

NESTING SUCCESS OF CHIMNEY SWIFTS RELATED TO AGE AND THE NUMBER OF ADULTS AT THE NEST, AND THE SUBSEQUENT FATE OF THE VISITORS

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Visitors and "helpers at the nest" have been reported for numerous species of North American birds (see review in Woolfenden 1976). Day (1899) and Sherman (1952) were the first to report observations on "helpers at the nest" among Chimney Swifts (*Chaetura pelagica*). In a banding and nesting study of Chimney Swifts at Kent State University, Kent, Ohio, in progress since 1944, many such cases have come to my attention. Some details of nests with 3 to 5 birds present have already been published (Dexter 1952, 1969, 1974). This report deals with nesting success of Chimney Swifts related to age and to the presence of visitors, commonly called "helpers at the nest," and with what became of those visitors in future years.

METHODS

General methods of study have been described earlier (Dexter 1969). Age has been determined by date of banding and the first year of breeding, which is usually the second year of life. Some ages must be regarded as minimum age. Sex has been determined by dissection of dead birds, and indirectly through the breeding records of those birds and subsequent generations over many years' time. The visitors were easily recognized because many of them joined a mated pair after nest building began; usually they roosted a short distance from the mates (which always roosted side by side before the nest was completed), and sometimes the visitor roosted on a different wall. All individuals were paint-marked for positive identification.

RESULTS

Nesting success of chimney swifts related to age.—The clutch size of 86 known first-year nesting females averaged significantly smaller than subsequent clutches (Table 1). First clutches ranged in size from 2 to 5 eggs (mean = 3.5, mode 3). In subsequent years clutch size ranged from 3 to 7 (mean = 4.1, mode 4). The average clutch size was consistent following the first year of nesting. From a single factor analysis of variance and the Newman-Keuls multiple range test, the first year clutch size is shown not to be equal to subsequent clutch sizes, and beyond the first year, clutch sizes are not significantly different at the 0.05 level of probability. The unique case of 7 eggs laid in one nest may have been the product of 2 females since there had been a visitor at that particular nest.

Nesting success of chimney swifts related to number of adults associated with a nest.—By 1979 I had observed 95 cases of nestings with more than 2 adults associated with a nest. Eighty nests each had 3 birds present, 13

TABLE 1. Clutch size of Chimney Swifts related to year of nesting (n = 86 ♀♀).

Clutch size	Year of nesting							
	1st	2nd	3rd	4th	5th	6th	7th	8th
2	3 (5) ¹	0	0	0	0	0	0	0
3	30 (48)	8 (23)	5 (15)	4 (21)	2 (13)	1 (11)	0	0
4	21 (34)	20 (57)	20 (59)	9 (47)	8 (53)	7 (77)	6 (75)	5 (83)
5	8 (13)	7 (20)	8 (23)	6 (32)	5 (33)	1 (11)	2 (25)	1 (17)
7	0	0	1 (3)	0	0	0	0	0
Mean clutch size	3.5	4.0	4.2	4.1	4.2	4.0	4.2	4.2
n =	62	35	34	19	15	9	8	6

¹ Number of clutches (% of total sample for age group).

had 4, and 2 had 5 birds. These nests involved 79 different individual birds as visitors. In 76 cases of these, involving 36 individuals (where the sex of the helper was known), 26 were males (72.2%) and only 10 were females (27.8%). In 5 cases a female was nesting for the first time and with a "helper" present during the nesting season. Clutch size of these 5 nests ranged from 3 to 4 (mean = 3.6). In 30 cases of first-year nesting females without visitors, the number of eggs ranged from 3 to 5 (mean = 3.5). While the number of eggs was about the same, the number of young produced with visitors present ranged from 3 to 4 (mean = 3.4), whereas without visitors the number of young produced ranged from 1 to 5 (mean = 2.9). The sample of first-year nesting females with visitors, however, is small. While there is an indication that in such cases visitors may possibly lead to a small increase in the production of nestlings, the difference is not statistically different (*t*-test, $P > .05$).

In 29 cases where the female had nested previously and had visitors at the nest, the clutch size ranged from 3 to 5 (mean = 4.2). In 80 cases where females which had nested previously and without visitors, the number of eggs also ranged from 3 to 5 (mean = 4.0). The number of young produced by those with visitors ranged from 1 to 4 (mean = 3.3), and the number of young produced after their first year of nesting without visitors ranged from 2 to 5 (mean = 3.3).

It would appear that during the first year a female breeds, the presence of "helpers" or visitors may possibly result in a small increase in the number of young produced, though this is not supported statistically. After the first year of nesting, however, there is no advantage (in terms of number of young produced) in the presence of visitors. In most cases, groups of 3 or 4 birds seem to be for the convenience of immature and unmated swifts. Where sex has been determined, the greater number of these are males, and while they may give some assistance, their presence does not usually seem to be a case of altruism.

On occasions they may help with incubation and feeding of nestlings, but this rarely increases productivity beyond the first year a female is breeding. Fischer (1958), in observing a single case of 3 Chimney Swifts nesting together, failed to find the visitor to take a turn at incubating the eggs, but it did help some in feeding the nestlings.

Subsequent fate of visitors.—An analysis of visitors banded from 1944 to 1978 and traced through 1979 (36 years) shows the following situations in reference to time spent as visitors and their subsequent life history. The extra bird often joined the mated pair after nesting began, and paint marks on all individuals clearly indicated the relationship of the group. Visitors were usually at some distance, at least some of the time, although at times, especially during cool weather, the 3 were side by side either on the wall or on the nest. Some visitors continued in that role for 2 or more years before obtaining a mate of their own.

