chimney Swifts in the campus colony.

TABLE 5

Analysis of chimney swift nesting charts

	No. of Pairs	No. of 3-Somes	No. of 4-Somes	No. Breeding	No. of Visitors	No. Which Changed Location ( )=over more than 1 year	No. Which Remained in Place	Total No. in Residence
1944	13	2		30	2			32
45	11	2	1	28	4	3	22	32
46	11	2	1	28	4	4	23	32
47	17	1	2	39	5	11	14	44
48	14	3	1	36	5	7	26	41
49	14	4	1	38	6	6 (1)	23	44
50	13	5		35	5	7 (2)	22	40
51	12	3		30	3	8	15	33
52	8	5		26	5	5	16	31
53	12	3	1	32	5	7	19	37
54	15	4		37	4	7	23	40
55	17	3	1	42	5	4	30	47
56	20	2		44	2	8 (2)	20	46
57	15	4		38	4	9	19	42
58	20	1		42	1	9 (1)	20	43
59	19	3		44	3	8	24	47
60	15	2		34	2	4 (1)	21	36
61	16	1		34	1	1 (2)	24	35
62	15	1		32	1	5	18	33
63	13	4	1	36	5	3	23	41
64	15	1		31	1	1	26	32
65	13			26		6 (1)	15	26
66	11	2		26	2	4	13	28
67	11	1		24	1	5 (1)	13	25
68	7	3		20	3		16	23
Range	7–20	0–5	0–2	20–44	0–6	0–11	13–30	23–47
Average	13.9	2.5	0.36	33.3	3.2	5.5	20.2	36.4

TABLE 6

Analysis of chimney swift pairing behavior
(Banded 1945 thru 1956 and traced thru 1966—Total: 129 birds)

	Number of Years												
	1	2	3	4	5	6	7	8	9	10	11	12	13
No. birds involved in nesting:	35	26	19	11	10	6	10	6	3	1	1	0	1
No. paired:	33	30	14	9	5	7	7	4		1			
No. in three-some:	35	14	10	3									
No. in four-some:	17	2	1										
No. of mates: 1 mate	30	12	8	2				1					
2 mates:		14	7	8	3	1	3	1	1				
3 mates:			3	1	4	3	2	0	1	1			
4 mates:					1	2	2	1	1				
5 mates:							1	2	1	1	1		
6 mates:							1						
No. different mate each nesting:		14	2										
No. with exclusive mate:		12	9	2				1					

TABLE 7

Chimney swifts whose life history has been published in part or in full

Nesting Chart No.	Band No.	Notes	Reference
1	42–196904	Typical life history	Dexter, 1950b
5	42–196901	" " "	" "
11	42–196907	10-year life history	" 1956a
13	42–196909	Typical life history	" 1951a; 1951c
14	42–196921	" " "	" " "
23	42–196913	" " "	" "
25	42–196914	" " "	" "
41	42–184486	" " "	" "
43	42–196952	Unusual life history	" 1951b
56	42–188523	13-year life history	" 1968b
66	42–188516	Unusual life history	" 1952a
77	42–188588	Typical life history	" 1955
81	42–188540	Partial life history	" 1952d
87	48–164510	10-year life history	" 1961b
109	48–164543	Partial life history	" 1952d
143	21–128574	Unusual life history	" 1961a
197	24–167740	" " "	" "
198	24–167741	" " "	" "
240	25–137573	" " "	" 1967

Case History 1.—Chimney Swift 42–188540 (No. 81 on the nesting charts) was a male banded 13 May 1948 from shaft A5, captured with two other returning birds which later became residents in that shaft, but failed to complete a nest. One week later No. 81 was recaptured in shaft A1, together with the mates of that shaft. Six days later he was found alone in shaft J1, and after another three days was found alone in shaft M7. On 10 June he was in shaft L1 with female 42–188542. On 26 June, they moved into shaft K1, but failed to nest. On 10 August, No. 81 roosted for the night with the mates of shaft N9 and five other swifts. He was recaptured as a return 12 May 1949 from shaft N9 with two other birds. No. 81 then went into shaft M7, where he was joined by female swift 42–188544 (No. 68 on the charts). These nested in M7 where No. 68 had nested the previous year. In 1950 No. 81 returned to M7, but, in the absence of his former mate, was joined by female 42–196906 (No. 10 on the charts) as his new mate. Later they were joined by 42–196914 which became a visitor with this pair in M7, forming a three-some for the season.

