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REPRODUCTIVE BIOLOGY AND DISTRIBUTION OF THE SILKY-TAILED NIGHTJAR (*ANTROSTOMUS SERICOCAUDATUS SERICOCAUDATUS*) IN ARGENTINA

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Abstract · The Silky-tailed Nightjar (*Antrostomus sericocaudatus*) is traditionally considered rare, poorly known, and possibly threatened. It comprises two subspecies: *A. s. mengeli* in the Amazon basin and *A. s. sericocaudatus* in the Atlantic Forest – a rapidly disappearing biodiversity hotspot in southeastern Brazil, eastern Paraguay, and the province of Misiones in Argentina. The subspecies differ in vocalizations and morphology, but reproductive biology has been studied only for *A. s. mengeli*. We found *A. s. sericocaudatus* throughout remaining Atlantic Forest in Misiones, and studied 10 nests. During courtship, the male sang incessantly from a high branch above the future nest site; when the female landed on another branch, he doubled the pace of his song, flew to the female (who emitted soft barks), dropped his wings, fanned his tail, and mounted the female while emitting a low croak. *Antrostomus s. sericocaudatus* laid two immaculate white eggs, in contrast to *A. s. mengeli* and most other *Antrostomus*, which lay eggs with markings. The incubation period was 19 days, and hatchlings were covered in dense pinkish-brown down (vs. "golden" in *A. s. mengeli*). During the day, incubation and brooding were mostly performed by the female, although the male was found incubating once during the day and brooding once at night. Both parents performed distraction displays from incubation until the chicks were 18–19 days old. Considering the restricted range of *A. s. sericocaudatus*, its dependence on remaining Atlantic Forest, and its differences with *A. s. mengeli*, it is important to study its population size, population trajectory, and tolerance of forest fragmentation, in order to determine its global conservation status.

Resumen · Biología reproductiva y distribución del Atajacaminos Oscuro (*Antrostomus sericocaudatus sericocaudatus*) en Misiones, Argentina
El Atajacaminos Oscuro (*Antrostomus sericocaudatus*) fue tradicionalmente considerado raro, poco conocido, y posiblemente amenazado. Se conocen dos subespecies: *A. s. mengeli* en Amazonia y *A. s. sericocaudatus* en la Selva Atlántica - un hotspot de biodiversidad en rápida desaparición en el sudeste de Brasil, este de Paraguay y la provincia de Misiones en Argentina. Las subespecies difieren en vocalizaciones y morfología pero la biología reproductiva ha sido estudiada sólo para *A. s. mengeli*. Encontramos a *A. s. sericocaudatus* en todos los remanentes de Selva Atlántica en Misiones, y estudiamos 10 nidos. Durante el despliegue el macho cantó incesantemente en una rama alta cerca o sobre el lugar del futuro nido; cuando la hembra llego a otra rama, el macho redobló el ritmo del canto, voló hacia la hembra (que emitió ladridos suaves), dejó caer sus alas, puso la cola en forma de abanico y montó a la hembra mientras emitía un "croar" bajo. *Antrostomus s. sericocaudatus* puso 2 huevos de color blanco inmaculado, en contraste con *A. s. mengeli* y la mayoría de las otras especies del genero *Antrostomus*, que ponen huevos con marcas. El período de incubación fue de 19 días, y las crías estaban cubiertas por un denso plumón natal color marrón rosado (vs. "dorado" en *A. s. mengeli*). Durante las horas diurnas la incubación de los huevos y pichones estuvo principalmente a cargo de la hembra, mientras que el macho fue encontrado incubando una vez durante el día y otra por la noche. Ambos padres realizaron despliegues de distracción desde la incubación hasta que los pichones tenían 18–19 días de edad. Considerando el rango restringido y la dependencia a la Selva Atlántica de *A. s. sericocaudatus* y las diferencias con *A. s. mengeli*, es clave estudiar el tamaño y trayectoria de la población, y la tolerancia a la fragmentación de la selva, con el objetivo de determinar su estado de conservación global.

Key words: *Antrostomus sericocaudatus* · Atlantic Forest · Caprimulgidae · Courtship · Development of young · Incubation · Injury-feigning · Misiones · Nesting · Vocalizations

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INTRODUCTION

The Silky-tailed Nightjar (*Antrostomus sericocaudatus*) is a little-known Neotropical species, sister to the Yucatan Nightjar (*A. badius*; Sigurdsson & Cracraft 2014). The genus *Antrostomus* was recently reinstated based on molecular evidence, and is now considered to include 11 species of nightjars, all of which inhabit the Americas, and many of which are endemic to small ranges (Chesser et al. 2012, Remsen et al. 2017).

For many years, distribution and biology of *A. sericocaudatus* were shrouded in mystery. Cassin (1849) described the species based on two specimens from South America, without locality information. For the following century, evidence was so sparse that Peters (1940, in Partridge 1956) doubted whether it was even a South American bird. Bertoni (1919) provided the first mention for Paraguay, commenting that it was not rare in the Atlantic Forest interior at Puerto Bertoni and Ihguasú (Iguazú), but did not provide evidence. Finally, Partridge (1956) obtained four specimens in Misiones and reported a 5th specimen collected previously in Paraguay (held at Museo Argentino de Ciencias Naturales "Bernardino Rivadavia"; MACN), providing the first concrete evidence of the species' presence in Paraguay and Argentina, and noting that it was among the most mysterious of all Atlantic Forest birds. In subsequent years, Partridge went on to capture several more individuals in Argentina (Table 1). Decades later, Dickerman (1975) described a new subspecies – *mengeli* – from the Amazon basin. The voice of *A. sericocaudatus* was not described until 1986 (Hardy & Straneck 1989). *Antrostomus sericocaudatus* is now thought to comprise two subspecies, which differ in size, plumage, and vocal repertoire, and inhabit disjunct ranges (Dickerman 1975, Hardy & Straneck 1989). *Antrostomus sericocaudatus sericocaudatus* is endemic to the Atlantic Forest of southeastern Brazil, eastern Paraguay, and the province of Misiones in Argentina, and *A. s. mengeli* inhabits the Amazon basin of Peru, Bolivia, and Brazil (Cleere & Nurney 1998, Wilkinson 2011).

