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## NESTING AND FEEDING HABITS OF THE WHITE-COLLARED SWIFT

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The White-collared Swift (*Cypseloides zonaris*) is a species that is found over much of México and Central and South America as well as in the Greater Antilles. Despite its widespread occurrence and large size, in which it is exceeded only by the White-naped Swift (*C. semicollaris*) in the Americas, little is known regarding its habits. Furthermore, some of the statements made in the literature regarding its nesting appear to be unconfirmed; they may even apply to other species.

### NEST SITES

In the summer of 1962 and 1963 several opportunities were afforded to study this species in southern México where three nesting colonies were visited by Rowley. The first of these colonies was found on April 30, 1962, in the pine-oak forest of the Sierra Madre del Sur of Oaxaca. On this occasion some White-collared Swifts were observed foraging low over a cornfield adjacent to the Río Molino at an elevation of about 7300 feet. The nesting cave was situated about one-half mile downstream behind a small waterfall. Its entrance was partly obscured by logs (fig. 2).

The existence of the cave was revealed by the behavior of the birds. Several individuals were seen to enter a V-shaped area between two large logs, fly over to the right side of the falls, and enter a cavity behind it. By wading through the pool at the base of the log jam the observer could see the cave behind the falls. The interior of the cave was approximately four feet wide, ten feet deep, and six feet high. Water from the pool covered about half of the floor space, which was strewn with rocks. The entire cave was wet from spray, and the walls were slimy.

Three nests of swifts were found here. They were situated on ledges and in crypts near the top of the cave wall at the back, and they could be seen only with the aid of a flashlight. One nest was on the left side of the cave, and two were on the right side. Two birds were seen sitting on one of the completed nests when the cave was entered. One of these was collected and proved to be a female. It had an egg measuring 33 by 22 mm. in the oviduct and an ovum with a diameter of 9.8 mm. in the ovary. No eggs were present in this nest.

The second nest examined contained a female swift and one egg. Both were subsequently collected along with the nest. When a flashlight was first turned on the female, she fluttered off and dropped to the water. Then she propelled herself toward the cave entrance by means of her wings and proceeded to climb up the side of the rock wall. After this she again dropped into the water, returned in the same manner to the interior of the cave, and started to climb the rock wall to the nest site. It seemed likely that this method of returning to the nest would be necessary for all of the birds nesting in the cave as soon as the rainy season came and the water level rose. This condition did not prevail at the other nesting sites that were found later. The ovary of the female with the single egg in her nest had an ovum 16 mm. in diameter in addition to a ruptured follicle representing the one egg that had already been laid.



Fig. 1. White-collared Swifts flying over a barranca, a painting by Don R. Eckelberry.

The third nest was empty; the adult or adults had probably left because of the disturbance at the other two nests.

When we returned to the cave on May 27, 1962, we found no evidence of recent occupancy by swifts, although several adult swifts were seen flying over the nearby cornfield. When the cave was visited on May 7, 1963, it was found that high water



Fig. 2. A cave behind this small waterfall and log jam provided a nesting site for two or three pairs of White-collared Swifts along the Río Molino in Oaxaca, México. Photographed May 27, 1963.

during the rainy season late in the previous summer had changed the position of some of the logs at the entrance. On this occasion the cave contained two nests, each with an adult bird. Both birds flushed when a flashlight was turned on them. One of the nests was in the same location as a nest of the previous year, but the other nest was in a new situation. Each nest contained two slightly incubated, white, mud-stained eggs. Both nests were collected. The cave was not visited during the nesting season of 1964. When it was entered again on January 10, 1965, two nests were found in the same places as those occupied on May 7, 1963.

On May 23, 1962, another cave inhabited by White-collared Swifts was examined along the Río El Chorreadero, Chiapa de Corzo, in Chiapas. This locality was at an elevation of about 2000 feet. The cave itself was estimated to be approximately 50 feet wide, 30 feet high, and about 250 feet deep. A subterranean river ran the length of the cave, and at the back end, where it was almost totally dark, water flowed down a rock wall into a pool about 40 feet wide and 20 feet deep (fig. 3). Several hundred swifts reside here all year around, according to Dr. Miguel Alvarez del Toro of Tuxtla Gutierrez, Chiapas.

On the occasion of this visit nests were in evidence, especially at the upper back

part of the cave near the top of the water slide about 30 feet above the pool. It proved impossible to reach any of them because of the slippery, vertical, limestone wall. Broken eggs and bits of the shells of hatched eggs were found, and it appeared likely that young birds were present in some nests.