When No. 81 returned 30 April 1951, he was recaptured from shaft M7, but, in the absence of his former mate, was roosting with female 42–188550 (No. 73 on the charts). These two nested successfully, but the next year his new mate did not return. In 1952 he began nesting with 48–164543 (No. 109 on charts). This pair nested in shaft M7 for four consecutive years (1952–55). In 1954 they were joined by a visitor 21–128563, one of their own offspring from the previous year, forming another three-some. While the mated pair had several temporary visitors in the season of 1955, none of them remained for long.

Case History 2.—In 1950 the three-some which had nested together the previous year in shaft D1 resumed nesting as before in the same shaft. Five eggs were laid, but one disappeared, and on 7 June the female parent also disappeared. Only the male, 42–184486, (chart No. 41) remained. On 11 June the remaining four eggs disappeared from the nest and on 17 June a new female (48–164508) joined the deserted male. Immediately a new clutch of eggs was laid in the same nest by the new female (chart No. 89); all of them were successfully hatched. This

same pair continued to nest in shaft D1 for the next three years, at the end of which time the female disappeared and was replaced by No. 100 (48–164546). This new pair continued nesting in shaft D1 through 1957 (for four years). In 1955 they were joined by a seasonal visitor. In 1958 No. 89 failed to return and was replaced by another male which nested with No. 100 that year.

Case History 3.—Female 48–164550 (No. 92 on chart) was banded 29 June 1950 when trapped with her mate 42–196952 from shaft H5. At that time the nest was about half made and about three weeks behind the usual nesting schedule. In spite of the late date, nesting was successful, and by middle August the young birds were off the nest. When No. 92 returned to H5 in 1951, she had a new mate. Her former mate nested that year in shaft H2, but in 1952, he rejoined No. 92 in H5 and her mate of the previous year moved into L3 for nesting. In 1953 her mate did not return; she nested with another bird for that season. When she returned in 1954, she again nested in H5 with her mate of 1951 who returned to H5 from L3 where he had nested the past two years. These remained mated through the season of 1956 in shaft H5. When her mate failed to return in 1957, she nested in the same place with a new male, but failed to nest in 1958 when he did not return. In 1959 she resumed nesting in H5 for the last time with another male which had previously nested in shaft G1.

Case History 4.—Chimney Swift 20–188695 (No. 117 on charts) was banded 6 August 1952 from shaft V. It was taken with a group of 38 roosting swifts, including the nesting pair which resided there and 14 other banded birds. No. 117 returned 24 May 1953 and was taken from shaft D1, where it was temporarily visiting the mated pair in that shaft. No. 117 then moved into shaft C2, where he was joined by female 42–196907. At times they roosted in shafts C1 or C3, but finally made their nest in C2. This was unexpected, since swifts typically nest in the end shafts of a block rather than in the middle. They raised only two juveniles. The male was taken as a return from shaft C2 on 3 May 1954, when he was found roosting alone. His former mate did not return. He was then joined for a brief time by the female which had nested in shaft A3 the previous year. They occupied first one and then another shaft in the C block, but eventually the female left to nest in shaft E6. Several other visitors were found roosting with No. 117 in shaft C1, but on 5 June 1954 he settled in shaft C2 with a new mate, 21–128598 (No. 129 on charts). When they returned in 1955, they remained mated, but nested in shaft C1. At first they roosted for brief periods in shafts C2 and B1, but they finally settled in shaft C1. The same pair nested in the same shaft in 1956, but in 1957 they moved into C3, where they remained over the next three years. In the season of 1959, they had a visitor with them for the entire nesting season; this was the final year for No. 117.

