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NOTES ON THE BIOLOGY OF THE SPOT-FRONTED SWIFT[1]

MANUEL MARÍN A.[2]
Western Foundation of Vertebrate Zoology, 439 Calle San Pablo, Camarillo, CA 93010

F. GARY STILES
Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Apto 7495, Bogota, D.C., Colombia

Key words: Cypseloides cherriei; *distribution; breeding; nest; nestling; molt; behavior; diet; Ecuador; Colombia.*

The Spot-fronted Swift (*Cypseloides cherriei*) is considered one of the rarest Neotropical swifts (Collins 1980). The species was described by Ridgway (1893) from a single specimen collected by G. K. Cherrie on Volcán Irazú, Costa Rica. No further details were given on date, sex, locality, or whether there was another specimen. Presumably, judging by the date of the description, the type was collected on the southwestern slopes of this volcano, above the city of Cartago, in Cartago Province. Fifty-two years later Zimmer (1945) reported a single specimen collected by Hno. Niceforo María in January 1939 at San Gil, Santander, Colombia. Zimmer (1945) examined the type and a second skin at the U.S. National Museum, which he speculated to be the paratype and that both were collected "on the top of Mt. Irazú"; however, it is doubtful that the summit was easily accessible at the time, and it is more likely that the birds were taken at a lower elevation. Soon thereafter Beebe (1949) reported nine specimens recorded or collected between 26 February and 13 June 1948 at Rancho Grande, Aragua, Venezuela. Subsequently, Collins (1968) reported on two more specimens, found at the British Museum of Natural History, collected by C. F. Underwood on 9 August 1898 at Volcán Irazú, again presumably on the southwestern slope, above Cartago, an area known to have been visited frequently by this collector. Twenty-seven years passed until the next account by Kiff (1975), who reported a single bird taken on 12 June 1971 by E. Fiala at Helechales, Prov. Puntarenas, Costa Rica. Five years later Collins (1980) described the first nest and egg for the species, found on 15 July 1976 near Rancho Grande, Aragua, Venezuela. The first detailed studies on the breeding biology of this species were reported by Marín and Stiles (1992) from the Río Tiribí, on the border between San José and Cartago Provinces, Costa Rica, where several nests were found, and they reported 15 birds either banded or collected. Here we present further information on distribution, breeding, molt, behavior and diet.

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[2] Present address: Museum of Natural Science and Department of Zoology and Physiology, Louisiana State University, Baton Rouge, Louisiana 70803, U.S.A.

FIGURE 1. Nestling of *Cypseloides cherriei* gave hostile displays when approached: wing-raising and body-uplift (as shown). The latter display has not been observed previously in the species or the group.

DISTRIBUTION

At present the species is known from five localities: three in Costa Rica, and one each in Colombia and Venezuela (Collins 1980, Marín and Stiles 1992). Here, we present additional localities and new distributional records. Recently the Instituto de Ciencias Naturales of the Universidad Nacional de Colombia (ICN) acquired a collection made by Kjell von Sneidern. When reviewing this new acquisition, FGS found two specimens of *C. cherriei,* a male and a female (?) (ICN #30043 and 30045) from Charguayaco (2,200 m), ca. 13 km N of Cerro Munchique, Departamento del Cauca, Colombia, collected on 5 and 18 May 1975, respectively. These specimens represent not only the second report of the species for the country but also the first specimens on the western slopes of the Andes, extending by over 700 km its range to the southwest. On 19 June 1989, MM and J. M. Carrión encountered two nests of *C. cherriei,* at Las Palmeras (1,900 m) near Chiriboga, ca. 35 km W of Quito, Prov. Pichincha, Ecuador. Both contained young (see below). That night they returned to the site and captured three of four adults. One adult and the oldest young were collected; both were males (WFVZ #46,879-80) respectively. On 26 August 1990 another male (WFVZ #48069) was collected at the same locality. The Ecuadorian specimens extend the species range southward by ca. 480 km from the Colombian locality. All localities for *C. cherriei* with elevational data fall in the wet middle elevations between about 1,100 and 2,200 m.

