

# Nest, eggs and reproductive behavior of Greenish Schiffornis (*Schiffornis virescens*)

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**ABSTRACT:** *Schiffornis* (Aves: Tityridae) includes seven species of Neotropical forest birds whose breeding biology is poorly known. We studied three nests of Greenish Schiffornis (*Schiffornis virescens*) in the Atlantic Forest of Misiones, Argentina. Nests were bulky cups of dead leaves and other vegetative fibres, lined with *Marasmius* rhizomorphs and fine rootlets. They were attached laterally to tree fern (*Alsophila procera*) stems, supported from below, and camouflaged by abundant epiphytes and tree fern petioles. Each contained three eggs, which were creamy white speckled with chestnut. Only one adult was seen to incubate, with on-bouts of 65, 69 and 89 min, and off-bouts of 18, 25 and 28 min. Two nests were depredated at the incubation stage, and the third was not followed. Considering that no *Schiffornis* nest has been followed to fledging, we strongly encourage researchers and bird watchers to be alert to *Schiffornis* flushing in the understory, and to follow nests to completion whenever possible.

**KEY-WORDS:** Atlantic Forest, clutch size, cup nest, incubation, uniparental care.

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After a long history of being transferred among various oscine families, the genus *Schiffornis* has been placed in the family Tityridae on the basis of morphology, life history, and genetics (Prum & Lanyon 1989, Barber & Rice 2007). *Schiffornis* includes seven species endemic to the Neotropics (Remsen-Jr. *et al.* 2017). Reproductive biology has been studied only for the Northern Schiffornis (*Schiffornis veraepacis*; Skutch 1969, Snow 2004).

The Greenish Schiffornis (*Schiffornis virescens*) is endemic to the Atlantic Forest of southeastern Brazil, eastern Paraguay, and northeastern Argentina (province of Misiones and extreme north of Corrientes), where it inhabits the forest understory and midstory (Saibene *et al.* 1996, Snow 2004, de la Peña 2016, pers. obs.). Snow (2004:169) mentions a single record of a nest “found in Brasília, 19<sup>th</sup> Dec, a large cup of leaves placed 3 m above ground in upright fork of bush, contained 2 eggs”, but Crozariol (2016) doubted the species identification and we could not trace the original source. Based on a review of museum collections and on-line photos, Marini & Heming (2017) place the breeding season between October and February, and report two sets of two eggs, which they describe as “light color apparently spotless”, probably collected around 1900 and possibly discolored. Saibene *et al.* (1996) and Bodrati *et al.* (2010) mentioned that the species breeds in Misiones, but without

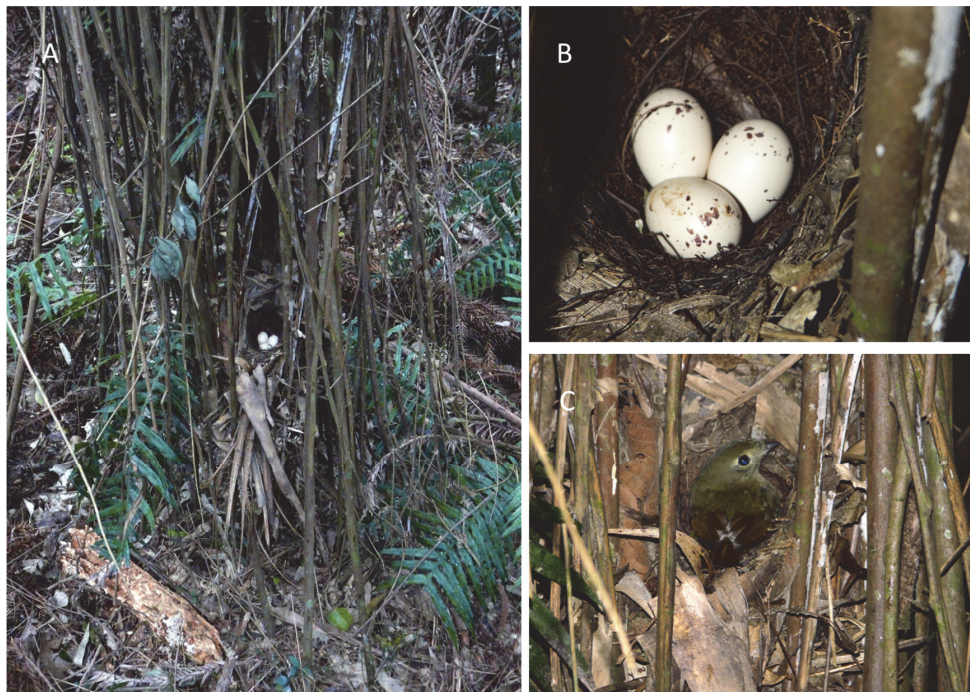
providing details. Here, we contribute a detailed, first-hand description of the nest, eggs, and adult behavior during incubation.