Cleere & Nurney (1998) describe the preferred habitat of *Antrostomus sericocaudatus* as "forest edges, especially with thickets, bamboo understory or second growth and clearings." Although *A. sericocaudatus* apparently tolerates some degree of forest disturbance, the Atlantic Forest is one of the most threatened ecosystems in the Americas, and less than 15% of the original forest cover remains (Myers et al. 2000, Ribeiro et al. 2009). *Antrostomus s. sericocaudatus* is categorized as threatened, near-threatened, or data deficient by all three of its range countries: "Vulnerable" in Argentina, "Near Threatened" in Paraguay, and "Data Deficient" in Brazil (Guyra Paraguay 2005, Machado et al. 2005, AA/AOP & SADS 2008). At the state level (Brazil) it is "Vulnerable" in Rio Grande do Sul, "Endangered" in Paraná, "Endangered" in São Paulo, and only recently recorded in Santa Catarina (São Paulo 1998, Bencke et al. 2003, Straube et al. 2004, Rupp et al. 2007).

Breeding biology is documented for *A. s. mengeli* (Wilkinson 2009), but poorly known for *A. s. sericocaudatus*, which may differ. Bertoni (1919) mentioned nests with two white eggs in Paraguay. Much later, Partridge (1956) found two nests near Arroyo Urugua-í (Misiones, Argentina); he never published details, but he collected two chicks, held at MACN. Chebez et al. (1988) reported that these chicks are 76.5 mm and 81 mm in total length, with yellowish down, a few pin feathers on the wings, and pale bills and legs. Chebez et al. (1988) additionally found a nest with two white eggs in 1986, 30 km west of Bernardo de Yrigoyen (Misiones, Argentina), but the nest was depredated the day it was found (Table 1). Finally, Krauczuk (2013) mentioned finding nests with two white eggs in Misiones. These brief comments appear to be the only information published on the reproductive biology of *A. s. sericocaudatus*, and have been overlooked in publications about the species (Cleere & Nurney 1998; Wilkinson 2009, 2011).

Here, we present information on the distribution and reproductive biology of *A. s. sericocaudatus* in the Atlantic Forest of Misiones, Argentina, including details of courtship, incubation, parental care, and chick development, and we compare its reproductive biology with that of *A. s. mengeli* and other *Antrostomus*.

METHODS

We did not search specifically for *A. s. sericocaudatus* but recorded adults, and occasionally their nests, while conducting site inventories and other bird studies in Misiones in 1997, 2000, and 2003–2017 (Bodrati et al. 2010, Bodrati & Cockle 2013). We conducted bird surveys throughout the year, by walking slowly along trails, detecting birds by sound or sight, in all types of forest from pre-dawn until mid-day, and again for 3–4 h from mid-afternoon until dark. From 2006 to 2017, we also searched for and monitored nests of cavity-nesting birds within dense forest (Cockle et al. 2015), and were alert to nightjars flushing in the understory. Relative abundance (encounter rate) of birds was recorded on daily lists as rare (1 individual), scarce (2–5), frequent (5–10), common (10–20), or abundant (> 20). We found nests of *A. s. sericocaudatus* at Parque Provincial Cruce Caballero (26°31'S, 53°58'W), Reserva Guaraní (26°56'S, 54°13'W), and Valle del Arroyo Alegría (Alto Paraná SA, now Arauco; 26°29'S, 54°00'W). Whenever possible, we checked nests every 1–7 days to confirm clutch size, determine hatch day, and describe parental behaviors and the development of chicks. We measured eggs using callipers and took weights of eggs and nestlings using a pesola. Vocalizations were documented using a Marantz PMD-222 tape recorder and Sennheiser ME-66 shotgun microphone. Recordings are available at www.xeno-canto.org. Nest sites were measured using a measuring