I studied 79 Chimney Swifts that lived at some time as visitors. These were involved in 74 nests with 3 adults (65 birds included as visitors), 11 nests with 4 adults (15 birds as visitors), and 2 nests with 5 adults (6 birds as visitors).

In later years, 100 nests including 12 with 3 birds, 2 with 4 birds, and 1 with 5 birds, involved 34 swifts which were former visitors, but subsequently became breeding birds. However, 44 other birds lived in the campus colony only as visitors.

Twenty-eight swifts were visitors with 2 other birds for 1 year; 3 were visitors for 2 years; and 1 was a visitor for 3 years. Also, 4 birds were visitors only in a group of 4 birds for 1 year, and 1 bird was a visitor in a group of 4 for 2 years.

Two birds lived as a visitor only for 2 years, 1 year in a group of 3, another year in a group of 4. Four birds were visitors only for a single year each in a group of 5.

Two swifts became a visitor with their parents the following year, and 1 bird became a visitor with its male parent the following year. Four swifts were visitors at first, but became a mate for late nesting the same season, or for a second nesting in another shaft as replacements for a breeding bird. None of these visitors however, mated with birds in the same group.

One bird was a visitor in 2 different shafts during the same season. One bird was a visitor for 2 years, then a mate for 3 years living for the last 2 in a group of 3. One female, after being a visitor for 1 year, became a breeding bird for 5 years (including 1 year in a group of 3), and was mated to 2 males during 1 season. Another bird, after being a visitor for 1 year, became the breeding bird in a group of 5, but over the following 3 years nested without any visitor. Another one, after being a visitor in a group of 5 for 1 year nested without visitors for 3 years.

Another visitor in a group of 5 for 1 year became a visitor in a group of 3 the following year, and then for 5 years was mated with a member of a former group. Details on the life history of this bird (no. 73-26436) are given below.

The longest breeding histories of swifts which began as visitors are as follows:

After being a visitor for 1 year, a male became a breeding bird for 9 years during which time it was in 3 groups of 3 and 1 group of 4. The other case was another male visitor in a group of 4 for 2 years, then in a group of 3 for 1 year, followed by 10 years of breeding during which time it was involved in 2 groups of 3 and 1 group of 4.

There was only one case of reversed behavior in which a breeding bird became a visitor. After 4 years of successful nesting, a female was absent for 2 years, but returned as a visitor in a group of 3 for its last year in the colony.

In only one case did a swift become the mate of a bird with which it was a visitor the previous year. Following is the life history of swift no. 73-26436 (referred to below as no. 36) which was a visitor in the colony for 2 years before breeding with a former host. No. 36 (later determined to be a male) was banded 18 June 1974 from air shaft H1 (See Dexter 1969:194 for location of air shafts) along with 2 other presumably immature visitors. At that time there were 4 eggs in the nest, and this group formed the first nesting group of 5 observed over 31 years of observations in this colony (Dexter 1974). (Zammuto and Franks 1978, reported a record number of 40 Chimney Swifts inhabiting a tree cavity with a single active nest.) Three days later no. 36 was taken as a repeat from shaft E1 as a temporary visitor along with 3 unbanded birds, also temporary visitors with the pair in shaft E1. At the time there were 5 eggs in that nest.

On 13 May 1975, no. 36 was captured as a return from shaft E1 with the former mates of that shaft plus 23 unbanded birds. Two weeks later no. 36 was taken as a repeat in air shaft M7 along with 2 returns. One of these (73-26426) had been a seasonal visitor in that shaft the previous year. The other (73-26489) had been banded the previous fall. These 2 returns became mates in M7 that year while no. 36 remained with them as a seasonal visitor forming a group of 3. No. 36 was the last swift to leave the campus that year (9 October 1975).

On 15 May 1976, no. 36 was recaptured in shaft C2 with an unbanded bird. Fifteen days later no. 36 was taken again from shaft M7 with its mate, no. 89, which had nested in that shaft the previous year where no. 36 was a visitor. This was the first known record of a former visitor mating with its former host.

In 1977, nos. 36 and 89 again were mated and in shaft M7; with them was a seasonal visitor (870-14159) which had roosted briefly there the previous year and which formed a group of 3 with the pair in 1977. Over the next 3 years nos. 36 and 89 remained mated and nested in shaft M7. They were joined by a visitor again in 1980 (#87-90730).

SUMMARY

First-year nesting Chimney Swifts in a colony on the campus of Kent State University, Kent, Ohio, laid fewer eggs (average 3.5) than in subsequent years (average 4.1).

First-year nesting females with "helpers" at the nest (i.e., seasonal visitors) laid about the same number of eggs as those without "helpers," but may produce more nestlings.

Beyond the first year of nesting, the mean number of eggs and nestlings produced did not vary significantly regardless of the presence of visitors.

There is no clear indication of altruism among nesting Chimney Swifts. Birds living with a mated pair are usually immature, or unmated. In spite of some aid given, nestling productivity is usually not increased.

In the subsequent life history of 79 Chimney Swifts, which lived at some time as visitors, 43% became breeding birds in the colony. However, most resided in the colony only as visitors over varying lengths of time. Two swifts became a visitor with their parents the following year, and one became a visitor with its male parent the following year. Four birds began as visitors, but became a breeding bird later in the season; none of them was mated with the original "host" bird of that season. The longest breeding histories for former visitors were 9 and 10 years.

The breeding history of Chimney Swift no. 73-26436 is given in detail, this was the only visitor which was later mated to its former female host.

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