

First nest description for Amazonian Trogon *Trogon ramonianus*, from eastern Ecuador, and a review of breeding data for Green-backed Trogon *T. viridis*

Overall, the reproductive biology of Neotropical trogons is poorly studied³ and recent taxonomic revisions⁵ have significantly redefined species limits within the genus, which is now considered to comprise 14 species¹⁷. In general, trogons are all cavity nesters, so far as is known in holes excavated by the birds themselves, in a variety of substrates including rotting tree trunks and nests of social insects^{3,15}. Here we provide novel information on the nesting biology of two species, based on observations in eastern Ecuador.

Green-backed Trogon

Trogon viridis

Formerly known as White-tailed Trogon³, with two subspecies: *T. v. viridis* and *T. v. chionurus*, both of which were treated as species by Ridgely & Greenfield¹⁸, a split since widely accepted^{12,18}. Nomenclatural confusion was generated by these two species, both being treated as *Trogon strigilatus*^{3,4}. Because the literature is somewhat convoluted, we review published nesting accounts of *T. viridis*, based on currently accepted distributions and species limits.

Goeldi⁸ found an active nest of *T. viridis* 5 m above ground in a nest of 'white-ants', presumably termites. Ihering¹³ described the eggs as white and provided measurements for eggs in the Nehrkon collection and another egg collected in Iguape, São Paulo, Brazil. Ihering¹⁴ subsequently described a termitarium nest with a clutch of three white eggs spotted yellow, and provided approximate measurements. Sneathlidge²⁴ reported a termitarium nest slightly more than 2 m up, and white eggs. Belcher & Smoother¹ described a clutch of two eggs in Trinidad 'laid on loose fibre in a hole in a dead palm', and gave measurements for four greenish-white eggs. In addition, they provided measurements for

a clutch of eggs from Venezuela. Hellebrekers¹¹ gave mean and extreme measurements of 17 white eggs collected by the Penard brothers in Surinam. Haverschmidt¹⁰ stated that nests are placed in arboreal termitaria, apparently based on four nests, and described white eggs. He also provided fresh egg mass and extreme measurements, but did not mention sample sizes for either. Nests on Trinidad are reported to be 3–7 m above ground, in both tree cavities and in termitaria⁷. French⁷ also provided mean measurements of four 'whitish' eggs. Cisneros-Heredia² described a termitarium nest from north-east Ecuador as being 40 m above ground.

To the above, we add another termitarium nest of *T. viridis* in the environs of Kurintza, near the Lliquino River, prov. Pastaza (01°28.9'S 77°32.9'W; 440 m). On 9 October 2013 the nest contained one unhatched egg and one nestling, which had almost certainly hatched within the past 24 hours as it still weighed less than the unhatched egg. The egg was subelliptical and glossy white, but fairly heavily stained with brown (apparently from its surroundings). It measured 31.2 × 24.8 mm and weighed 9.5 g, similar to previous records^{1,7,11,13,14}. The nestling was pink-skinned and lacked natal down, as described for Masked Trogon *T. personatus*⁹. It weighed 7.5 g and its tarsus measured 11.2 mm.

The termitarium was c.30–40 cm in diameter and attached to a living *Miconia napoana* (Melastomataceae) tree at 3 m above ground. The nest entrance was c.8 cm in diameter. Inner height of the nest cavity was c.21 cm. As far as we could ascertain, the termitarium was not inhabited by termites. The floor of the nest chamber was littered with seeds of unknown species of Myristicaceae trees.

Amazonian Trogon

Trogon ramonianus

The taxonomic history of *T. ramonianus* is controversial and still debated^{12,17}, with the

taxa *ramonianus* and *caligatus* treated as species, separate from *violaceus*^{4,16}. *T. violaceus* (*sensu lato*) comprises three species: Gartered Trogon *T. caligatus*, Guianan Trogon *T. violaceus* and Amazonian Trogon *T. ramonianus*, the latter from Amazonian Colombia, Ecuador, Peru, Bolivia and Brazil (south of the Amazon), extending into southern Venezuela in the upper Orinoco basin^{17,21}.

