TABLE TWO. AGE RATIOS BY FAMILIES OF BIRDS BANDED IN CENTRAL NEW JERSEY - AUTUMN 1970.

Family	N	HY	%HY	AHY	%AHY
Columbidae	50	9	18.0	41	82.0
Tyrannidae	12	12	100.0	0	00.0
Corvidae	61	34	55.7	27	44.3
Paridae	17	14	82.4	3	17.6
Troglodytidae	32	26	81.4	6	18.6
Mimidae	124	79	63.7	45	36.3
Turdidae	152	118	77.7	34	22.3
Sturnidae	10	9	90.0	1	10.0
Vireonidae	18	16	88.9	2	11.1
Parulidae	193	95	49.2	98	50.8
Fringillidae	448	327	73.1	121	26.9
TOTALS	1117	739	66.1	378	33.9

* * *

THREE-YEAR BANDING PROJECT OF TREE SWALLOWS

By Kenneth Wade Prescott

The recent article by Frederick S. Schaeffer (1971) on Tree Swallows, *Iridoprocne bicolor*, at coastal and inland areas referred to the present study than in manuscript form. This three-year study (1968-1970) was conducted at the New Land Research Reserve, located about 1.5 miles south of Hopewell, Mercer County, New Jersey. The reserve is owned and operated by the Stonybrook-Millstone Watershed Association. It preceeded that portion of Schaeffer's study also at the Reserve.

During the winter of 1966-1967, Richard Thorsell, then Program Director of the Association, installed with the help of Boy Scouts approximately 10 nest boxes on metal poles in and near an artificial pond that had only recently been created by the damming of a small, meandering stream. Shortly after the pond had been formed, Thorsell had observed Tree Swallows flying over the pond and wondered if it would be possible to establish a colony. In the spring and summer of 1967, I observed that Tree Swallows had indeed occupied some of the nest boxes and successfully fledged young. The Association granted permission to the New Jersey State Museum for its personnel (I was than associated with the Museum) to conduct a banding study of the newly established colony. In Schaeffer's figure 2, the location of the 44 nest boxes at the Reserve are given although the number varied from 10 (1967) to 9 (1968),to

23 (1969), 21 (1970) and to 44 (1971).

The author was assisted in the field by his daughter and sub-permittee bander. She recorded all data in our field notebook and provided a summary to Schaeffer some of which were incorporated in his report but additional data used here were not available to him.

Nesting Success

Table One gives the number of boxes in which nests were built and from which young were known to have been successfully fledged in comparison with the number of boxes available for the three year period of this study.

TABLE ONE.	1968	1969	1970
Available boxes	9	23	21
Used and Successful	5	6	8
Percentage successful	55.5%	26.1%	38.1%

Insofar as successful nest box occupancy is concerned, adults in the population utilized over one-half of the available boxes in 1968, but apparently there were not a sufficient number of adults in the population for the years subsequent to 1968 to take advantage of the increased number of boxes. In 1968, one box contained nesting material and one egg but this was the only nest box of the three year study to contain an abandoned nest. Some "empty" boxes contained a few pieces of nesting material but not enough to indicate that actual nest construction had begun. In 1971, 11 of Schaeffer's 44 nest boxes were occupied. If young were successfully fledged from each of the eleven nests, the comparable percentage would be 25.0%.

Is there a preference for over-water nest boxes? Although these data are insufficient for other than a tentative conclusion, the successful fledging of young from 60% of the available over-water boxes during the three-year study rather strongly suggests that there is a preference by the Tree Swallow for over-water sites to those available in adjacent open field areas. [Table Two]

One pole in the pond contained two nest boxes of which only one was utilized during the three year period. Both boxes were included in the total number of available "over-water" boxes. If the Tree Swallow has a preference for one nest box rather than two per pole, the percentage of preference for single over-water nest boxes would be even more strongly indi-

TABLE TWO. Preference for over-water boxes.

Year	over-water		pond edge	
	avail.	success.	avail.	success.
1968	6	4	1	0
1969	5	2	1	1
1970	4	3	1	0
TOTALS	15	9	3	1

Year	open field	
	avail.	success.
1968	2	1
1969	17	4
1970	16	5
TOTALS	35	10

cative.

Data are arranged in Table Three to show the relation of clutch size to successfully fledged young. For the three-year period, 87.8% of the 98 eggs known to have been laid and incubated resulted in 86 successful fledglings (*i.e.* those that flew from the nest). In the table, the numbers given in parentheses represent the total number of young fledged from nests of the given clutch size. Note: one unincubated egg of an incomplete clutch is not included in the figures of Table Three. In those nests which successfully fledged young, only four eggs did not hatch. For these nests, 95.9% of the 98 eggs laid hatched and 87.8% resulted in fledged young. Eggs incubated but unhatched occurred in clutch sizes of four (three nests), and five (one nest). Dead young were found in clutch sizes of seven (one nest with one dead) and five (one nest with two dead). The data in Table Three indicate that nesting success varied directly with increased clutch size up to the optimum size of six.