We studied nests at Parque Provincial Cruce Caballero, San Pedro, Misiones, Argentina (26°31'S; 54°00'W; 550–600 m a.s.l.), where the Greenish Schiffornis is an abundant resident of primary and secondary forest (Bodrati *et al.* 2010). The vegetation is mixed Atlantic Forest with laurel (Lauraceae), Guatambú (*Balfourodendron riedelianum*) and Paraná Pine (*Araucaria angustifolia*; Cabrera 1976), and annual rainfall is 1200–2400 mm distributed evenly throughout the year. We found nests of Greenish Schiffornis while conducting a site inventory and other bird studies from 2003 to 2016 (*e.g.*, Bodrati *et al.* 2010, Cockle *et al.* 2017). We measured eggs using callipers and nests using a measuring tape. We watched one of the nests (nest 3) for 7 h 46 min during the incubation period (Table 1). We collected this nest after it failed, and deposited it at Museo de la Plata. We used R version 3.2.2 (R Core Team 2015) for statistical analysis.

We found three nests, all well-camouflaged within the shady understory of tree fern (*Alsophila procera*) patches in primary forest, more than 800 m from the nearest edge (Table 1). All were bulky cups of leaves and fibers, considerably larger than the adult bird, loosely

**Table 1.** Nests of Greenish Schiffornis (*Schiffornis virescens*) in Parque Provincial Cruce Caballero, Misiones, Argentina.

|  | Nest 1     | Nest 2     | Nest 3     |
|--|------------|------------|------------|
| Date found                                       | 5 Oct 2010 | 3 Oct 2011 | 6 Oct 2014 |
| Height above ground (cm)                         | 43         | 64         | 48         |
| External height of nest (from rim to bottom; cm) | 16         | 17         | 15         |
| External (horizontal) diameter (cm)              | 10 × 8     | 9 × 8      | 10 × 8     |
| Internal depth (cm)                              | 10         | 10         | 9          |
| Internal diameter (cm)                           | 7 × 8      | 7 × 6      | 7 × 6      |
| Clutch size                                      | 3          | 3          | 3          |
| Egg measurements (mm)                            | 24 × 18    | 24 × 17    | 23 × 16    |
|  | 23 × 16    | 23 × 15    | 23 × 17    |
|  | 22 × 16    | 23 × 16    | 24 × 16    |



**Figure 1.** Nest 3 of Greenish Schiffornis (*Schiffornis virescens*) in Parque Provincial Cruce Caballero, Misiones, Argentina, on 8 October 2014. (A) Nest is attached laterally to a tree fern and sits on a large dead epiphytic bromeliad, within a curtain of dead tree fern petioles. Note inclination of nest toward the photographer and away from the stem of the tree fern. (B) Complete clutch of three speckled eggs. (C) Incubating adult in typical position, facing the tree fern. Photo author: Marcos Cenizo.

attached laterally to the stems of tree ferns and supported underneath by epiphytes (Figs. 1 & 2). All were inclined noticeably outward, with the nest cup facing away from the stem of the tree fern. Although nest interiors were well constructed of woven fibres, the outer portion of the nest, constructed of larger plant material, was loose, and the nests moved slightly when touched.

Nest 1 was wedged between a living tree fern and a second, partly fallen, dead tree fern. This nest was very well hidden by the dead petioles of the living tree fern and by the epiphytic ferns that grew from its stem. Nest 2 was attached laterally to a tree fern and rested on an accumulation of epiphytic bromeliads and ferns that grew

from the tree fern stem. Nest 3 sat on an accumulation of dead epiphytic bromeliads (*Tillandsia* spp.) attached to a tree fern, and was well hidden behind the curtain created by the tree fern's pendant dead petioles (Fig. 1).

Nest materials were similar for all three nests, but we only examined them in detail for nest 3. The outer part of the nest was formed of loosely woven bamboo (*Merostachys* spp. and *Guadua trinitii*) culm sheaths; leaves of *Merostachys* spp., *Alchornea triplinervia*, and laurels (Lauraceae), including several leaf skeletons; whole inflorescences; pieces of tree fern petioles; and leaf rachises. This outer cup was lined with a pad of black *Marasmius* rhizomorphs, which was further lined, up to the edge of

the cup, with a woven mat of fine brown roots, tree fern fibers, a few leaf skeletons, and a few lichens.