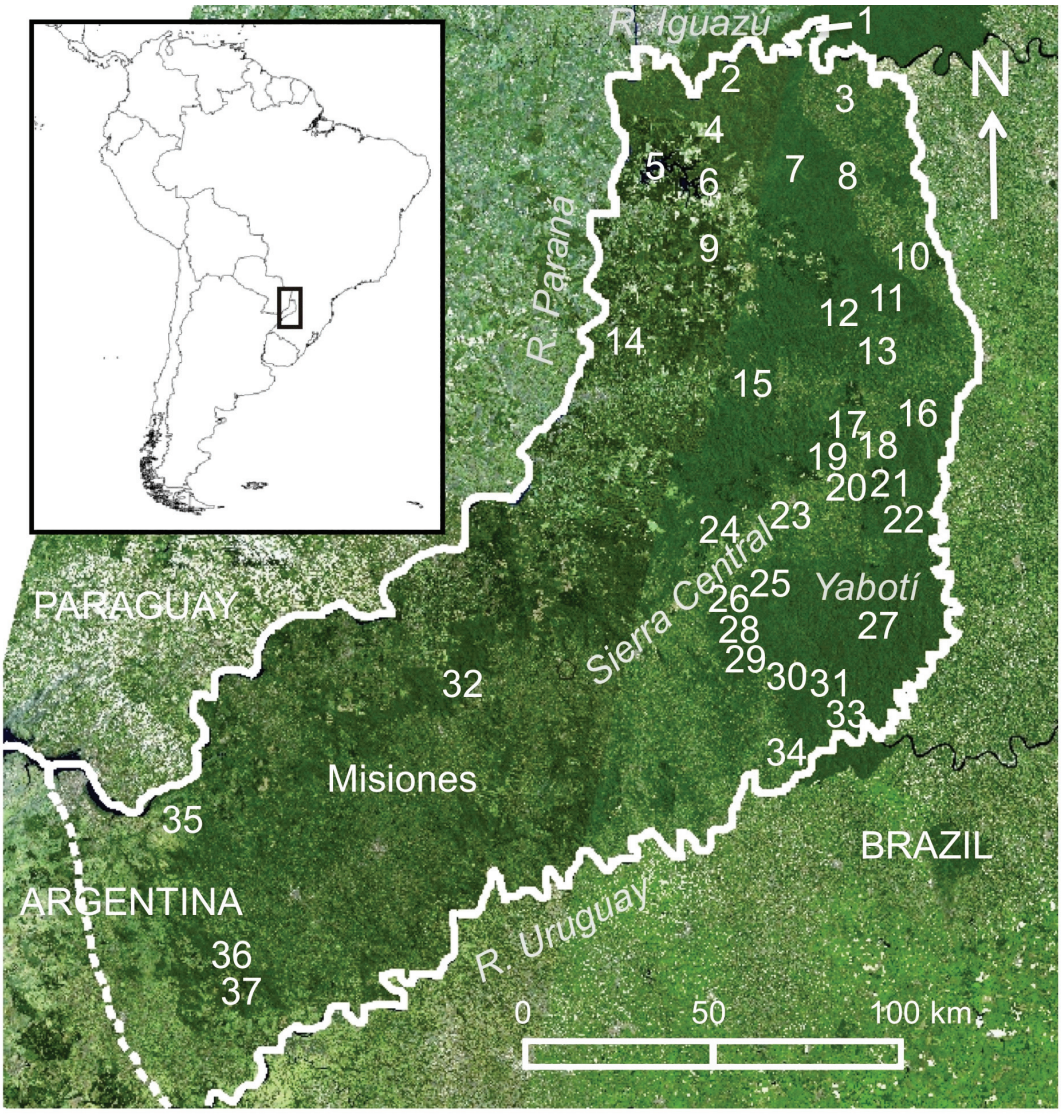

Figure 1. Satellite image of the province of Misiones, Argentina (LandSat 5, 2005, courtesy of CONAE) indicating localities where Silky-tailed Nightjar (*Antrostomus sericocaudatus sericocaudatus*) has been recorded (numbers correspond to Table 1). Cultivated land, pastures, and urban areas are light green and white; tree plantations are dark green; native forest is medium-green.

tape. For reference, we examined museum specimens of *A. sericocaudatus* at MACN and American Museum of Natural History.

RESULTS

Distribution and habitat. We found *A. s. sericocaudatus* throughout the remaining Atlantic Forest of Misiones, in all months of the year, at 30 localities (Figure 1, Table 1). Although we sometimes found individuals within 50 m of forest edges, most of our records were in the interior of primary or selectively-logged forests. We found *A. s. sericocaudatus* in all of the large forests we visited at night; it was much more unusual, although not completely absent, in mosaic landscapes that include forest remnants connected by corridors. We recorded *A. s. sericocaudatus* with greater frequency in the Sierra Central and Reserva de Biósfera Yaboti of central Misiones (e.g., Parque Provincial Cruce Caballero, Parque Provincial Esmeralda, Parque Provincial Caá Yarí, Reserva Guaraní) than in the north (e.g., Parque Nacional Iguazú; Table 1). The only localities where we searched for birds at night and did not find *A. s. sericocaudatus* were Puerto Bemberg (25°55'S, 54°36'W) and Barra Concepción (28°06'S, 55°32'W). Puerto Bemberg is a forest remnant on the Paraná River in northern Misiones, surrounded by a predominantly rural and urban landscape (Bodrati et al. 2012). Barra Concepción is located on the Uruguay River in southern Misiones and represents an ecotone between Atlantic Forest and grasslands. Whereas *A. s. sericocaudatus* was not detected at Barra Concepción, its congener, the Rufous Nightjar (*A. rufus*), was common in gallery forest along the river and in natural Atlantic Forest patches within the grasslands. *Antrostomus rufus* is typically associated with ecotones between forest and grasslands (Krauczuk 2013), and is not found in

Table 1. Records of Silky-tailed Nightjar (*Antrostomus sericocaudatus sericocaudatus*) in Misiones, Argentina. Localities: Res. - Reserva, Est. - Establecimiento, Aº - Arroyo, PP - Parque Provincial, PN - Parque Nacional, Pje - Paraje, Secc. - Seccional, Cnia. - Colonia. Evidence: H - heard, O - observed, AR - audio recording (CLO ML - Cornell Laboratory of Ornithology Macaulay Library), C - collected, P - photographed, NG - not given. Observers: AB - Alejandro Bodrati, EM - Emilse Mérida, JIA - Juan Ignacio Areta, JS - José Segovia, KC - Kristina Cockle, LP - Luis Pagano, ML - Martjan Lammertink, NF - Nestor Fariña, RF - Rosendo Fraga. * E. Krauczuk (*in litt*.) has not recorded *A. sericocaudatus* at Campo San Juan despite decades of bird surveys.

