Avocetta N° 17: 203-207 (1993)

Nesting chronology, molt, and ectoparasites of Vaux's Swifts in northeastern Oregon

EVELYN L. BULL and CHARLES T. COLLINS

USDA Forest Service, Pacific Northwest Research Station- La Grande, OR 97850 U.S.A.
Dept. of Biology, California State University - Long Beach, CA 90840 U.S.A.

Abstract—We recorded nesting chronology at 15 Vaux's Swift (*Chaetura vauxi*) nests. Nest building was observed as early as 3 June. Nestlings were present from 2 July to 4-7 September and were in the nest at least 27-32 days. Molt of primaries began in early July and probably ended after the swifts left the area. Weight of 30 adults averaged 18.5 g. One species of feather louse and 1 species of feather mite were collected.

Introduction

Little information is available on the nesting chronology, molt, or ectoparasites of the Vaux's Swift (*Chaetura vauxi*) in North America. Three studies (Bent 1940, Baldwin and Hunter 1963, Baldwin and Zaczkowski 1963) have reported dates on the nesting chronology of these swifts. This study provides additional information in a different area.

These swifts are difficult to find nesting in forests and even more difficult to catch while nesting to measure characteristics such as molt and weight. This basic information on life history is essential to understanding the ecology of the species. Our objectives were to record nesting chronology, patterns of molt, ectoparasites, and weights of Vaux's Swifts during the nesting season.

Methods

We searched for nest trees used by Vaux's Swifts in 4 study areas in June and July 1992. The areas (Syrup, Frog Heaven, Ukiah, and Balm) are primarily mixed coniferous forests and were selected on the basis of observed swift abundance. Syrup and Frog Heaven are 35 km west-southwest and 41 km southwest of La Grande, Union County, Oregon, respectively. The Ukiah area is 17 km west of Ukiah, Umatilla County, Oregon. Balm is 38 km southeast of Union, Baker County, Oregon.

To locate nests, we spent 1 hour watching hollow trees that swifts had used previously for nesting (Bull and Cooper 1991) and by watching additional hollow trees suitable for nesting in the 4 areas. Swifts flying in or out of a tree during the day indicated that the tree was being used for nesting.

We gathered information to determine nesting status by recording activity for about 9 hours (approximately 09:30-18:30) at 2 nests during nest building and at 3 nests during the incubation and nestling stages. We recorded behavior and the time swifts entered or left the nest tree. We calculated frequency of visits to the nest by determining the minutes between times that swifts entered the cavity. Time in the nest was the interval between when a swift flew into the cavity and when a swift flew out. From these 9-hour observations, we were able to ascertain the status at other nests in about an hour each week, based on the time the swift was in the nest and the interval between visits.

Molt and weight were recorded for adults that were trapped in mist nets suspended in front of nest cavities. Trapping was not done during incubation to reduce the risk of abandonment. We attempted to catch swifts every 2 weeks for measurements; however, the birds frequently escaped from the net. Most birds were captured once, about half were captured twice, and a few were captured 3 and 4 times.

Captured birds were lowered to the ground and removed from the net. We measured the right wing chord and weight and recorded presence of parasites and molt of the primaries and rectrices. Parasites were collected and preserved in alcohol. Each time we caught a bird we weighed it; the weight reported for a particular bird is the average of its weights.

Accepted 21 March, 1993

We measured the total length of each new primary and the portion out of the sheath. For the first 10 birds, we measured molt on both wings; however, molt was always the same for each wing, so only measurements for the right wing were recorded thereafter. For the analysis, we calculated the state of molt of individual primaries by using the following categories and scores (Newton 1966):

Old feather	0
Feather missing or in small pin stage	1
Feather in large pin or brush stage	2
Feather brush to half grown	3
Feather half to three-quarters grown	4
Feather three-quarters to full length	5

To determine the score, we divided the length of the partially grown feathers by the length of that feather fully grown (measured from birds with fully molted feathers). We used the following lengths for fully molted feathers: 36 mm for primary 1, 42 mm for 2, 49 mm for 3, 57 mm for 4, and 64 mm for 5. There was a potential score of 50 for each wing if the molt was complete and thus a total potential score of 100 for each bird. In the birds captured primaries 7-10 had not molted, and no complete molt of primary 6 was observed. A linear regression of primary molt score on julian date was computed to determine rate of growth and the start and end of molt.