A third breeding colony was found near Ocozocoautla, at an elevation of approximately 1300 feet along the Río Las Flores in Chiapas. Here the river flows through a deep, narrow barranca, the vertical cliffs of which rise to a height of about 400 feet. The terrain on either side of the barranca is heavily forested. By following a game trail from the top it was possible for us to descend to the river bed and wade upstream to where there was a series of limestone caves on one of the cliffs. Water cascaded over the cave entrances from a tributary stream that flowed down the rocky surface into the main river.

Many of these caves were impossible to reach because they were high above the river bed. However, one cave, situated near the base of the falls, was accessible. It had an entrance about 15 feet high by 20 feet wide and extended back about 30 feet. Inside it was quite dark, and the walls, ceiling, and floor were soaking wet from the spray of the falls that covered the entrance. On April 30, 1963, eleven nests were found in this cave. Each nest contained two fresh white eggs that were very soiled by wet mud. The nests were situated in small niches rather than on larger ledges as at the Río Molino site in Oaxaca.

#### NESTS AND EGGS

As pointed out by Rowley and Orr (1962:362), some confusion exists in the literature regarding the nest of *Cypseloides zonaris*. Most of this stems from the assertion by Reboratti (1918) that *C. zonaris*, like *C. fumigatus*, builds a cone-shaped nest about 10 to 15 centimeters in length. It is reportedly composed of mud, moss, and saliva and is attached to the vertical surface of a cliff. This is one of the nesting characters given by Lack (1956) for the species that he included in the genus *Cypseloides* whose nests were known at that time. Lack also mentions that members of this genus, as he delimited it, usually nest in association with water, and he specifically states (p. 6) that "*C. zonaris* nests behind waterfalls" on the basis of brief reports in the literature. Reboratti (*op. cit.*) asserts that the usual clutch is one, although the other observers cited by Lack suggest that two eggs are laid.

From the observations reported here it would seem that the nest reported by Reboratti actually was that of some other species of swift of the genus *Cypseloides*. All the nests observed during this study were disk-shaped or would have been disk-shaped had space on the nesting ledge permitted.

The two nests collected on April 30, 1962, from the cave along the Río Molino in Oaxaca were essentially circular. The larger one was 170 mm. in diameter and had a maximum depth of 75 mm. A very shallow depression about 90 mm. in diameter was present. The other nest was 150 mm. in diameter, 90 mm. deep on one side, and 33 mm. deep on the other.

The nests found in the cave along the Río Las Flores in Chiapas on April 30, 1963, were also circular, but they were shallower. One nest measured 135 mm. in diameter and had a maximum depth of 30 mm. Another was 125 mm. in diameter, and its greatest depth was 38 mm.

All the nests examined were composed of mud, moss, and large quantities of particles of insect chitin. The texture of the mass suggested the possibility that some saliva may enter into the composition of these structures. The presence of insect chitin



Fig. 3. The entrance to a cave used for nesting by White-collared Swifts along the Río El Chorradero, Chiapas, México. Photographed May 23, 1962.

rather evenly distributed throughout the nest structure is not readily explained. It is likely that, if undisturbed, these nests are used year after year with certain modifications or additions made annually. Chitin from the fecal pellets of the young may thereby become incorporated into the mud and moss. This, however, does not satisfactorily explain the uniform distribution of the chitin.

Although the nesting time for this species in southern México appears to be late April and early May, Pinto (1954:33) and Mitchell (1957:100) cite records of White-collared Swifts nesting in January in southeastern Brazil.

#### GENERAL BEHAVIOR

White-collared Swifts were most often seen in flight in the early morning and evening hours, unless they were disturbed at other times. In many respects they resembled White-naped Swifts (see Rowley and Orr, 1962). Their calls, given when the birds were disturbed at nest sites, were similar to those of White-naped Swifts but were not as loud or of as great duration, and they were uttered less frequently. In

open flight these swifts were usually silent as they foraged in loose flocks over cornfields and meadows. No close-formation diving such as the White-naped Swifts engage in was observed in this species.

Just before dark on the evening of May 19, 1963, one of us (Rowley) observed several White-collared Swifts flying through a small waterfall in a deciduous forest at an elevation of about 2400 feet near San Gabriel Mixtepec in Oaxaca. The next morning a small cave was found behind the falls. The cave went straight back eight feet and then turned at a right angle and continued another 15 feet. This second section of the cave was dry. No signs of nesting were found here, but the cave was used by 10 to 12 birds as a roost during the observer's stay in the region for the following month. One male swift was collected and showed no signs of reproductive activity. The testes measured  $7 \times 5$  and  $6 \times 5$  mm. It was suspected that these swifts might be nonbreeding first-year birds. The fact that the interior of the cave was dry might also account for its not being used by breeding birds. During visits to this area on September 29, November 6, 19, and 20, 1964, and January 8 and 9, 1965, White-collared Swifts were not observed.

