A Study of Barn Swallow Nestings During the Summer of 2008 in Ontario

Antonio Salvadori
17 Colborn Street
Guelph, ON
N1G 2M4
e-mail: Salvadori@rogers.com

ABSTRACT

During the summer of 2008, nests of the Barn Swallow (Hirundo rustica) *were monitored on a weekly, or more frequent, basis at 21 locations/sites in Wellington County, ON. This paper summarizes some of the findings. In particular, the productivity of the first brood of 229 nests and second brood of 120 nests is discussed in detail.*

INTRODUCTION

The Barn Swallow *(Hirundo rustica)* is a very common bird throughout North America and around the world (Turner 2004, Sibley 2000). However, in recent years it has started to undergo a decline throughout its range (Langley 2009, Lepage 2007). In order to understand this decline, a study of Barn Swallow nests was begun in 2004 in Wellington County, ON. In particular, 21 colonies, ranging in size from two to 47 nests, were monitored in 2008 on at least a weekly basis from the first arrivals to the last departures. Six sites consisted of old animal barns, with or without animals in them; five of horse stables; four of cow barns; two of poultry sheds; and four of multi-use workshops containing tractors and other farm machinery. A typical location is shown in Fig. 1. In this paper, we discuss, among other things, the productivity at each site and some possible reasons for the swallow decline.

Birds build their mud nests, lined with feathers and animal hair, either fastened to a vertical wall or wooden beam beside the juncture with the ceiling (>95%) or on top of a horizontal board (<5%). If the nests are not destroyed, the birds use existing nests (99%) from year to year, with only a small number (<1%) of new nests being built in any given year.

Fig. 1. Typical Barn Swallow nesting location (site #2).

METHOD

Locations were visited from early May to late August. At each visit the nests were checked to see which were used by the returning birds; to monitor the number of eggs laid; and, subsequently, to monitor the number of young born and fledged. All nests were marked individually by a unique number which was written beside the nest. As eggs were laid or young hatched, accurate numbers were kept for each nest and event. When the young were about 7-9 days old, they were banded.

At five locations, adult birds were trapped using mist nets strung outside or immediately at the entrances to the nesting barns. The success rate (28.9%) was low as, once disturbed, the swallows tended not to return to their nests until we had removed the nets. As a result, trapping was attempted only for a short half-hour period at any site per visit. No trapping was attempted until the swallows were on eggs and/or had young. Swallows readily returned to the nests once the nets were removed. To the best of our knowledge this activity did not interfere with the overall success or failure of the breeding process.

RESULTS and DISCUSSION

As shown in Table 1, at all but one site (#19), many more nests were available than there were pairs of birds to nest. Each returning pair had a choice of 2.63 nests, on average. All birds had ample choice regarding where to lay their eggs. Hence, it is clear that nest availability at a site is not a cause for population decline. Table 1 also shows the occupied ratio (%OR) which is defined as the ratio of nests used to the total availability of nests. Nests are always relined with new feathers and/or hair. It is not known if birds return to the same nests each year or not.

Table 1. The number of occupied (ON) and unoccupied (UN) nests and the percentage occupied ratio (%OR) at each of the 21 sites studied.

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Avg
UN	46	42	42	12	12	38	3	17	10	9	10	6	13	8	2	55	7	8	0	1	9	13.42
ON	47	21	20	19	15	12	12	10	10	9	9	9	7	6	5	4	3	3	2	2	2	8.37
%OR	51	33	32	61	55	24	80	37	50	50	52	60	35	43	71	7	30	27	100	67	18	47.44

Table 2. The eggs laid (E#) and young fledged (Y#) in the first brood at each of the 21 sites; the number of nests (Tot) and percentage (%) of nests with a given number of eggs or young; the number of nests raising a full clutch (#RFC); the percentage of nests where a full clutch was raised (%RFC).