Rectrices were measured and scored in the same fashion as primaries. If molt was complete, the score was 50. Only 6 birds with rectrices molting were captured, so no analysis was done.

Results

Nesting chronology

Nesting chronology was recorded for 15 nests and will be discussed in 3 stages: nest building, incubation, and nestling. We observed nest building behavior from 3 June to 23 June (Fig. 1). During nest building, swifts broke small twigs off trees while flying through the branches. After several passes through a tree, the swift entered the nest tree and remained inside for a mean of 17 (nest B) and 24 minutes (nest A) (Table 1). We presumed that the bird was positioning the sticks in the nest with saliva. The interval between visits to the nest tree averaged 79 and 42 minutes for the 2 nests watched (Table 1).

We observed incubating birds as early as 18 June and as late as 25 July (Fig. 1). The interval between visits to the nest averaged 38, 53, and 55 minutes for 3 days of observation (Table 1). There was considerable variation in the amount of time a bird was in the nest tree. The average time for nest C (Table 1, first entry) was 2 minutes for the first 7 nest visits, but then 2 birds stayed in for 37 and 69 minutes. On the second day of observation at nest C (Table 1, second entry), the average time in the nest was 2 minutes. Nest B did not reflect this short time exchange, because 3 birds entered the nest tree, and some of them remained in the cavity.

Table 1 - Interval between visits to the nest and time spent in the nest tree during nest building, incubation, and when nestlings were present at 4 Vaux's Swift nests. Each line represents 9 hours of observation (approximately 09:30- 18:30) at each nest, northeastern Oregon, 1992.

		Interval between visits to nest (min)		Time in nest (min)	
Nest	Activity	Mean	Range	Mean	Range
A	Nest building	79	3-155	24	4-41
B	Nest building	42	5-70	17	4-27
B	Incubation	38	8-89	37	11-78
C	Incubation	55	17-100	14	1-69
C	Incubation	53	25-77	2	1-4
B	Nestlings	20	1-44	1	1-7
C	Nestlings	17	1-40	12	1-41
D	Nestlings	13	5-64	7	1-65

Nestlings were present from 2 July to 4-7 September (Fig. 1). The time the young were in the nest tree was > 30-32 days at 3 nests, > 28 days at 2 nests, and 27-29 days at 1 nest. The adults returned to the nest an average of every 13, 17, and 20 minutes at 3 nests and remained in the nest an average of 1, 7, and 12 minutes (Table 1). For the 3 nests, there was an average of 3.6 visits/hour to feed young. The 3 nests where we recorded activity throughout the day had young < 15 days old.

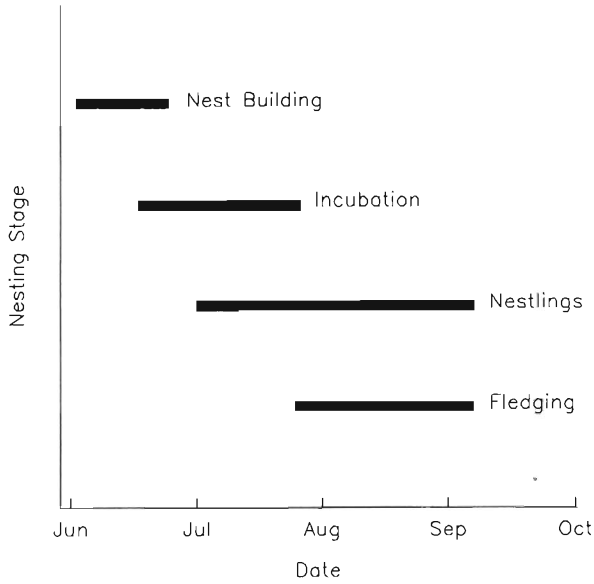

Figure 1 - Nesting chronology at Vaux's Swift nests in northeastern Oregon, 1992.

