

- PICMAN, J. 1977. Destruction of eggs by the Long-billed Marsh Wren (*Telmatorhynchus palustris palustris*). *Can. J. Zool.* 55:1914–1920.
- POWER, H. W., E. LITOVICH, AND M. P. LOMBARDO. 1981. Male Starlings delay incubation to avoid being cuckolded. *Auk* 98:386–389.
- SHELLEY, L. O. 1934. Tree Swallow tragedies. *Bird-Banding* 5:134.
- STACEY, P. B., AND T. C. EDWARDS. 1983. Possible cases of infanticide by immigrant females in a group-breeding bird. *Auk* 100:731–733.
- TRAIL, P. W., S. D. STRAHL, AND J. L. BROWN. 1981. Infanticide in relation to individual and flock histories in a communally breeding bird, the Mexican Jay (*Aphelocoma ultramarina*). *Am. Nat.* 118:72–82.

The Condor 88:531–532
© The Cooper Ornithological Society 1986

NEST, EGGS, AND REPRODUCTIVE BEHAVIOR OF THE COCOS FLYCATCHER¹

THOMAS W. SHERRY

Department of Biological Sciences, Dartmouth College, Hanover, NH 03755

Key words: *Clutch size; Cocos Island; Costa Rica; eggs; flycatcher; Nesotriccus ridgwayi; nest; reproductive behavior; Tyrannidae.*

Song similarities suggested that the Cocos Flycatcher (*Nesotriccus ridgwayi* Townsend, Tyrannidae), endemic to Cocos Island, Costa Rica, is closely related to the Mouse-colored Tyrannulet (*Phaeomyias murina*) (Lanyon 1984a, see also Kroodsma et al., in press) and their plumages are similar. However, their bills are strikingly different (Sherry 1985), and this difference thwarted early attempts to understand the origin of *N. ridgwayi*. In this paper, I describe for the first time nest and egg characteristics of the Cocos Flycatcher, which support Lanyon's (1984a) conclusions about its systematic position. I also present data suggesting a typical clutch size of one egg, and I report observations on *N. ridgwayi* reproductive participation of the sexes.

NEST AND EGG DESCRIPTIONS

Cocos Island, Costa Rica, is a lushly rainforested, uninhabited island approximately 500 km southwest of Costa Rica in the tropical eastern Pacific Ocean (5°32'57"N, 86°59'17"W). It contains within a 46.2 km² area an impoverished and largely endemic avifauna (Slud 1967, Sherry 1985): besides *N. ridgwayi*, the only resident land birds are the Cocos Finch (*Pinaroloxias inornata*), Cocos Cuckoo (*Coccyzus ferrugineus*), and Yellow Warbler (*Dendroica petechia aureola*). In nine months of residence on Cocos Island, I discovered four nests of *N. ridgwayi*. All were well concealed, compact cup nests in distal branch tips in the canopy or subcanopy vegetation. The first nest, found on 29 February 1980, was approximately 25 m above ground in a *Saccoglottis holdridgwayi* (Houmeriaceae) tree growing on a steep slope just southwest of the ridge between Chatham and Wafer Bays. This nest was built on a small, horizontal twig and anchored to several leaf petioles, such that it was covered by surrounding leaves, within 10 cm of an outer canopy branch tip. Two adults were feeding one or two nestlings. I was not able to return to this nest on subsequent days.

The second nest (specimen #114,953, Western Foundation of Vertebrate Zoology) was found on March 18 1980, in a *Hibiscus tiliaceus* (Malvaceae) thicket near the Wafer Bay beach. The nest was 10.5 m above ground, again near the distal tip of vegetation (Fig. 1a). It was constructed largely of fine, black fungal filaments (rhizo-

morphs of *Marasmius crinisiqui*—F. G. Stiles, pers. comm.) and was lined with feathers. This nest had spider egg-cases attached to the outside of the nest (Fig. 1b). Pale fibers of undetermined plant origin were used to support and attach the *Hibiscus* nest to vegetation. It had inside and outside diameters, respectively, of 4.0 to 4.5 cm and 7.0 to 7.5 cm, and inside and outside depths, respectively, of 2.5 cm and approximately 5.0 cm. It was saddled on a 3 to 6 mm diameter *Hibiscus* twig at an angle of 30°, but was anchored in addition to an *Ipomoea* (Convolvulaceae) vine (Fig. 1a). An adult was incubating one egg, which broke during my attempt to collect the nest. The egg was unmarked and uniformly creamy white.