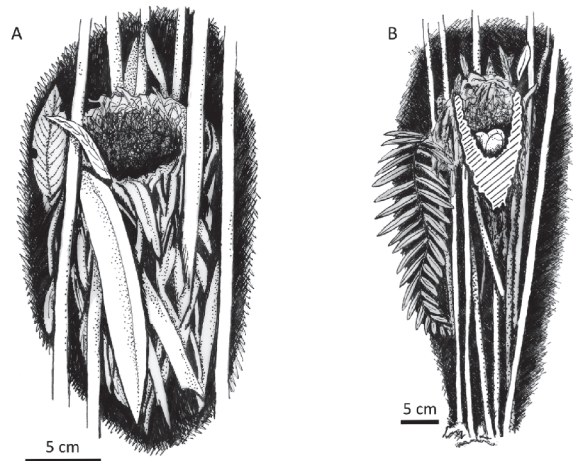
All nests contained three (incubated) eggs, which were creamy white, speckled with reddish chestnut, and measured  $23 \pm 0.2 \times 16 \pm 0.3$  mm (mean  $\pm$  SE; Table 1, Fig. 1B). The speckles were accentuated toward the larger end, forming an open wreath. These eggs were similar in width (Wilcoxon Rank Sum Test,  $W = 15.5$ ,  $P = 0.75$ ) but significantly longer ( $W = 34.5$ ,  $P = 0.01$ ) than the four “apparently spotless” century-old eggs reported by Marini & Heming (2017).

We only ever saw one adult at any nest. When on the nest, the incubating adult always faced the tree fern stem (Fig. 1C). When completing an incubation bout, it flew about 30 m, sang, and was answered by another adult (presumably the pair). We sometimes heard this other adult singing 20–100 m away, but it never approached the nest. When we approached the adult on the nest, it would flush and perform a distraction display, as if injured. As time went by, we could get very close (40 cm), and the adult would remain on the eggs, flattening its body against the nest. At nest 3 we observed three complete incubation bouts, on 9, 10 and 12 October 2014. On-bouts lasted 65, 69 and 89 min, and off-bouts lasted 18, 25 and 28 min.

We visited nest 1 only once, so its fate is unknown. Nests 2 and 3 were found empty and deteriorated on 6 October 2011 and 14 October 2014, respectively, and were presumed to have been depredated.

We observed fledglings at Parque Provincial Cruce Caballero twice. On 16 November 2008 we observed an adult feeding a juvenile, which had a tail about  $\frac{3}{4}$  the length of the adult's tail and pale pink-yellowish gape flanges. On 3 November 2012 we observed an adult capturing larvae in the forest understory, feeding two juveniles which emitted short calls when the adult approached them. The juveniles remained perched on two adjacent branches about 2 m high, hidden under a plant. When the adult fed one chick, the other flew clumsily to the same branch. These fledglings had yellow gape flanges (pink nearest the bill and at the base of the lower maxilla). Their tails were half as long as the adult's tail.

Overall, Greenish Schiffornis was very similar to Northern Schiffornis in nest structure, nest placement, egg size and coloration, and parental care (Skutch 1969). Similar to Greenish Schiffornis, Northern Schiffornis builds a bulky cup nest of leaves and other fibers, lined with fungal rhizomorphs and/or rootlets, and attached laterally to a sturdy stem (small tree or palm), with its base resting on some other structure (epiphytes, crisscrossed stems and vines, or the abandoned nest of another bird; Skutch 1969). Nests of the Greenish Schiffornis were, however, deeper (9–10 cm) than those of Northern Schiffornis (4–6 cm; Skutch 1969). Clutch



**Figure 2.** Nest 3 of Greenish Schiffornis (*Schiffornis virescens*) showing (A) close-up and (B) cut-away view with eggs. Illustration author: Luis Pagano.

size of Greenish Schiffornis (3) was larger than that of Northern Schiffornis (1–2; Skutch 1969), consistent with the general pattern that avian clutch size increases with latitude (Lack 1948, Jetz *et al.* 2008). Similar to our observation that only one Greenish Schiffornis parent appears to incubate, Skutch (1969) noted that the Northern Schiffornis fails to pair, and the male pays no attention to the nest. He also noted that the incubating female became more confident as the incubation period progressed, consistent with our observations of Greenish Schiffornis.

Unfortunately, we were unable to study the nests of Greenish Schiffornis beyond the incubation period. Length of incubation period, nestling development and parental care of nestlings remain unknown. Furthermore, although Skutch (1969) was able to study part of the nestling period in Northern Schiffornis, he was unable to follow any nest until fledging, which means that the nestling period and late-nestling development remain unknown for any species of *Schiffornis*. Considering that nests have only been partially studied, and only for two of the seven *Schiffornis* species, we strongly encourage researchers and bird watchers to be alert to *Schiffornis* flushing suddenly in the understory, and to study their nests as long as possible, whenever the chance arises.

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