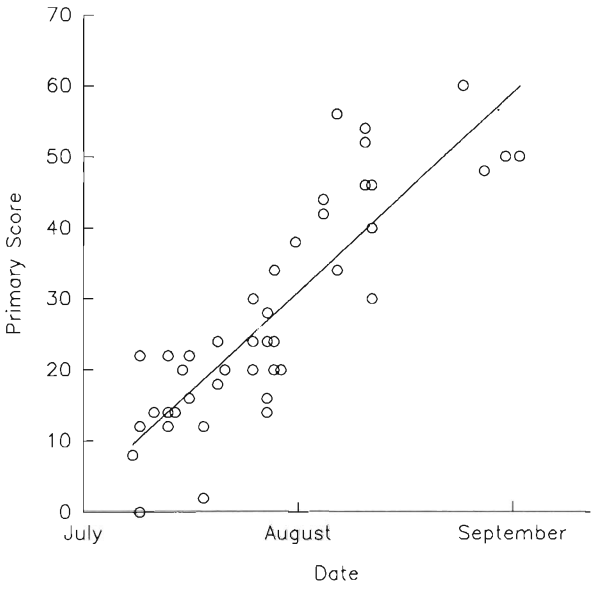

Figure 2 - Molt score of primaries in relation to date for 30 swifts captured a total of 47 times in northeastern Oregon, 1992. Primary score is for both wings.

The earliest date that young fledged was 26 July, and the latest was between 4 and 7 September. The mean fledging date of 10 nests at 9 nest trees (1 tree had 2 nests) was 7 August. Of the 15 nest trees observed, 9 had young fle,dge, 1 failed during nest building or incubation, 2 failed with nestlings, and in 3 the results were unknown.

Primary molt

We caught 30 adults (12 of them more than once) and recorded a total of 47 molt measurements (Fig. 2). Birds were first captured on 9 July, when primary molt had just begun. Molt of the primaries progressed from the proximate to distal. The last bird was captured 1 September and had an arrested molt ending with the sixth primary. The linear regression of primary score (y) on date (x) was:

$$y = -164.52 - 0.92x.$$

Setting y = 0 (no molt occurring yet) suggests that molt started 27 June, so most swifts started molting primaries shortly after their eggs hatched (Fig. 1). Setting y = 100 (molt complete) suggests that molt ended 14 October, which means that molt took 109 days to complete. This period could be somewhat longer if the growth rate of the longer primaries, 7-10, was slower than the growth rate of the shorter primaries, 1-6 (Fig. 3).

We observed a roost in the Ukiah study area each week from 4 August until 25 September. During the first 2 weeks in September, > 500 swifts went in the roost. On 16 September, only 283 swifts went in. On

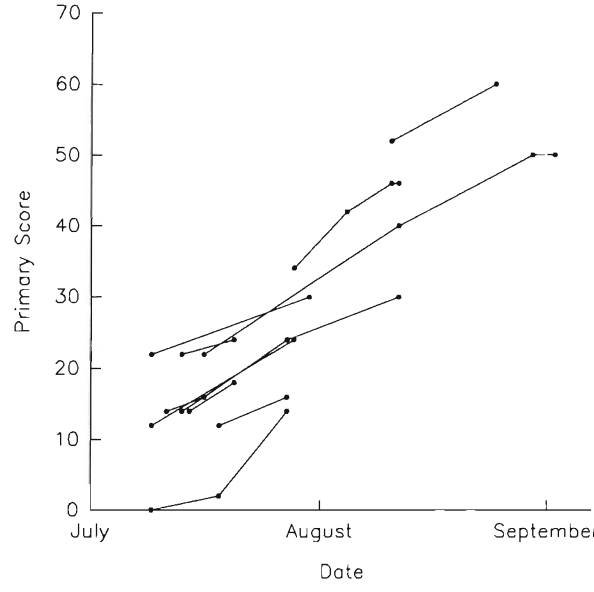

Figure 3 - Rate of increase in primary score (both wings) in relation to date in adult nesting swifts in northeastern Oregon, 1992. Each line refers to a particular individual, and its slope indicates the rate of molt in the primary feathers in points per day.