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Tot	%
E7	0	0	0	1	0	2	1	0	1	0	0	0	2	0	0	0	0	0	0	0	0	7	3
E6	8	3	0	6	3	2	2	2	3	3	0	1	2	0	1	2	0	0	1	0	0	39	17
E5	22	14	11	9	10	5	7	7	4	4	6	5	2	4	4	2	3	0	0	3	1	123	54
E4	9	2	4	2	2	3	2	0	0	2	2	1	0	1	0	0	0	1	0	1	1	33	14
E3	2	1	1	1	0	0	0	0	2	0	0	0	1	1	0	0	0	0	1	0	0	10	4
E2	1	0	3	0	0	0	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	9	4
E1	4	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	8	3
Total	206	100	81	99	81	69	62	49	51	46	40	37	39	29	26	22	15	4	9	20	9	229	
Y7	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	1
Y6	6	3	0	4	2	1	2	1	3	2	0	1	3	0	1	2	0	0	1	0	0	32	15
Y5	14	8	10	8	3	1	6	7	4	3	6	4	2	3	3	1	3	0	0	2	0	88	43
Y4	14	3	3	3	7	7	4	0	0	4	2	1	0	1	1	0	0	1	0	1	1	53	26
Y3	4	3	1	2	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	14	7
Y2	1	1	3	0	0	0	0	1	3	0	1	1	0	1	0	0	0	0	0	0	0	12	6
Y1	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	6	3
Total	177	81	72	82	60	46	58	43	47	43	40	32	38	21	25	17	15	4	7	18	4	207	
#RFC	26	12	13	10	5	3	9	5	10	3	8	6	5	6	3	3	0	0	1	2	0		
%RFC	57	57	65	53	31	25	75	50	91	33	89	75	71	86	60	75	0	0	50	40	0		

Table 3. The eggs laid (E#) and young fledged (Y#) in the second brood at each of the 21 sites. F = Full nest, i.e., 100%; the number of nests (Tot) and percentage (%) of nests with a given number of eggs or young; the number of nests raising a full clutch (#RFC); the percentage of nests where a full clutch was raised (%RFC).

Site	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Tot	%
E6	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	4	3
E5	7	8	4	5	6	2	1	2	4	2	1	1	3	3	1	0	1	0	0	1	0	52	43
E4	11	2	5	2	3	2	2	1	3	2	3	4	0	2	3	1	1	0	1	1	0	49	41
E3	3	0	1	0	2	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	9	8
E2	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	2
E1	0	0	2	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3
Total	88	48	47	39	55	22	13	14	35	23	17	27	15	23	17	4	9	6	4	9	0	120	
Y6	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1
Y5	5	5	2	1	7	2	1	1	3	0	0	1	3	1	1	0	1	1	0	0	0	35	35
Y4	9	3	4	1	3	1	0	1	3	3	4	4	0	0	1	1	1	0	1	1	0	41	41
Y3	4	1	2	1	1	0	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	13	13
Y2	1	0	0	0	1	0	0	0	2	1	0	0	0	0	2	0	0	0	0	0	0	7	7
Y1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	3
Total	75	40	33	12	53	14	8	9	34	20	16	27	15	5	4	4	9	5	4	5	0	100	
#RFC	12	5	6	2	11	3	1	1	6	3	2	6	3	1	2	1	2	0	1	0	0		
%RFC	63	56	67	67	85	F	50	50	67	50	50	F	F	F	50	F	F	0	F	0	0		

Of 493 adult birds and 4,147 local birds banded in the study in previous years, we found that at least 103 adult birds (20.8%) and at least 29 local banded birds (0.7%) returned as breeding birds to the same site. Only a single adult bird changed sites and five local birds (0.12%) returned as breeding birds to a different site. Several of the adult birds returned repeatedly to the same site; one for seven years in a row. (This is the oldest swallow in our study.) This result suggests that the degradation of a nesting site may lead to a population decline. Indeed, such an event did take place at location #6 in 2009 where the flooring of the barn was replaced totally, with the total destruction or predation of 45% of the active nests.

In total, 349 active nests were monitored: 229 in the first brood and 120 in the second brood. Tables 2 and 3 show the number of eggs laid and young fledged for each brood respectively. The sites are ordered from the largest to the smallest in terms of number of occupied nests. #RFC is the number of nests raising a full clutch; %RFC is the percentage of nests where a full clutch was raised.

Table 2 shows the raw data for the first brood, summarizing the eggs laid and young fledged. The average clutch size laid was 4.96 eggs. Seven birds laid as many as seven eggs and eight birds laid only one egg each. However of the seven birds, only two were able to raise seven chicks to fledging. Of the eight birds that laid one egg each, only four raised their chick successfully. Only 51% of birds were able to raise their full clutch successfully and at no site did all birds raise a full brood. The productivity, i.e., percentage of young fledged to eggs laid, is summarized in Table 4.

Table 4: The productivity, in percentages, of each site for the first and second broods.