TABLE THREE.

clutch size	nests and young fledged (--) 1968	1969	1970	nests	eggs	young fledged no.	%
3	0	0	0	0	0	0	0
4	2(6)	2(7)	0	4	16	13	81.3
5	2(9)	3(13)	4(15)	9	45	37	82.2
6	0	1(6)	4(24)	5	30	30	100.0
7	1(6)	0	0	1	7	6	85.7
8	0	0	0	0	0	0	0

Austin and Low (1932) found that seven of 193 young died from being "crowded to death" by older nestlings. The clutch size of their 60 completed nests, arranged in Table Four,

gives an interesting comparison to that of my three-year study.

TABLE FOUR.

Clutch Size	Number of nests	
	Austin & Low	Prescott
2	1	0
3	7	0
4	17	4
5	29	9
6	4	5
7	2	1

The median number of eggs per clutch is five for both groups of nests fiven in Table Four. At the two sites reported by Schaeffer (1971), the average clutch size was 5.00 and 5.13 (Reserve) which agrees closely with the three-year average of 5.11 eggs per nest for this study. However, the average number of young per nest which Schaeffer (1971) found at his two sites, 2.8 and 3.3 (Reserve) is considerably lower than the 5.6 average which I found.

The data summarized by Nice (1957) from 748 Tree Swallow nests which she found reported in the literature are arranged in Table Six. Of these studies, only that of Wedemeyer gives such high percentages as I found for eggs hatched (95.9%) and young fledged (87.8%). Mason (1968), reported on his 13 year study of Tree Swallow nests containing 664 young, gives the average brood size as 4.37 young per nest.

TABLE SIX.

Source	years of study	number of nests	eggs	hatched no.	%	fledged no.	%
Chapman, 1939	9	219	1123	928	83.4	679	61.0
Low, 1934	3	352	1759	1424	81.0	857	48.7
Kuerzi, 1941	3	80	430	310	72.1	303	70.5
Shelley, 1937	2	37	184	163	88.6	123	66.8
Wedemeyer, 1935	8	60	363	358	98.6	340	93.7

(note: tabular data are from Nice, 1957)

Returns

One adult (75-43250) fledged in 1969 from nest box #1 located over the water (clutch size 4) nested the following year in a nest box (clutch size 6) which was located in a field several hundred yards from the pond. Another adult (75-42253) fledged in 1970 from nest box #20 (clutch size 6) located in a field adjacent to a deciduous woods, in the following year built a nest in a nest box located in a field about 80 feet distant from the first. Due to human interference, the bird

died in the nest which contained one egg.

Early and Late Nests

The earliest successful nests during the three year study occurred in 1970. On 6 June of that year, four nests contained young large enough to be banded, and nestlings of two nests (each with clutch size of 6) were nearly ready to fly from the nest, and two nests (with clutch sizes of 5 and 6) contained young approximately 3-4 days old. It is interesting to note that ten nests of large clutch sizes (5, 6, 7 eggs) had young sufficiently large enough to be banded prior to 15 June and young from only three nests (clutch sizes 5 and 6) were banded after 15 June. Clearly nests with larger clutch sizes, which were completed in late May and early June were the most successful. The latest nest to have its clutch (of 5 eggs) completed was 27 June 1968 and the four nestlings were banded on 17 July. In this late nest, two of the young were noticeably smaller than the two siblings. At Cape Cod, Austin and Low (1932) found that the first fledglings left the nest on 17 June and the latest on 18 July.

Other Species

The Eastern Bluebird, *Sialia sialis*, successfully fledged three young from one nest box and three other boxes contained nest material believed to be from this species' unsuccessful nest building attempts. House Sparrows, *Passer domesticus*, fledged young from three nest boxes. One box containing a nest with three eggs was deserted by an unknown species. No competition for nest boxes was observed between these nesting species. That additional nest boxes were available and empty suggests that little or no decrease in nesting success for the Tree Swallow should be attributed to the occupation of nest boxes by the other species at the Reserve during the period of this study.

Chapman (1939) reported that "a few pair" of Bluebirds and House Wrens, *Troglodytes aedon*, nested within the Tree Swallow colony but no flighting was observed during the years 1935-1937. This was in contrast to his comments for the years 1932-1934 when he noted "considerable fighting" between the Bluebirds and Tree Swallows. Low (1933) noted that the Tree Swallow was "always victorious in any dispute with Bluebirds" in competition for nest boxes.

The presence of wasps *(species ?)* in several otherwise empty nest boxes located in field areas at the Reserve suggest that their activity was a deterent to the Tree Swallow.

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Conclusions

At this Reserve, the creation of an artificial pond created where none existed before, and the provision of artificial nest sites within the established nesting range of the Tree Swallow successfully attracted the species and enabled it to establish a breeding population in a new and suitable habitat. The number of adults increased slightly each year but never utilized all of the available nest boxes.

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