Locality	Coordinates	Dates	No. of records	Evidence (source)
1. Península Andresito	25°30'S, 54°07'W	2 Aug 2008, 14 Feb 2010	1 /visit	H,O (AB, JIA)
2. PN Iguazú	25°33'S, 54°17'W	Jul 1992, Feb 2000, 2007–2010	1 /week	H (AB, JIA)
3. Res. Cabure-í	25°40'S, 54°04'W	13 Jun 2008	1 ind.	H (AB)
4. Est. San Jorge	25°50'S, 54°15'W	20–28 Sep 2004	1–4 daily	H (AB, JIA); AR (CLO ML 135632 JIA)
5. Aº Urugua-í km 10		Nov 1953, Sep 1960	2 specimens	C (MACN, Partridge 1956)
6. Aº Urugua-í km 30		Oct 1954, Oct 1957, Jan 1958	8 specimens (6 adults, 2 chicks)	C (MACN, AMNH, Chebez et al. 1988)
7. Aº Uruzú, PP Urugua-í	25°52'S, 54°11'W	Jul 1993 3 Jun 2005	not given 1 ind.	NG (Contreras et al. 1994) AR (AB)
8. Pje María Soledad	25°49'S, 54°01'W	14 Jul 1992	1 specimen	C (Contreras et al. 1994)
8. Secc. 101, PP Urugua-í	25°49'S, 54°01'W	4–5 Jun 2005	1 ind.	H (AB, KC, NF)
9. Res. Aguaray-Mí	26°04'S, 54°24'W	6–9 Jul 2009	1–5 daily	H (AB, KC, EM, JS), AR (AB)
10. San Antonio (INTA)	26°02'S, 53°46'W	4 Jun 2004	1 ind.	H (AB, KC, NF)
11. 30 km NW of Bernardo de Irigoyen		21 Nov 1986	1 specimen	C (MACN, Chebez et al. 1988)
12. SW PP Urugua-í	26°10"S, 53°57'W	Jun 2005	2 daily	H (AB, KC), AR (AB)
13. 30 km W of Bernardo de Irigoyen		17 Nov 1986	1 nest	O (Chebez et al. 1988)
14. María Magdalena, Aº Piray Miní		30 Jul–6 Aug 1993	not given	NG (Contreras et al. 1994)
15. Cerro 60	26°23'S, 54°14'W	8 Apr 2011	2 ind.	H (AB)
16. PP Piñalito	26°25'S, 53°49'W	Feb 2004, Jun 2008	several	H (AB, KC)
17. Puente Alto (Est. Alegría)	26°27'S, 53°58'W	Nov 2003, Feb 2004	1–2 almost daily	H (AB, KC), AR (AB)
18. Tobuna	26°28'S, 53°53'W	Sep–Oct 1953 Jul–Sep 1959 14 Feb 2005	2 specimens 4 specimens 2 individuals	C (COFML, MACN) C (LACM) AR (AB)
19. PP Cruce Caballero	26°31'S, 53°58'W	Oct 2003–Dec 2016	2–6 almost daily	H (AB, KC), AR (AB)
19. Aº Alegría		Sep–Oct 2003	1 nest	P (ML), O (AB)
20. Pje Cruce Caballero	26°31'S, 53°56'W	7 Oct 2008	2 ind.	H (AB)
21. Pje Piñeiro (Ruta 22)	26°33'S, 53°53W	18 Jul 2009	2 ind.	H (AB)
22. Ruta 16	26°37'S, 53°47'W	May 2009–Jun 2010	1 ind.	AR (AB)

Table 1. Continuation.

Locality	Coordinates	Dates	No. of records	Evidence (source)
23. PP Araucaria & surroundings	26°37'S, 54°06'W	2003–2005	several	AR (AB)
24. Res. Itaovy-Coral, Yaguaroundi & Yacutoro	26°39'S, 54°15'W	Oct 2006, Oct 2016	1–4 daily	AR (AB)
25. Ruta 21 (N)	26°51'S, 54°07W	30 Jan 2007	1 ind.	H (AB)
26. PP Caá Yarí	26°52'S, 54°14'W	Sep 2006, Oct 2006, Mar 2011	2–4 daily	AR (AB)
27. PP Esmeralda	26°53'S, 53°53'W	24 Aug 1993 Nov 2004, Sep 2005	not given 2–5 daily	NG (Contreras et al. 1994) H (AB, KC, RF, JIA), AR (AB; CLO ML 135860 JIA)
28. Res. Guaraní	26°56'S, 54°13'W	Aug 1993, Sep 1993 Oct 2004, Apr 2005	not given 1–7 daily	NG (Contreras et al. 1994) H (AB, KC, NF, RF), AR (AB)
29. Res. Papel Misionero	26°59'S, 54°09'W	1 Sep 2009	3 ind.	H (AB, JS, ML), AR (AB)
30. Cnia. La Flor	27°01'S, 54°08'W	30 Nov 2006	1 record	AR (CLO ML 132974 P.A. Hosner)
30. Res. Tangará	27°00'S, 54°07'W	Feb 2007, Nov 2009	1 almost daily	H (AB, KC, NF, LP, JS), AR (AB)
31. Ruta 21 (S)	27°00'S, 54°02'W	8 Nov 2006	1 ind.	H (AB)
32. PP Salto Encantado	27°03'S, 54°49'W	8 Mar 1997	2 ind.	H (AB)
33. PP Moconá	27°09'S, 53°54'W	14–19 Oct 2005	2 ind.	AR (AB)
34. Res. Yasí Yateré	27°14'S, 54°01'W	16–17 Oct 2006	2 daily	H (AB)
35. Campo San Juan*	27°26'S, 55°38'W	Jun 1991	not given	NG (Contreras et al. 1994)
36. Cnia. Taranco	27°42'S, 55°25'W	not given	not given	NG (Krauczuk 2013, E. Krauczuk *in litt*. 2017)
37. Cerro Mártires	27°51'S, 55°24'W	not given	not given	NG (E. Krauczuk *in litt*. 2017)

Atlantic Forest interior. However, in recent years we have recorded it colonizing central Misiones (e.g., near Parque Provincial Cruce Caballero), where it is present but rare in open areas near remnant forest.