BREEDING

Cypseloidine swifts are known to nest near water, in shady dark areas where the relative humidity stays near or above 90%, often near or behind waterfalls (Knorr 1961, Foerster 1987, Marín and Stiles 1992). On 19 June 1989, in a dark and wet ravine near a small waterfall, at Las Palmeras, two nests of the Spot-fronted Swift *C. cherriei* were found, both nests were located in small cavities adjacent to the waterfall. They were attached to protuding stones, within 3 m of each other. They were half-cup shaped, and the substrate angle was 65–70°. The bulk of the nest was composed of bryophytes mixed with some mud and a large amount of coarse vascular vegetable fibers (probably root tips). The lining was made of coarse vegetable fibers. The fibers present on the lining and those hanging from the nest (Fig. 1) resembled the nest described by Collins (1980) in Venezuela. Interestingly, none of the Costa Rican nests observed by Marín and Stiles (1992) had such lining material. The use of such materials in the Ecuadorian nests probably reflected the scarcity of vegetation on the ravine walls and surrounding areas where the birds evidently gathered nesting material; all ravines and streams examined in the area lacked abundant bryophytes on the walls. Instead, large numbers of roots and other vascular tissues protruded from the walls. In contrast, in Costa Rica the walls of the Río Tiribí canyon were rich in bryophytes and other vegetation. Both Ecuadorian nests were closer to the wet type described by Marín and Stiles (1992), although they were not water-saturated. The wet mass of one of the nests (WFVZ # 159,223) was 90.5 g, and its dry mass was 24.5 g, with 72% of the mass being water. The first nest was about 1.8 m above the waterfall pool, attached to a small knob in a concave wall, that received constant spray from the waterfall. A few cm below this nest was a nest of an Andean Cock-of-the-rock *Rupicola peruviana.* The second swift nest was about three meters downstream on a small, protuding rock on the side of a cavity about 1 m directly above the waterfall pool. Spray from the waterfall kept the nest moist. This nest (WFVZ # 159,223) contained a well-grown chick (WFVZ # 46,880). During the 1990–1992 seasons a Cock-of-the-rock built its nest over the first *C. cherriei* nest, and the second nest was rebuilt in 1990 and occupied during the subsequent seasons. On 23 May 1992, both nests of *C. cherriei* were found in an advanced stage of construction; by 22 June both nests were partially destroyed. On the site of the first nest, a *Rupicola* was building its nest; we do not know who or what caused the destruction of the second nest.

The first nest found in 1989 contained one young about 18 days old with open eyes and well-formed semiplumes on the body. After about 13 days of age, the wing length increases linearly ($r = 0.99$, $df = 13$, $P < 0.001$) and is the best indicator of age in young swifts (Marín and Stiles 1992). Using the flattened wing measurement, we estimated the older chick to be 56 days old. The hatching dates in these Ecuadorian nests thus ranged from late April to early June, about 2–3

months earlier than the hatching season in Costa Rica, and probably, Venezuela.

MOLT

Of the Colombian specimens captured in May, the female had the first primary fully grown, the second over half grown, and the third about one-quarter of full length; the male showed no primary molt. Of the Ecuadorian birds banded or collected in June, the collected bird had the fourth inner primary over half grown. One of the banded birds had the fifth primary three-quarters grown, and a second banded bird had the second inner primary almost fully grown. A third bird banded on 22 June 1992 had the fourth primary one-third, and the fifth emerging from sheath. The bird collected on 26 August 1990 had the sixth about nine-tenths and the seventh, one-third of the full primary length. The timing of molt is fairly similar between the Colombian and Ecuadorian birds, and as with breeding, the season in these areas appears to be about 2–3 months earlier than in Costa Rica (cf. Marín and Stiles 1992).

BEHAVIOR

During a nocturnal visit to the Ecuador site, as in our previous observations in Costa Rica, Marín observed both adult birds roosting on the nests, and both covering the chicks. The chicks were silent and when approached gave a hostile wing-raising display. This behavior seems to be a common antipredator response of young in related *Cypseloides* swifts (Marín and Stiles 1992; Marín, pers. observ.). Marín also observed that the nestlings raised themselves, as if to increase their apparent body size (Fig. 1). We have not observed previously this presumed antipredator behavior in other cypseloidines. Marín did not observe the adults during the day at this site. During one nocturnal visit to the site, an adult was attracted to the light of the headlamps, which it approached while emitting a continuous stream of harsh twittering-clicking notes that reminded Marín of the sound that *C. cryptus* emitted in Costa Rica (cf. Marín and Stiles 1992). We speculate that such notes might be a kind of rudimentary echolocation. Some species of cypseloidines arrive in their roosting or nesting places after dark, from 20:00 to 22:00 hr, but we have never heard such notes when the birds arrived. We think that, even in near darkness, vision is the primary sense of orientation in some species of this subfamily. Spot-fronted Swifts have strikingly large eyes that are 5.5% of their body mass, which we suspect is an adaptation to dim light conditions. Possibly they use what we speculate to be echolocation as a secondary method of perception or where it is too dark to use vision. In species of swiftlets (*Aerodramus* species) that use echolocation as the primary method of perception to get about in dark caves where they nest or roost, the eyes are not as strikingly large as in the *Cypseloides* species.