Relatively little information has been published on the behavior of this species. Pinto (1951:172) observed White-collared Swifts at an elevation of about 3500 feet at Campo Belo River at Ponte Maromba, Itatiáia, in the state of Rio de Janeiro, Brazil. Specimens were collected in a cavelike opening among the huge rocks of the riverbed. The birds were difficult to see in the dark interior, where they clung to the rocky walls amid constantly dripping water.

The White-collared Swift, like the White-naped Swift, appears to be limited in its local distribution by the availability of suitable nesting caves. It is not quite as specialized in this regard, however, as the White-naped Swift, with which its taxonomic relationship is not quite clear (Orr, 1963). The latter, as far as known, nests only in caves containing running water and ledges with dry sand on which the eggs are deposited. By way of contrast the White-collared Swift builds a nest of mud and moss on wet ledges in caves behind waterfalls as does the Black Swift (*Cypseloides niger*). Although this sort of nesting site is uncommon, it is not as rare as that used by the White-naped Swift. These nesting prerequisites no doubt are responsible for the difference in the distribution of the two species. Both species are of localized occurrence within their respective ranges but *Cypseloides zonaris* has a very much larger range than that of *C. semicollaris*, which is limited to central and southern México. *C. niger*, whose nesting habits somewhat resemble those of *C. zonaris*, is also found over many parts of North and South America.

#### FOOD AND PARASITES

Two digestive tracts of White-collared Swifts obtained along the Río El Chorreadero in Chiapas on May 23, 1962, were preserved in alcohol. One was that of a female whose stomach measured  $31 \times 38$  mm. The distance from the posterior end of the stomach to the tip of the tongue when the esophagus was straightened but not stretched measured 135 mm. The esophagus including the crop contained some insect material but the stomach was distended with food. The second digestive system saved was from a male whose crop and esophagus were distended with undigested insect remains but whose stomach contained a considerably smaller amount of food. As will be seen from the tabulation of the food contents of the two digestive systems examined, the great majority of the insects eaten were flying ants.

The contents of the female esophagus and stomach were identified as follows:

HEMIPTERA.—Reduviidae, 1, Lygaeidae, 1, Pentatomidae, 1, family ?, 3; HOMOPTERA.—family ?, 3; COLEOPTERA.—Curculionidae, 5, family ?, larvae, 4; LEPIDOPTERA (Microlepidoptera), 2; DIPTERA.—Trypetidae, 1, family ?, 1; HYMENOPTERA.—Ichneumonidae, 9, Formicidae, *Azteca foreli*, 811. Total, 842.

The contents of the male esophagus and stomach were identified as follows:

HEMIPTERA.—Lygaeidae, 3, family ?, 10; HOMOPTERA.—Jassidae (?), 2, family ?, 4; COLEOPTERA.—Staphylinidae, 2, wood-boring beetles, 2, Curculionidae, 10, Bruchidae, 3, family ?, 1; LEPIDOPTERA.—family ?, 7; DIPTERA.—Phoridae, 1, Ortalidae, 4, Trypetidae, *Anastrepha*, 2, family ?, 4; HYMENOPTERA.—Ichneumonidae, 5, Formicidae, 471, *Azteca foreli* family ?, 7. Total, 538.

ARACHNIDA, Spider, 1.

Twenty-three lice (Mallophaga), including 12 females, 2 males, and 9 nymphs, were removed from these two birds. They were identified as *Dennyus spinotus*.

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To Dan B. Bull of La Mesa, California, we wish to express our sincere thanks for permitting us to reproduce in black and white the painting of the White-collared Swifts made for him by Don R. Eckelberry.

#### SUMMARY

During the early summers of 1962 and 1963 three nesting caves occupied by White-collared Swifts (*Cypseloides zonaris*) in the states of Oaxaca and Chiapas were examined. The nest of this species in each instance was found to consist of mud, moss, insect chitin, and possibly some saliva. The nests are disk-shaped with a shallow depression for the two white eggs. They are built on ledges in caves that are situated behind waterfalls and are kept constantly wet by spray. The birds appear to be colonial at all seasons of the year, although as few as two pairs may nest in a single small cave. The behavior of White-collared Swifts resembles that of White-naped Swifts (*Cypseloides semicollaris*), although the former are somewhat more silent in flight, do not fly in such close formation, and have not been observed in steep dives.

The food of the White-collared Swift consists of insects which are captured in the air, although four beetle larvae were found in one stomach and a spider in another.

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