Site Productivity	1	2	3	4	5	6	7	8	9	10	11	12	13	14
First Brood	85.92	81	88.89	82.83	74.07	66.67	93.55	87.76	92.16	93.48	100	86.49	97.44	72.41
Second Brood	85.23	83.33	70.21	30.77	96.36	63.64	61.54	64.29	97.14	86.96	94.12	100	100	21.74

Table 4: (cont'd)

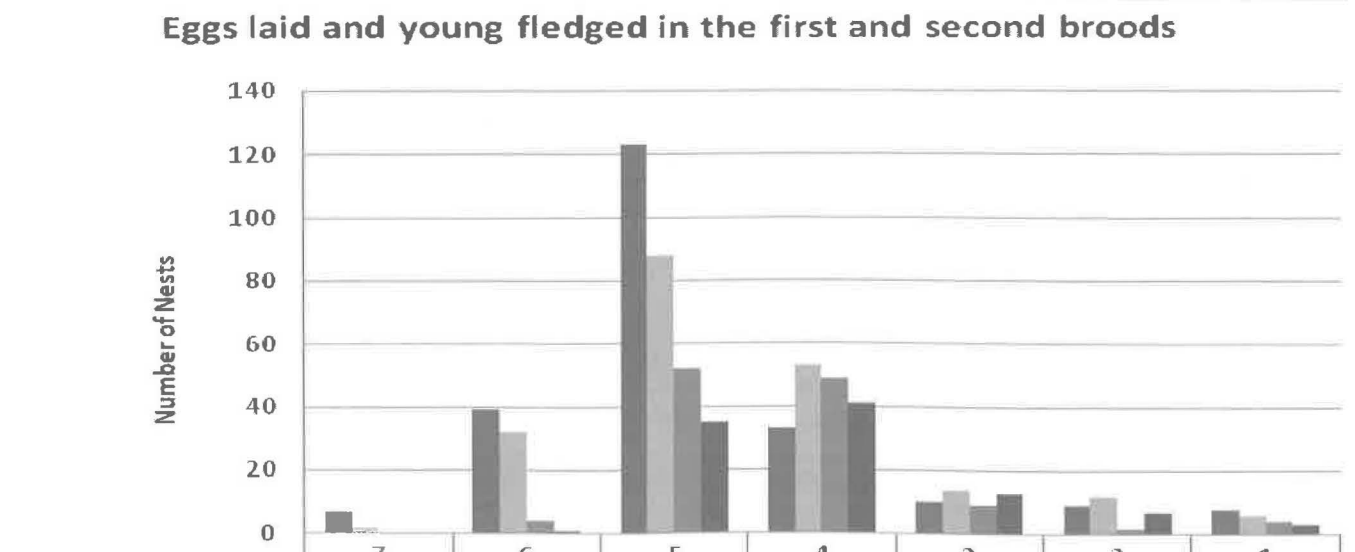
Site Productivity	15	16	17	18	19	20	21	Average	Std Dev
First Brood	96.15	77.27	100	100	77.78	90	44.44	85.16	13.08
Second Brood	23.53	100	100	83.33	100	55.56	0	75.89	25.57

The Total (Tot) column shows the total number of nests with the given number of eggs or young. A word of caution is needed when reading these figures as direct comparison of columns is misleading. For example, in Table 2, the 88 nests that fledged five young include some nests that had six or seven eggs from which only five young were fledged. The same is true for all other rows.

Determining the timing of the second brood presented a major problem as the adults were unmarked, except for the invisible leg bands. In future years, we shall try to deal with this by marking the returning birds individually. So far, however, it is impossible to say if new nests found belonged to late breeders or second broods. Hence, we took the decision that eggs laid in nests that had already hatched and raised a first set of chicks were deemed to be second broods–although the unlikely possibility exists that new birds occupied the now vacant nest. In all other cases, a flexible cut-off date was used. The cut-off date was around 30 Jun, with a 2-5 day variation, depending on the site. This date would, of course, vary from year to year, depending on weather, food supply and other factors. According to this criterion, 52.4% birds laid a second brood. This is similar to results found by Smith and Montgomerie (1992).

Table 3 shows the raw data for the second brood summarizing the eggs laid and young fledged. The average clutch size laid was 4.2 eggs–significantly lower than the 4.96 of the first brood. The highest clutch size was six but only one of the six raised a full set of chicks. A full 64% of birds were able to raise their full clutch successfully. This is a significant improvement over the first clutch. Indeed at seven locations, all pairs raised a full brood in stark comparison to the first brood. This may be due to several reasons, including smaller second clutch sizes, more insects later in the summer and better experience from new mothers.