Nests 3 and 4 were also discovered near the Wafer Bay beach on 16 and 21 February 1984, respectively. The third,

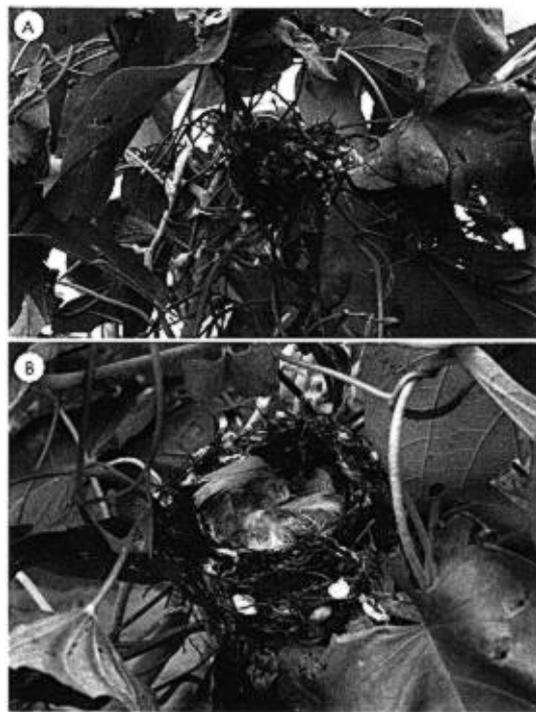


FIGURE 1. a. Nest location of Cocos Flycatcher in distal branch of *Hibiscus tiliaceus* tree. b. Close-up view of nest in Figure 1a showing details of nest construction, interior, and attachment.

¹ Received 27 January 1986. Final acceptance March 7, 1986.

estimated to be 10 m above ground, was in a distal branch tip, in the lower canopy of a 20-m tall *Erythrina fusca* (Leguminosae) tree. When it was discovered, one adult went to the nest and another was nearby, but I could not ascertain the stage of nesting, and there was no activity at the nest on subsequent days. The fourth nest was approximately 12 m above ground in another *Erythrina fusca* tree more than 20 m tall, in a horizontal forked branch, about 0.3 m from a branch tip. Both adults brought nesting material to this nest when it was discovered, and an adult was incubating or brooding on 13 March, when I was next able to visit the nest, but I saw no activity on subsequent days. All four nests had whitish exterior spots which looked superficially like the spider egg-cases on the second nest, the only one I could examine closely.

The discovery of all four *N. ridgwayi* nests in February and March is consistent with the tendency of the other Cocos landbirds to concentrate nesting activity in the driest months of January to March (T. W. Sherry and T. K. Werner, unpubl. data). Placement of *N. ridgwayi* nests in high, distal vegetation (similar to nest sites of Cocos Finches—T. W. Sherry and T. K. Werner, unpubl. data) may help reduce nest predation, since introduced rats and feral house cats are the only potential nest predators of which I am aware.

Nest and egg characteristics of tyrannid flycatchers tend to be evolutionarily conservative within most genera (Traylor and Fitzpatrick 1982; Lanyon 1984b, 1985; L. Kiff, pers. comm.). Nest construction and egg color of *N. ridgwayi* are similar to those of the Mouse-colored Tyrannulet (L. Kiff and M. D. Williams, pers. comm.) and of the Yellow Tyrannulet (*Capsiempis flaveola*) (L. Kiff, pers. comm.), thus corroborating Lanyon's (1984) conclusion based on syrinx and nasal septum characters that these three species are closely related. Nest and egg descriptions reported here provided the basis for Traylor and Fitzpatrick's (1982) nest categorization of *N. ridgwayi*.

CLUTCH SIZE

Two observations suggest that *N. ridgwayi* clutches typically contain one egg. First, the incubating female (described above) was sitting on one egg, although I could not be sure that the clutch was complete when I collected the nest. Second, fledgling *N. ridgwayi* were invariably alone and separated by distances comparable to the diameter of an average territory (based on several family groups observed in February to March 1980, and 22 groups from 17 March to 1 April 1984). Although I often observed two adults feed a fledgling, I never saw one adult feed more than one fledgling. I could easily distinguish fledglings from adults because the former are buffier throughout the body, especially on the rump and wing bars, than the latter (see specimen #824,704, American Museum of Natural History; and unpublished photographs by author), and because fledgling vocalizations are distinctive from those of adults (T. W. Sherry, unpubl. observ.). The possibility that *N. ridgwayi* clutches usually contain one egg is intriguing. This would be unique among Tyrannidae (see Skutch 1960) because *P. murina* typically has two-egg clutches (M. D. Williams, pers. comm.) and because the other common land bird resident—the Cocos Finch—has two-egg clutches ($n = 12$ clutches or broods; T. W. Sherry and T. K. Werner, unpubl. data). Island birds and other animals often have reduced clutch sizes (e.g., Cody 1971), although the reasons for this pattern are not well understood.