Case History 5.—Male Chimney Swift 21–194777 and female 24–167608 (Nos. 188 and 189 on the charts) proved to be the second most constant pair for remaining mated over the longest period of time, nesting in shaft S1 for eight consecutive years (1958–65). No. 188 was banded as a juvenile from shaft Q2 on 10 August 1956. He was a casual visitor on the campus in 1957, roosting first one place and then another, sometimes alone and sometimes with other swifts. In 1958 when he returned from his winter home in the upper Amazon Valley (See Lincoln, 1944), he joined female 24–167608 in Shaft S1, where they were to remain as mates over the next eight years. In the season of 1960 they were joined by a visitor, which returned to them again in 1961, but did not remain long, since he acquired his own mate and nested in Shaft R2. Three years later another visitor stayed with them for part of the nesting season. In 1961 they were visited by two birds on brief occasions. During that year the nest fell from the wall, following a heavy rain. One egg and two nestlings were destroyed. No attempt was made to replace the nest. (If nesting has not proceeded too far, a fallen nest will sometimes be replaced and a new clutch of eggs laid—see Dexter, 1952a). Late in the season,

this pair often served as hosts to swifts flocking in preparation for migration. In 1963 the S1 pair was joined by a visitor for part of the nesting season. In 1963 two eggs which had been laid disappeared on 30 May, and on 4 June the nest was washed away by a heavy rain, but in this case, a replacement nest was constructed beginning 14 June. The first replacement egg was found 23 June, the second one three days later, and a third one the next day. These were later abandoned; possibly they were infertile. In 1964 the pair was reunited, and for a short time a visitor stayed with them. During a severe storm on 20 June, the nest was once again destroyed, but three juveniles survived the fall and were faithfully tended by the adults at the bottom of the shaft. In 1965 they successfully raised three juveniles without incident. No. 188 returned 5 May 1966 to his summer nesting place with his former mate, but nine days later he was found dead in Ravenna, Ohio, where he had struck some object while in flight. Following this accident, No. 189 moved into Shaft Q2 and nested with the male which had been a resident there since 1963. This was the final year for No. 189.

Case History 6.—Chimney Swifts 24–167601 and 24–167731 (Nos. 200 and 201 on the charts) had the longest life together, nesting for nine consecutive years in shaft U. The former proved to be a male and the latter a female. The male was banded as a juvenile from shaft P3 on 14 September 1957. It was recaptured the next year from the same shaft with its parents, which continued to nest there. No. 200, being immature, was a casual visitor on the campus that year. In 1959 he took up residence in shaft U, where he was joined by No. 201, and over the next nine years they remained mated and continued to occupy that same shaft. During the first year of nesting, a single egg was laid, which was eventually deserted. At the end of that season, this pair was host to a flock of 143 swifts, which roosted in their shaft in the evening of 17 September 1959. The next year, this pair was the first to complete its nest (on 28 May) and the first to lay eggs (two found on 1 June). Three more eggs were subsequently laid, but on 8 June 1960 the nest and eggs disappeared. The mates remained, however, and replaced the nest, building on the opposite wall from the previous nest. In 1961, during a heavy rain storm in the evening of 16 July, the nest fell from the wall, but the three juveniles managed to cling to the wall without suffering a fall. In 1962 the parents again returned early, started nest building 19 May, and laid the first egg (29 May) to appear in the colony. That year there were no complications. In the season of 1963, this pair had a visitor for part of the season, sharing it with the pair in shaft S1. That year the nest, attached 36 feet down on the west wall, was found missing as the birds were released from the trap on 26 May. Within a few days, a new nest was started on the opposite wall, 36 feet down from the top. The first egg appeared 5 June. A total of four was laid, as usual. On 7 July, the nest fell under the weight of the nestlings, which could be heard crying at the bottom of the shaft. Two of them survived and eventually worked their way up the wall where they remained until they could fly.

In 1964 the same pair resumed nesting in shaft U. Four eggs were laid, but, following a severe storm during the night of 20 June, the eggs disappeared. The next day the parent birds and two visitors were observed in the shaft, but they soon abandoned it. The next year they were among the first to return to the campus and the first to construct a nest (completed 13 May), and the next day they laid the first egg of the season (earliest on record for this colony). They successfully raised four nestlings. In 1966 they again made the first nest of the season, laid the first egg, and raised four nestlings (although five eggs were laid), but this time they had a seasonal visitor (No. 263) with them during much of the nesting period, and on a few occasions, a second visitor. In the evening of 21 July, approximately 50 swifts occupied shaft U. The next night 28 were trapped from there, including the mates of that shaft and their visitor, three non-nesting repeats from the campus colony, a return, and 21 unbanded birds. In

1967 the same pair, with only a temporary visitor, was again among the first to nest, but not as early as before; the first egg was laid 5 June. The installation of pipes in shaft U that summer interferred with normal nesting, but two juveniles persisted. While No. 200 returned in 1968, he did not go to his usual shaft, his mate did not return, and he soon disappeared.