20 September, 102 swifts went in, and the next night only 12 went in. So it appears that the swifts migrate before the molt is complete

Rectrix molt

Only 6 swifts of those captured were molting rectrices; the earliest capture was 31 July and the latest was 27 August. Ten swifts caught during this period were not molting rectrices. The rectrices were replaced from the outermost inward, and molt scores ranged from 8 to 34 (potential of 50 with all new rectrices). All 6 swifts retained 2-5 old rectrices, and rectrices 1-2, 1-3, or 1-4 were growing in. Molt of these rectrices occurred when primaries 4 and 5 or when 5 and 6 were coming in. Two birds had asymmetrical molt with the third or fourth rectrix missing on 1 side.

Measurements

We captured 30 adult and 6 juvenile swifts. The average weight of adults was 18.5 g (SD = 1.16, range = 15.5-22.2), and for juveniles it was 17.6 g (SD = 1.0, range = 16.6-19.1). The average wing chord length was 113.6 mm (SD = 2.70, range = 109-118) for adults and 111.5 mm (SD = 5.32, range = 105-118) for juveniles.

Ectoparasites

We first discovered feather louse (Mallophaga) eggs on the feathers of the nape of a swift on 28 July. All 16 adult swifts captured after that date had eggs or lice on them; 3 of 6 juveniles had eggs or lice. The ectoparasites collected were 1 species of feather louse (*Dennyus dubius*) and 1 species of feather mite (*Berlesella* sp.); this mite probably represents a new species as we know of no previous reference to *Berlesella* in North America (N. A. Wilson, Univ. of Northern Iowa, Cedar Falls; pers. comm.). *Dennyus dubius* has been reported previously on the Chimney Swift (*Chaetura pelagica*) and *D. vauxi* on the Vaux's Swift (Emerson and Pratt 1956).

Discussion

The nesting chronology we observed was fairly consistent with the dates reported in the literature. Baldwin and Zaczkowski (1963), Baldwin and Hunter (1963), and Bent (1940) report that eggs hatched on 10 July, 14 July, and in "early July," respectively. Ten of the 15 nests we observed had eggs hatch in late June and early July. In Montana (Baldwin and Zaczkowski 1963, Baldwin and Hunter 1963), young left the nest tree 28-30 days after hatching (7-9 August); the birds we observed left the nest tree > 28-32 days after hatching. Ten of the nests we observed had young leave between 26 July and 10 August, while young left the last nest between 4 and 7 September. We think this late nest was a renesting attempt, because swifts first were observed incubating in this tree on 24 June. Even though swifts were entering the tree in June and July, feeding of nestlings was not observed until 4 August.

Molt of primaries and rectrices was variable in our study areas (Fig. 2). Baldwin and Hunter (1963) noted a similar variability in Montana where in 1961 2 swifts had not started to molt primaries by 27 July, and 2 others had molted the first 3 and first 5 primaries by 4 and 11 August, respectively. In 1962, 4 swifts were molting primaries 2-6 on 9 August (Baldwin and Zaczkowski 1963).

The molt probably was not completed before the swifts migrated; however, some swifts in the Ukiah study area spent part of each day in a communal roost in August and September after young left the nest. The swifts entered the roost shortly before dark but some did not leave the roost until after 10:30 in September. We suspect they were building their body reserves for migration and progressing with their molt during this time. Bent (1940) reports that swifts started roosting in a chimney in Washington in mid-August and in 10 days > 500 were roosting there; over the next 16 days, their numbers gradually declined to only 3 swifts roosting in the chimney.

The overlap of breeding and molting has been recorded in other swifts (Kainady 1977, Cramp 1985) and particularly in *Chaetura* (Fischer 1958, Collins 1968). Arrested molt also has been described, particularly in migratory species (Cramp 1985). The migratory Chimney Swift of Eastern North America appears to complete its primary molt by early October while still in the early stages of migration (Coffey 1958).