DIET

Prior to this account the only reports on the diet of this species are from three stomachs described by Beebe (1949) in narrative form, and the contents of one stomach, containing few insects, reported by Marín and Stiles (1992). Our samples from Ecuador are based on two food boluses and two stomach contents with a total of 719 prey items, of which 86.7% were Hemiptera and Hymenoptera (Table 1). Other reports on the diet of the Spot-fronted Swift and other cypseloidine swifts indicate a similar preference for Hymenoptera and Hemiptera. Rowley and Orr (1962) reported that the esophagus and stomach contents of a White-naped Swift, *Streptoprocne semicollaris*, contained 63.6% Hemiptera and Hymenoptera. In two esophagi and stomachs of the White-collared Swift, *S. zonaris*, 94.3% were Hymenoptera (Rowley and Orr 1965). Marín and Stiles (1992) reported four stomachs and two boluses for the White-chinned Swift *C. cryptus*, of which 91.7% were Hymenoptera. Narrative accounts on data from stomach contents of other Neotropical swifts within the subfamily (e.g., Beebe 1949, Howell 1957, Collins 1968b, Collins and Landy 1968, and Sick 1986) indicate a similar trend, with Hymenoptera as the main component of the stomachs observed. Data available for the temperate breeding member of the group, *C. niger*, (e.g., Bent 1940, Foerster 1987, Marín, unpublished data) indicate a predominance of Hymenoptera in its diet, but also see Rathbun (1925) as one exception. All reports in the literature on cypseloidine swifts taken anywhere along their range show a great degree

TABLE 1. Contents of food boluses and stomachs of *Cypseloides cherriei* from Ecuador.

Order	Family	Number
Hymenoptera		283
	Formicidae	280
	Chalcidoidea	1
	Barconidae	1
	Blastophagidae	1
Coleoptera		24
	Curculionidae	1
	Nitidulidae	7
	Scolytidae	2
	others	14
Hemiptera		341
	Cicadellidae	149
	Fulgoroidae	101
	Anthocoridae	2
	Aphididae	65
	Coreidae	1
	Miridae	2
	others	21
Psocoptera		11
Diptera		39
	Tipulidae	18
	Tephritidae	1
	Phoridae	5
	others	15
Lepidoptera		5
Ephemeroptera		8
Araneida		8

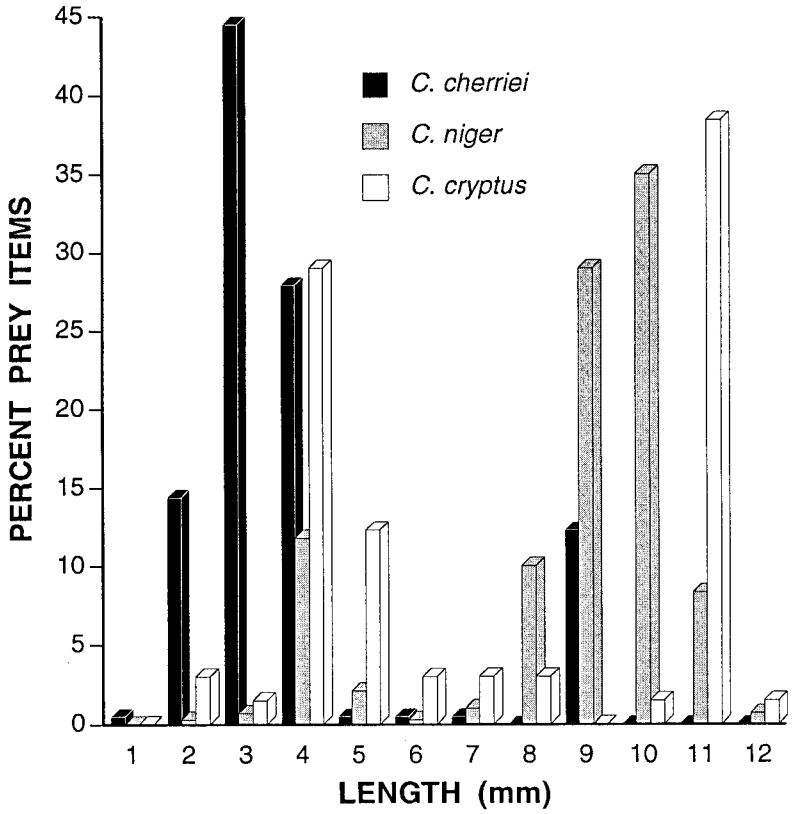

FIGURE 2. Frequency of prey size taken by three *Cypseloides* species. The size categories are defined as to read fractional numbers to next class size, (e.g., 0–1 = 1; 1.1–2 = 2; 2.1–3 = 3); data for *C. niger* from Collins and Landy (1968).