Placement and Use of Nest

Over the years of this study, 400 nests were measured. The nearest to the top of the air-shaft was only 5.6 ft down, while the deepest was 53.2 ft down. The average depth was 22.05 ft. South and north walls (directions are only approximate) were used most often (163 and 101 times respectively), while west and east walls were used 94 and 42 times, respectively. While they used the south and north walls about twice as often as the east and west walls, there were twice as many shafts (19) with the long axis facing in those directions as there were shafts (10) with west- and east-facing walls with the long axis. There seems to be no apparent reason for the predominant choice of south over north and west over east. Eight shafts were equal in dimensions, but even in these, south was chosen more often than north and west was chosen more often than east. Typically the same birds built their nest in approximately the same place from one year to the next. Even when new occupants entered a shaft, they generally nested in the same area on the same wall.

Generally about one-quarter of the nests fell from the wall by the end of the autumn season, one-half fell during the winter season, and one-quarter remained when the swifts returned in the spring. Only twice did swifts attempt to reuse the old nest, and both times they were unsuccessful (for details see Dexter, 1962b). At times the nest fell before nesting was completed. If incubation had not proceeded too far, a replacement nest was constructed and a new clutch of eggs laid. If nestlings from a fallen nest were not killed in the fall, they were tended and fed at the bottom of the shaft until they could climb up the walls. A number and variety of special cases have been described (Dexter, 1952a; 1960b).

SUMMARY

1. Between 1944–68, a total of 1700 Chimney Swifts was banded on the campus of Kent State University, Kent, Ohio, of which 274 became summer resident birds occupying 38 of the 86 air-shafts on four buildings. In addition to the band, each resident was given a paint-mark annually for ready identification.

2. From 28 to 55 swifts returned each year (average 41.5), giving a total of 996 return records made by 318 birds. The year 1959 had the largest number of returns and the greatest number of year-classes (11). Since 1963 there has been a decline of returning and resident swifts.

3. Ages of birds ranged from one to 13 years (average 4.6); length of residence averaged 3.4 years. Nineteen swifts lived at least 10 years or more.

4. Eight recoveries and four "foreign recoveries" were made, the most distant being from Chattanooga, Tennessee, and Rome, Georgia. Reciprocal recoveries were made from both of those localities.

5. Median dates were determined for: first arrivals (Apr. 21), start of nest building (May 23), first egg (May 29), first fledging (July 14), last departure (Oct. 6), and length of residence (168 days).

6. Nesting groups (pairs, three-somes, and four-somes) occupied separate air shafts, distributed themselves as widely as possible, and, with few exceptions, utilized the end-shafts and avoided occupying adjacent shafts.

7. The combinations of all pairs, three-somes, and four-somes are charted for each year to show duration of nesting groups, annual changes in their composition, and changes of nesting site. There were 486 cases of the same bird nesting in the same shaft from one year to the next, 177 cases of the same pair remaining

together from one year to the next, and 143 changes in nesting location. An average of 36.4 birds were in residence each year. Mated pairs tended to remain mated to each other as long as both returned to the campus, but occasional changes were made. They also tended to nest in the same shaft as long as mated to each other.

8. Pairing behavior is analyzed for 129 swifts banded between 1945–56 and traced through 1966, when all had completed their life span.

9. Sex ratio was 1M:1F and average weight (24.45 gm) was the same for both sexes.

10. Nests were placed an average depth of 22 ft down in the air-shaft on all directions of walls, but with a preference for south over north and west over east. When walls were unequal in breadth, the wider side was used five times as often as the narrow side. Only one-quarter of the nests remained until the next nesting season and they were never reused successfully.

11. Six cases of breeding histories are traced, including two pairs which remained mated to each other and occupied the same air-shafts, over periods of eight and nine years, respectively.

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