Vaux's Swifts in Montana had a mean weight of 17.2 g (N = 4, range = 16.4-19.0) in late July (Baldwin and Hunter 1963) and 19.2 g (N = 5, range = 18.3-19.9) in early August (Baldwin and Zaczkowski 1963). Two samples of spring migrant Vaux's Swifts in California averaged 15.4 g (N = 35, range = 14.1-17.4; Collins 1971) and 17.1 g (N = 72, range = 15.0-20.9; Collins unpubl. data). These data generally are similar to those presented here and do not reflect the dramatic increase in body weight (51%) of fall migrants reported for *C. pelagica* (Coffey 1958).

All the adult swifts captured had either feather lice or eggs of feather lice. One recently fledged juvenile had > 30 eggs and > 6 adult lice and was in poor condition. Watson (1933) reports Vaux's Swifts

heavily parasitized by lice and weak and emaciated during migration in California. Possibly a heavy infestation of biting lice can jeopardize survival of swifts, particularly if the birds are energetically stressed, as during migration.

The swifts displayed considerable variability in nesting chronology because of the 41-day difference between when the first and last nest had young leave. The swifts appeared to be synchronized in the time (16-21 September) they left the Ukiah study area, however. Time of nesting, parasite loads, stage of molt, and weights of swifts when they leave the breeding grounds no doubt have a great deal to do with their survival during migration.

Acknowledgments - We thank B. E. Carter, H. D. Cooper, R. Guse, J. E. Hohmann, C. Hunter, K. I. Kronner, P. E. Talbot, B. C. Wales, and B. R. Younker for their assistance with field work. N. A.Wilson identified the ectoparasites. Funding was provided by the USDA Forest Service, Pacific Northwest Research Station.

Riassunto - Si è osservata la cronologia di nidificazione in 15 nidi di *Chaetura vauxi*. La prima nidificazione data 3 giugno. I nidiacei sono stati visti al nido dal 2 luglio al 4-7 settembre e permangono nel nido almeno 27-32 giorni. La muta delle primarie è iniziata ai primi di luglio e probabilmente è terminata dopo che i rondoni hanno abbandonato l'area di nidificazione . Il peso di 30 adulti è in media 18.5 g. Sí sono raccolti una specie di pidocchio ed una di acaro delle penne.

References

Baldwin, P. H., and W. F. Hunter. 1963. Nesting and nest visitors of the Vaux's Swift in Montana. *Auk* 80:81-85.

Baldwin, P. H., and N. K. Zaczkowski. 1963. Breeding biology of the Vaux's Swift. *Condor* 65:400-406.

Bent, A. C. 1940. Life histories of North American cuckoos, goatsuckers, hummingbirds, and their allies. Part II. *Bull. U.S. Natl. Mus.* 176.

Bull, E. L., and H. D. Cooper. 1991. Vaux's Swift nests in hollow trees. *Western Birds* 22:85-91.

Coffey, L. C. 1958. Weights of some Chimney Swifts at Memphis. *Bird-Banding* 29:98-104.

Collins, C. T. 1968. The comparative biology of two species of swifts in Trinidad, West Indies. *Bull. Florida State Museum* 11:257-320.

Collins, C. T. 1971. A probable swift-cactus collision. *Calif. Birds* 2:101.

Cramp, S., ed. 1985. The birds of the western Palaearctic. *Vol. 4. Oxford Univ. Press.* 960 pp.

Emerson, K. C., and H. D. Pratt. 1956. The menoponidae (Mallophaga) found on North American swifts. *Jour. Kansas Ent. Soc.* 29:21-28.

Fischer, R. B. 1958. The breeding biology of the Chimney Swift *Chaetura pelagica* (Linnaeus). *N. Y. State Museum and Sci. Service. Bull.* 368:1-141.

Kainady, P. V. G. 1977. The overlap of breeding and moulting in some Iraqi birds. *Bull. Basrah Nat. Hist. Mus.* 4:65-68.

Newton, I. 1966. The moult of the Bullfinch *Pyrrhula pyrrhula*. *Ibis* 108:41-67.

Watson, S. A. 1933. The Vaux Swift at Whittier, California. *Condor* 35:203-204.