REPRODUCTIVE BEHAVIOR

N. ridgwayi is apparently monogamous and territorial. While recording songs and conducting playbacks (Kroodsma et al., in press), we observed that invariably two adults approached speakers closely and immediately, and often produced sex-specific, temporally coordinated songs, i.e., duets. I frequently observed two adult birds foraging closely

together, and one such pair collected 21 March 1980, was confirmed (by gonads) to consist of a male and a female. Several pairs of color-banded birds occupied contiguous, largely nonoverlapping areas, particularly in the cloud forest where pairs occupied approximately 0.25 ha ($n = 4$), suggesting that territories serve both feeding and reproductive purposes.

Two observations suggest that females alone incubate the egg(s). First, in two cases involving adults color-banded during the reproductive period, and for which two individuals were confirmed to travel and feed together, one individual had a brood patch and the other had a cloacal protuberance but no brood patch (T. W. Sherry and T. K. Werner, unpubl. data). Second, two other individuals that had receding brood patches when collected had ovaries.

Reproductive observations, taken together, suggest that *N. ridgwayi* adults are monogamous, that both sexes feed nestlings and fledglings, and that females alone incubate, all typical patterns for Tyrannidae (Skutch 1960). I observed two adults, presumably the male and female, constructing the fourth nest (above); Skutch (1960) observed nest construction by both sexes in only a few tyrannids, mostly Elaeniinae, the subfamily to which *N. ridgwayi* belongs.

The dissertation-improvement program of the National Science Foundation, the Western Foundation of Vertebrate Zoology, the Frank M. Chapman Memorial Fund of the American Museum of Natural History, EARTH-WATCH, and the National Geographic Society generously funded three expeditions to Cocos Island. For logistic support I thank C. L. Hogue, F. G. Stiles, the Organization for Tropical Studies, personnel of Servicio de Parques Nacionales de Costa Rica (particularly J. Maria Rodriguez, Fernando Cortés, J. Barborak, and R. Carlson) and the Guardia Nacional de Costa Rica stationed in Puntarenas and on Cocos Island. For suggestions on the manuscript I thank R. T. Holmes, L. Kiff, W. E. Lanyon, N. L. Rodenhouse, P. Stettenheim, T. K. Werner, C. J. Whelan, and M. D. Williams. K. Orndorff and T. K. Werner provided photographic assistance and T. K. Werner provided continual assistance in the field.

LITERATURE CITED

- CODY, M. L. 1971. Ecological aspects of reproduction, p. 461–512. In D. S. Farner, and J. R. King [eds.]. Avian biology, Vol. 1. Academic Press, New York.
- KROODSMA, D. E., V. INGALLS, T. W. SHERRY, AND T. K. WERNER. In press. Songs of the Cocos Flycatcher: vocal behavior of a subspecies on an isolated oceanic island. Condor.
- LANYON, W. E. 1984a. A phylogeny of the kingbirds and their allies. Am. Mus. Novit. No. 2797:1–28.
- LANYON, W. E. 1984b. The systematic position of the Cocos Flycatcher. Condor 86:42–47.
- LANYON, W. E. 1985. A phylogeny of the Myiarchine flycatchers, p. 361–380. In P. A. Buckley, M. S. Foster, E. S. Morton, R. S. Ridgely, and F. Buckley [eds.], Neotropical ornithology. Ornithol. Monogr. No. 36, American Ornithologists' Union, Washington, DC.
- SHERRY, T. W. 1985. Adaptation to a novel environment: food, foraging, and morphology of the Cocos Island Flycatcher, p. 908–920. In P. A. Buckley, M. S. Foster, E. S. Morton, R. S. Ridgely, and F. Buckley [eds.], Neotropical ornithology. Ornithol. Monogr. No. 36, American Ornithologists' Union, Washington, DC.
- SKUTCH, A. F. 1960. Life Histories of Central American birds. II. Families Vireonidae, Sylviidae, Turdidae, Troglodytidae, Paridae, Corvidae, Hirundinidae and Tyrannidae. Pacific Coast Avifauna No. 34.
- SLUD, P. 1967. The birds of Cocos Island (Costa Rica). Bull. Am. Mus. Nat. Hist. 134:262–295.
- TRAYLOR, M. A., JR., AND J. W. FITZPATRICK. 1982. A survey of the tyrant flycatchers. Living Bird 19:7–50.