of similarity in their prey items, with the bulk of their composition Hymenoptera and Hemiptera. At present, we lack sufficient data to assess the differences in prey size among cypseloidine swifts. We can, however, compare the frequencies of prey size among three closely related species of *Cypseloides* of similar proportions: *C. cherriei, C. cryptus,* and *C. niger* (Fig. 2). By body mass *C. cherriei* (23.2 ± 1.69 g; $n = 16$) is the smallest of the three. From our sample from Ecuador ($n = 684$ prey items) 44.5% of the prey items falls into the 3 mm length category and 87.3% were between 1–4 mm class length. The next species by body size is *C. cryptus* (35.27 ± 1.92 g; $n = 13$), for which a sample from Costa Rica had ($n = 63$ items) 38.4% of the prey in the 11 mm category, and a cluster of 41.3% in the 4–5 mm range. The largest species is *C. niger* (38.6 ± 2.64 g; $n = 10$) for which a sample from Mexico ($n = 278$ items) Collins and Landy (1968) had 35% of the prey in the 10 mm category and 82.3% in the 8–11 mm range. Because few prey taxa made up a large volume of the items, prey size follows a similar pattern, with a large preponderance of the prey items in discrete length categories.

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FOOD CACHING AND ITS POSSIBLE ORIGIN IN THE BROWN CREEPER[1]

STEVEN L. LIMA AND ROBERT M. LEE, III
Department of Life Sciences, Indiana State University, Terre Haute, IN 47809

Key words: Brown Creeper; Certhiidae; caching behavior; food hoarding.

We report here the first observations of food caching in the Brown Creeper (*Certhia americana*) and the family Certhiidae. We have not located other such observations in the ornithological literature, nor have recent reviews of food hoarding in birds (Smith and Reichman 1984, Källander and Smith 1990, Vander Wall 1990) mentioned food caching in the Certhiidae. These observations extend to seven the number of passerine families known to contain food hoarders (following Vander Wall 1990, excluding a questionable report in the Sturnidae). We also consider briefly the possible evolutionary origin of food hoarding in the Certhiidae.

Brown Creepers were observed caching small bits of sunflower seed kernels during a winter study on the foraging behavior of Black-capped Chickadees (*Parus atricapillus*; see Lima 1985); the importance of these observations has become apparent to us only recently. During this study, chickadees, and incidently, Brown Creepers, were presented with a feeder containing bits of sunflower seed kernels ranging in size from 3 to 17 mg. Only one food item size was available during a given day. The feeder was 1 m off the ground, and placed in the open understory of a mature, 3 ha red pine (*Pinus resinosa*) plantation surrounded by a hardwood forest (near Rochester, New York).

Brown Creepers frequently forage in mixed-species flocks formed around parids (Morse 1970), and they were often observed feeding on nearby pines when chickadees were visiting the feeder. Although the sunflower seed food was available each morning for 1.5 hr from late December, 1983, through March, 1984, creepers were not observed visiting the feeder until early February. After this time, creepers visited the feeder 27 times during seven of the remaining 20 morning observational sessions conducted over a 40 day period.

A Brown Creeper's typical feeder visit consisted merely of swallowing several bits of sunflower seeds before departing. However, on at least five feeder visits during three observational sessions, creepers (numbers unknown) cached several food items in the bark of nearby trees. They tended to do so when relatively few chickadees were present. Brown Creeper caching behavior was similar to that of nuthatches (*Sitta* spp.; Kilham 1974, Petit et al. 1989). A caching bird would carry a single food item to the trunk (20–30 cm in diameter) of a nearby red pine tree, and then carefully thrust it upward into a crevice in the bark. They made no attempt to cover their caches as do nuthatches (Kilham 1974), but caches were nonetheless difficult to detect from a distance of 1–2 m.

The creepers "scattered" food items singly (cf. Käl-

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