Timing of breeding. Courtship began in mid-August, and nests were active between early September and mid-November (Table 2). The earliest nest (nest 7) was found with a complete clutch on 1 September, showing that laying sometimes begins as early as late August (winter).

Courtship, vocalizations, and territoriality. *Antrostomus s. sericocaudatus* was heard vocalizing occasionally throughout the year, primarily at dawn and dusk. Vocal activity increased in August and we began to hear singing almost every dawn and dusk. It peaked in September and October with some individuals singing nearly all night, and declined in November.

We observed courtship displays at nest 7 on 11 and 19 August 2008. Both times, the male began by singing from a branch ca. 14–16 m high, above the site where the eggs would later be laid (Figure 2A). He emitted the usual song (see Hardy & Straneck 1989) but slightly faster (< 2 s between notes). The female flew in, then perched on a nearly horizontal branch of a *Lonchocarpus leucanthus* (Fabaceae) about 10 m away. As she arrived, the male suddenly halved the interval between notes in his song, uttering several notes in quick succession (Figure 2B). He then flew to the female and perched beside her, as the female emitted soft bark-like notes every 0.5 s (Figure 2C). The male opened his tail like a fan, lowered his wings against the branch, and mounted the female (apparently copulating) while emitting a low croak (Figure 2D).

Territories appeared to be quite stable. One individual, sometimes two, could be heard singing from the same locations, even from the same trees, during multiple breeding seasons (e.g., nest 8 in six sequential years). However, vegetation changed from year to year, and we did not find birds reusing the exact same places for nesting.

Table 2. Nests of Silky-tailed Nightjar (*Antrostomus sericocaudatus sericocaudatus*) in the Atlantic Forest, Misiones, Argentina. Brood size [] is given where clutch size is unknown. Fate: C - collected, F - failed, S - successful, PS - probably successful. Sources: nest 1 - Partridge 1956, nest 2 - Partridge in Chebez et al. 1988, nest 3 - Chebez et al. 1988, nests 4–13 - this study. Blank cells indicate unknown values.

Nest N°	Locality	Dates	Clutch [brood] size	Egg length × width (mm) [mass in g]	Fate
1	A° Urugua-í km 10				
2	A° Urugua-í km 30	30 Oct 1957	[2]		C
3	30 km W of Bernardo de Yrigoyen	17 Nov 1986	2	32 × 19	F
4	Res. Guaraní	29 Sep 2005	2	29 × 20 28 × 21	
5	PP Cruce Caballero	3 Sep–12 Oct 2007	2	28 × 20 29 × 23	
6	PP Cruce Caballero	9 Sep–3 Oct 2007	2	27 × 20 29 × 22	PS
7	PP Cruce Caballero	1–8 Sep 2008	2	28 × 19 29 × 20	F
8	PP Cruce Caballero	29 Sep–8 Nov 2008	2	30 × 22 29 × 22	S
9	PP Cruce Caballero	12 Oct 2009	[2]		PS
10	PP Cruce Caballero	23 Sep 2011	2		
11	PP Cruce Caballero	9–29 Oct 2012	2	29 × 21 29 × 22	
12	PP Cruce Caballero	11–28 Oct 2012	2	26 × 18 [5.1 g] 28 × 18 [5.6 g]	
13	A° Alegría	19 Sep–11 Oct 2013	2		

Nest placement. All nests were located on the forest floor, in areas with relatively sparser ground cover than their surroundings (Figure 3). All except nest 7 were on leaf litter comprised primarily of the leaves of takuapí bamboo (Poaceae: *Merostachys* spp.). Nest 7 was placed on the ground, in a natural depression about 8 × 9 cm wide and 3 cm deep. It was in an understory gap created by the death of a takuapí stand, on leaf litter comprised of dead laurel (Lauraceae: *Ocotea* spp.) leaves, about 20 cm from a dead takuapí culm, 30 cm from a *Cedrella fissilis* (Meliaceae) seedling, and 5 or 6 m from the main trail at Parque Provincial Cruce Caballero (Sendero Carayá Pytá). There were many large trees around the nest, including *Lonchocarpus leucanthus* and *Ocotea* spp.

Eggs and incubation. We found nine complete clutches, each of which contained two immaculate white eggs, ovoid to somewhat rounder (Table 2). Nest 8 contained one egg (incubated by the female) on 29 September, two eggs on 30 September, two eggs at 08:10 h (Argentina ST) on 18 October, and two fluffy chicks with the remains of one eggshell at 17:20 h on 19 October. We thus estimate the incubation period as 19 days (from laying of the second egg on 30 September to hatching of the second chick on 19 October).

Development of chicks. When the chicks first hatched, their eyes were partly open and their bodies were covered in pinkish brown down (nests 8, 11, and 13; Figure 3C). The down was darker (approaching cinnamon) on the back of the neck, and paler yellowish on the crown. The legs and feet were dark, with paler toenails, and the mouth interior was light pink. The broken shell of one egg was present in the nest. On day 4, the chicks had moved a few meters from the original nest location, the down was becoming slightly sparser, and pin feathers were beginning to emerge on the wings, spinal column, and head (nests 8 and 13; Figure 3D). No egg shells remained. By day 5–6, the chicks at nest 8 had moved 20 m from the original nest location. By day 10–11, pin feathers were still very noticeable on the crown, and were open on the wings and back (nest 11, Figure 3E). The shoulders were covered in rufous plumage and the feathers of the back were golden with a black spot. The tip of the bill was dark. Chicks were still captured easily.