The productivity of the second brood is summarized in Table 4. However, overall, the average productivity was lower than the first brood and statistically significant (paired t-test, $p=0.019$). The low productivity at a few second brood sites deserves an explanation. At site 4, there was an infestation of blood-sucking maggots that killed many of the young. At sites 14 and 15 the low numbers are due to predation of the nests. There was no second brood at Site 21.



	7	6	5	4	3	2	1
Eggs First Brood	7	39	123	33	10	9	8
Young First Brood	2	32	88	53	14	12	6
Eggs Second Brood		4	52	49	9	2	4
Young Second Brood		1	35	41	13	7	3

Fig. 2. Graph showing number of nests versus number of eggs laid and young fledged for first and second broods.

Fig. 2 compares the total eggs laid and young fledged visually using the totals column of Tables 2 and 3. Note that below five the number of young raised *appears* to be greater than the number of eggs laid, but this is due to the fact that many of the nests that had a greater number of eggs raised fewer young.

Some nests–10.6% on average–were predated. We could only speculate on the cause of predation. Since all of the sites were rural, cats were present at all but two sites. Predation by cats was evidenced twice: at one location a cat leapt over a meter into the air, catching and killing an adult swallow. At another site, an American Kestrel (*Falco sparverius*) was observed taking a bird perched on a wire. Elsewhere, a Sharp-shinned Hawk (*Accipiter striatus*) was observed on two occasions going after swallows *inside* the barn but it was unable to catch any swallow. At one nest, a 12-day-old bird was found hanging with a long horse hair, used to line the nest, wound around its neck. Mice (Muridae sp) and raccoons (*Procyon lotor*) were seen at several locations. We speculate that mice and raccoons may be responsible for the majority of predated nests as both animals can easily run along old barn beams on which the swallows were nesting. In subsequent years, we plan to place strategic cameras to monitor some nests.

ACKNOWLEDGMENTS

A thank-you to the 21 property owners for permission to study the swallows on their properties. Without their invaluable help, this study would not have been possible. I also thank Sue Blue, John Burger, Richard Frank, Larry Stanisfort, and Bryan Wyatt for helping the author on many occasions; and to Kate Salvadori for editing my manuscript. An especial thanks to my long-suffering wife, Mary, for the many family disruptions I caused during the course of this study.

LITERATURE CITED

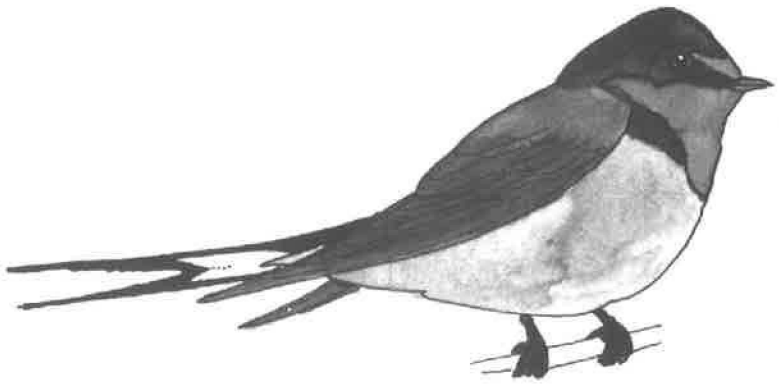
Langley, N. 2009. Birds without borders. *World Birdwatch* 31:16-19.

Lepage, D. 2007. Barn Swallow, pp. 398-399, *in* Atlas of the breeding birds of Ontario, 2001-2005. (M.D. Cadman et al., eds.), Bird Studies Canada, Environment Canada, Toronto, ON.

Sibley, D.A. 2000. The Sibley guide to birds, Knopf, New York, NY.

Smith, H.G. and Montgomerie, R. 1992. Male incubation in Barn Swallows: the influence of nest temperature and sexual selection. *Condor* 94:750-759.

Turner, A.K. 2004. Family swallows and martins (*Hirundinidae*), pp. 602-685 *in* Handbook of the birds of the world. vol 9. (L. del Hoyo et al., eds.), Lynx Edicions, Barcelona, Spain.



Barn Swallow
by George West