We heard the chicks from nest 8 on several evenings as we returned to camp after conducting other field work. By day 15–16, they were 40 m from their original nest site. They were heard whistling, which brought in the adult, but they were not captured to observe closely. On day 17–18, they whistled and

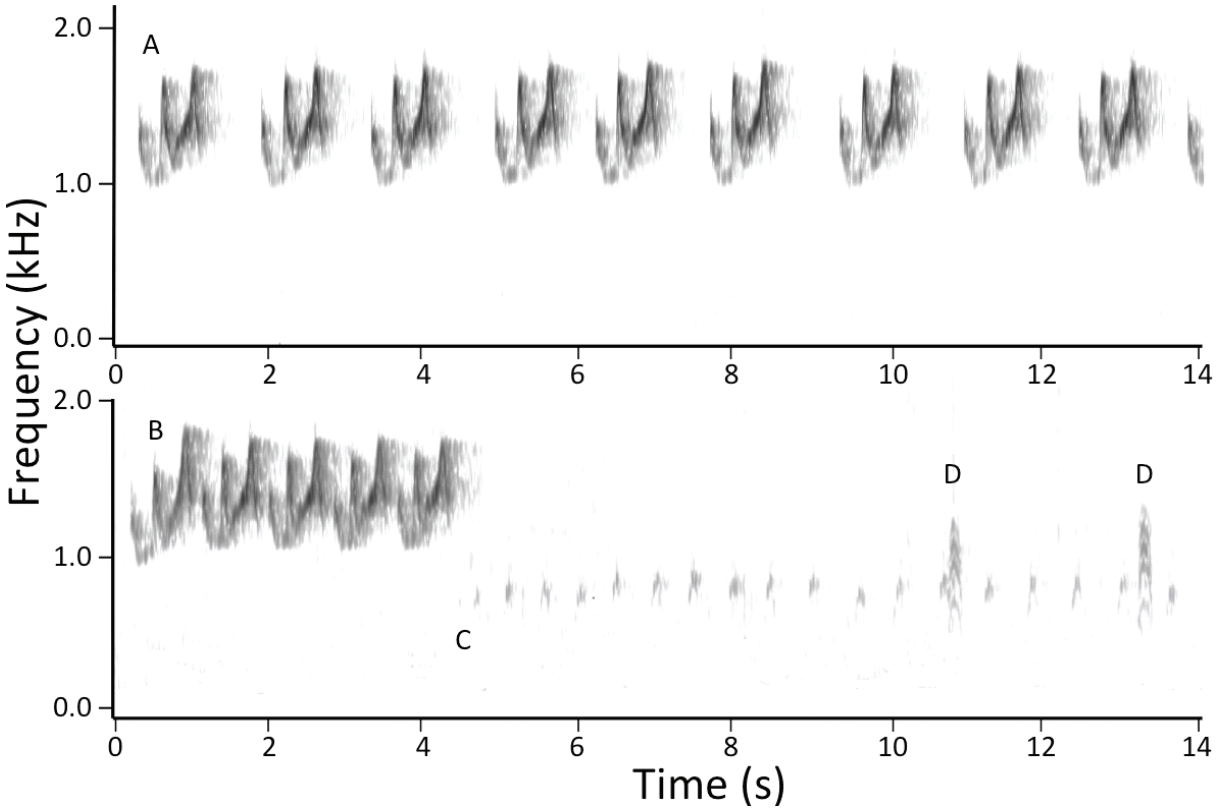

Figure 2. Vocalizations of Silky-tailed Nightjar (*Antrostomus sericocaudatus sericocaudatus*) at 18:20 h on 11 August 2008, several days before laying at nest 7, Parque Provincial Cruce Caballero, Misiones, Argentina. (A) Presumed male singing regular song. (B) Female arrives on a branch 10 m away and male suddenly shortens the interval between notes, then flies to the female. (C) Female emits soft barks. (D) Male croaks during copulation attempt. Audio recordings by A. Bodrati.

made clumsy jumps, but could not fly. On day 18–19, we captured one of these chicks 120 m from the original nest site. It was fully feathered on the wings, head, and back, but it had a short tail (Figure 3F). Its plumage was overall much more golden than that of an adult male or female. The head, back and wing coverts were golden with black spotting, whereas the adult male is dark brown and the female is grey with black spots. The breast and throat were golden with black barring, whereas adults are dark mottled brown with a white necklace and other white markings. The flanks were barred grey on white. It weighed 48 g (vs. 83 g for an adult male in Paraguay; Dunning 1993), its wing chord was 124 mm (vs. 177–190 mm in adults; Cleere & Nurney 1998), and its tail measured 43 mm (vs. 130–152 mm in adults; Cleere & Nurney 1998). Its legs were pink, with dark toes and toenails, and brown down on the thighs. The iris was dark brown, mouth interior pink, and the bill yellowish with a dark tip and light pink gape flanges. It made short, clumsy flights, up to 6 m.

Parental care and distraction display. When we visited nests during daytime, we almost always found the female incubating the eggs or brooding the chicks. AB and park ranger Javier Baez flushed a male from nest 7 at 9:05 h on 1 September 2008. While AB measured the eggs, the male nightjar perched on a dead bamboo culm about 10 m away, and Baez flushed a female from the ground about 10 m away in another direction. The male was back on the nest when we returned at 10:30 h and around mid-day, but the female was incubating in the afternoon. On the night of 23 October 2008, we visited nest 8 and found the male brooding the 4–5-day old nestlings. On other occasions, when visiting a nest at night, we flushed an adult from the nest but could not determine its sex. After dusk on 25 October 2008, the female arrived near nest 8, walked to the nest and made rapid head movements, apparently regurgitating. She opened her bill, and the 6–7-day old chicks took turns inserting their heads to feed.

The female's reaction to observers changed over the course of the nesting period. At first, when the eggs were newly laid, she quickly escaped into the undergrowth, flying low, whenever we approached. As the incubation period progressed, she began staying on the nest longer, eventually staying until we were just 2 m away. She would then perform an injury-feigning display, flying 5–8 m, then perching on the ground in full sight. There, she began to move her wings up and down, wagging her tail from side to side. For a few seconds at a time, she stood on the tips of her wings, with the back side of her body almost vertical (Figure 1B). Sometimes she clapped her wings quickly and audibly against the ground.

Figure 3. Nests of Silky-tailed Nightjar (*Antrostomus sericocaudatus sericocaudatus*) at Parque Provincial Cruce Caballero. (A) Nest 7 with eggs on 1 September 2008. (B) Female performing distraction display at nest 13 on 11 October 2013. (C) Newly hatched chicks at nest 13 on 7 October 2013. (D) 4-day old chicks at nest 13 on 11 October 2013. (E) 10–11-day old chick at nest 11 on 29 October 2012. (F) 18–19-day old fledgling from nest 8 on 6 November 2008. Photographers: Alejandro Bodrati (A, E), Martjan Lammertink (B–D), Kristina L. Cockle (F).

On the night of 2 November 2008, AB was returning to the camp when he heard the chicks from nest 8 (now 14–15 days old) vocalizing in the dense undergrowth about 4 m from the trail. Suddenly, a male landed on the trail, lifting his wings, 8 m in front of the observer. Immediately after landing, he jumped ca. 1 m into the air, landing again in the same spot. He bobbed and raised his wings three or more times. As AB passed the chicks, the male flew off the trail and was lost from sight. Four days later, on 6 November 2008, we again heard vocalizations of the chicks from nest 8 (now 18–19 days old, and on a different section of the trail); as we approached, in an attempt to capture them, one of the adults flew at us 4 or 5 times, emitting short, low vocalizations "cruak!". When we captured one of the chicks, it vocalized in alarm, and the female responded instantly, emitting the "cruak!" vocalization while flying so close that she brushed the observer.

DISCUSSION

Antrostomus sericocaudatus occurs throughout Misiones, wherever there is sufficient Atlantic Forest. Of all the nightjars in the Atlantic Forest region in Misiones, we found *A. sericocaudatus* to be most strongly associated with mature forest interior, followed by the Ocellated Poorwill (*Nyctiphrynus ocellatus*) (Bodrati & Baigorria 2013). Other species (Long-trained Nightjar *Macropsalis forcipata*, Little Nightjar *Setopagis parvula*, Scissor-tailed Nightjar *Hydropsalis torquata*, Common Pauraque *Nyctidromus albicollis*, *Antrostomus rufus*, and Spot-tailed Nightjar *Hydropsalis maculicaudus*) are associated with cleared areas and/or forest edges, and their populations may be expanding (Bodrati & Areta 2010, Bodrati et al. 2010, Bodrati & Cockle 2012, Krauczuk 2013). In Paraguay, which has experienced more extensive deforestation than Argentina, *A. s. sericocaudatus* is restricted to the last remnants of the Atlantic Forest, and is generally rare or uncommon (Guyra Paraguay 2004, Esquivel et al. 2007, pers. observ.). Although we found *A. s. sericocaudatus* at many localities in Misiones, some of them new, the species is clearly forest-dependent. Widespread historical and ongoing destruction of the Atlantic Forest is very likely to be causing population declines.

Antrostomus s. sericocaudatus breeds earlier (laying in August/September) than other nightjars in Misiones. *Nyctidromus albicollis*, *Nyctiphrynus ocellatus*, and *Setopagis parvula* nest, in Misiones, in October–November (Bodrati & Baigorria 2013, pers. observ.). Whereas *A. s. sericocaudatus* begins to vocalize with increased frequency, perform courtship displays, and copulate in August, other nightjars do so beginning in September. Likewise, elsewhere in

Table 3. Eggs and incubation of the Atlantic Forest subspecies of Silky-tailed Nightjar (*Antrostomus sericocaudatus sericocaudatus*; Bertoni 1919, Krauczuk 2013, this study), the Amazon subspecies of Silky-tailed Nightjar (*A. s. mengeli*; Wilkinson 2009) and congeners Yucatan Nightjar (*A. badius*; Paynter 1955), Tawny-collared Nightjar (*A. salvini*; Howell & Webb 1995), Chuck-will's-widow (*A. carolinensis*; Hoyt 1953, Straight & Cooper 2012), Rufous Nightjar (*A. rufus*; Wetmore 1968, Salvador et al. 2014), Greater Antillean Nightjar (*A. cubanensis*; Bond 1934, Cleere & Nurney 1998), Dusky Nightjar (*A. saturatus*; Marin & Schmidtt 1991), Mexican Whip-poor-will (*A. arizonae*; Bent 1940), Eastern Whip-poor-will (*A. vociferus*; Raynor 1941, Cink et al. 2017), Puerto Rican Nightjar (*A. noctitherus*; Vilella 1995, Delannoy 2005) and Buff-collared Nightjar (*A. ridgwayi*; Rowley 1962, Short 1974). * No evidence that clutch was complete.

Taxon	Breeding range	Clutch size	Egg color	Incubation period (days)
A. s. sericocaudatus	SE South America	2	immaculate white	19
A. s. mengeli	Amazon	2	pale pinkish orange with dark maroon specks	unknown
A. badius	Yucatan Peninsula	2	white with chocolate markings	unknown
A. salvini	E Mexico	2	whitish with brown or grey markings	unknown
A. carolinensis	E North America	2	whitish with greyish to brownish markings	20–21
A. rufus	South America	2	cream-colored with grey, lilac, or brown markings	unknown
A. cubanensis	Caribbean	2	whitish with brown markings	19
A. saturatus	Central America	1*	white, unmarked	unknown
A. arizonae	SW USA to Central America	2	pure white, or white with pale purple or clay-colored markings	unknown
A. vociferus	E North America	2	cream or whitish marbled with lavender grey blotches or brown spots	19–21
A. noctitherus	Puerto Rico	1 or 2	buffy brown with numerous brownish purple spots	18–20
A. ridgwayi	Mexico & Central America	2	buff with brownish and lilac markings	unknown

northeastern Argentina, nightjars nest in October–November. In the Chaco, *Antrostomus rufus* can sing all night from dusk to dawn beginning in September, but mainly does so in November (pers. observ.).

Little is known about courtship and copulation in *Antrostomus* nightjars. The courtship display that we observed for *A. s. sericocaudatus*, with the male dropping his wings and opening his tail, was similar in some respects to the courtship displays described by Bent (1940) for Chuck-will's-widow (*A. carolinensis*) and Vilella (1989) for Puerto Rican Nightjar (*A. noctitherus*); unlike Bent (1940), we did not observe the male puffing up his feathers. AB observed a similar display, involving a pair of *A. rufus*, at Parque Nacional Chaco (Chaco, Argentina; 26°48'S, 59°36'W), at dusk on 23 October 1997. The female *A. rufus* landed on top of a vertical arm of a cactus (Cactaceae: *Cereus stenogonus*), about 6 m high. The male followed her, landing on an adjacent arm of the same cactus (40 cm away), a little higher than the female. Immediately he dropped his wings, began bobbing, opened his tail like a fan, and moved it laterally and vertically, while vocalizing rapidly, almost without interruption, for ca. 2 min. The female bobbed several times, then took flight, and the male followed her immediately. Our observation that *A. s. sericocaudatus* sang from the same territories in multiple breeding seasons is consistent with records of high nest site fidelity in *A. s. mengeli*, *A. carolinensis*, *A. noctitherus* and Eastern Whip-poor-will (*A. vociferus*) (Bent 1940, Raynor 1941, Vilella 1995, Wilkinson 2009, O'Connor 2013).

Clutch size (two) and incubation period (19–21 days) are similar for all *Antrostomus* that have been studied to date (Table 3). However, the eggs of *A. s. sericocaudatus*, and possibly the nestlings, differed remarkably from those of *A. s. mengeli*. Although our eggs (29 ± 1.3 × 20 ± 1.6 mm; mean ± SD) fell within the range of measurements reported for *A. s. mengeli* (27.1 ± 2.1 × 21.4 ± 3.1 mm; range: 21.8–31.0 × 18.0–30.7; Wilkinson 2009), their coloration differed. Whereas all eggs of *A. s. sericocaudatus* were immaculate white, *A. s. mengeli* (and most other *Antrostomus*) have pale eggs with darker markings (Table 3). The Mexican Whip-poor-will (*A. arizonae*) sometimes lays white eggs, and a single white egg has been described for the Dusky Nightjar (*A. saturatus*); no other *Antrostomus* is known to lay immaculate white eggs (Table 3). Newly-hatched chicks of *A. s. sericocaudatus* were covered in dense, pinkish-brown to

cinnamon-colored down, similar to descriptions of *A. arizonae* (Bent 1940), *A. noctitherus* (Vilella 1995, Delannoy 2005), *A. vociferus* (Raynor 1941), and *A. rufus* (Di Giacomo & López Lanús 1998, Salvador et al. 2014). Their coloration appears different from that of *A. s. mengeli* ("golden," Wilkinson 2009) and *A. carolinensis* (yellow-ochre; Bent 1940, O'Connor 2013). Although Chebez et al. (1998) described yellowish down, pale bill and legs, in *A. s. sericocaudatus*, their observations were based on discolored/faded museum specimens (pers. observ.).

Female-biased incubation and brooding, especially during the day, appears to be the norm in *A. s. sericocaudatus* (this study), *A. s. mengeli* (Wilkinson 2009), *A. carolinensis* (Hoyt 1953, O'Connor 2013), *A. rufus* (Salvador et al. 2014), and *A. vociferus* (Cink et al. 2017). We found at least one male *A. s. sericocaudatus* incubating during the day, which was not observed for *A. s. mengeli* (Wilkinson 2009). To date, *A. noctitherus* is the only species of *Antrostomus* for which males are known to take the primary responsibility for diurnal care (Vilella 1995).

The distraction displays we observed for *A. s. sericocaudatus*, and the changes in parental response to intruders (flushing immediately in the days after laying vs. sitting tight and then feigning injury during the late-incubation and early-nestling periods) appear similar to those of other *Antrostomus*, including *A. s. mengeli*, *A. carolinensis*, *A. vociferus*, *A. ridgwayi*, *A. noctitherus*, and *A. cubanensis* (Bent 1940, Garrido 1983, Vilella 1995, Cleere & Nurney 1998, Delannoy 2005, Wilkinson 2009, Cink et al. 2017).

To our knowledge, there have been no genetic studies focusing specifically on *Antrostomus sericocaudatus*. Based on one specimen from each subspecies, Sigurdsson & Cracraft (2014) place *A. s. sericocaudatus* next to *A. s. mengeli*, but note that relationships with other *Antrostomus* remain unresolved. Given that *A. s. sericocaudatus* differs from *A. s. mengeli* not only in vocalizations and morphology but also in some aspects of reproduction, particularly egg color, it is worth considering whether the two subspecies should be evaluated separately for conservation purposes. Our records, as well as recent records from Brazil (Rupp et al. 2007, Legal et al. 2009) suggest that *A. s. sericocaudatus* may be more abundant than previously thought within large tracts of Atlantic Forest; however, few such tracts remain, and the subspecies is vulnerable to ongoing forest destruction throughout its range. To assess its global conservation status, it is important to study the population size of *A. s. sericocaudatus* within each of its three range countries, where forest management differs considerably, and to evaluate its tolerance for forest fragmentation, which is already severe in most of its Atlantic Forest habitat.

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