The breeding biology of *T. ramonianus* is unknown. Most previously published nesting data ascribed to *T. violaceus*, including some of the numerous works of Skutch^{22,23} refer to Gartered Trogon^{6,19}. Only a few nesting data published for *T. violaceus* pertain to *T. violaceus sensu stricto*^{1,20,25}. We found a nest of *T. r. ramonianus* with two slightly developed eggs at Shiripuno Research Center, prov. Pastaza (01°06'S 76°43'W; 220 m) on 2 January 2011. The nest was 3.5 m above ground, excavated in an active termitarium affixed on one side to a vertical tree trunk. The downward-facing entrance was roughly circular and 10.5 cm in diameter. We could not determine the dimensions of the internal nesting chamber, but it opened up after only 5–6 cm of excavated tunnel and had only a slight, unlined concavity that held the eggs. Both eggs were subelliptical and glossy white, but heavily stained with brown spotting presumably from the termite nest. They measured 33.2 × 24.7 mm and 33.0 × 24.4 mm, mass 10.7 g and 10.6 g, respectively. Irrespective of taxonomy, the distinctness of *ramonianus* (including *T. r. crissalis*) has never been questioned, and our description is a valuable addition to knowledge of Neotropical trogon nesting biology.

Acknowledgements

For help in the field, HFG thanks Inka Harms and Julia Barth, and HC thanks Nicolás Tinoco, David Velalcázar, Jorge Brito and Alvaro Pérez. John V. & the late Ruth Ann Moore, as well as Matt Kaplan have generously supported HFG via grants to the Population

Biology Foundation. Field work by HFG was further supported in part by a Pamela & Alexander F. Skutch Award, the Maryland Ornithological Society and Field Guides Inc. We are particularly grateful for the ongoing support of the PBNHS, Tim Metz, Jay Peltz and the Humboldt Crew. HC was funded by eni e&p Division and Agip Oil Ecuador, and his field work was conducted with the participation of Fauna & Flora International.

References

- Belcher, C. & Smooker, G. D. (1936) Birds of the colony of Trinidad and Tobago. Part IV. *Ibis* 13: 792–813.
- Cisneros-Heredia, D. F. (2006) Notes on breeding, behaviour and distribution of some birds in Ecuador. *Bull. Brit. Orn. Club* 126: 153–164.
- Collar, N. J. (2001) Family Trogonidae (trogons). In: del Hoyo, J., Elliott, A. & Sargatal, J. (eds.) *Handbook of the birds of the world*, 6. Barcelona: Lynx Edicions.
- Cory, C. B. (1919) Catalogue of birds of the Americas and adjacent islands, pt. 2(2). *Publ. Field Mus. Nat. Hist. Zool. Ser.* 197.
- DaCosta, J. M. & Klicka, J. (2008) The great American interchange in birds: a phylogenetic perspective with the genus *Trogon*. *Mol. Ecol.* 17: 1328–1343.
- Eisermann, K. & Brooks, D. M. (2006) Unusual and noteworthy nesting records for Guatemala. *Cotinga* 26: 48–51.
- French, R. (1991) *A guide to the birds of Trinidad and Tobago*. Second edn. Ithaca, NY: Cornell University Press.
- Goeldi, E. A. (1898) Ornithological results of an expedition up the Capim River, state of Pará, with critical remarks on the Cracidae of lower Amazonia. *Ibis* 8: 472–500.
- Greeney, H. F., Sheldon, K. S. & Simbaña, J. (2008) Observations on the hatchlings, eggs and incubation of the Masked Trogon *Trogon personatus* in eastern Ecuador. *Cotinga* 29: 82–84.
- Haverschmidt, F. (1968) *Birds of Surinam*. Edinburgh & London: Oliver & Boyd.
- Hellebrekers, W. P. J. (1942) Revision of the Penard oölogical collection from Surinam. *Zool. Meded.* 24: 240–275.
- del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E. (eds.) (2015) *Handbook of the birds of the world Alive*. Barcelona: Lynx Edicions (retrieved from www.hbw.com/node/55701 on 27 March 2015).
- Ihering, H. von (1900) Catálogo crítico-comparativo dos ninhos e ovos das aves do Brazil. *Rev. Mus. Paulista* 4: 191–300.
- Ihering, H. von (1914) Novas contribuições para ornitologia do Brazil. *Rev. Mus. Paulista* 9: 411–448.
- Johnsgard, P. A. (2000) *Trogons and quetzals of the world*. Washington DC: Smithsonian Institution Press.
- Pinto, O. M. O. (1937) Ornithologia amazonica. *Rev. Mus. Paulista* 23: 499–604.
- Remsen, J. V., Areta, J. I., Cadena, C. D., Jaramillo, A., Nores, M., Pacheco, J. F., Robbins, M. B., Stiles, F. G., Stotz, D. F. & Zimmer, K. J. (2015) A classification of the bird species of South America. www.museum.lsu.edu/~Remsen/SACCBaseline.html (accessed 20 March 2015).
- Ridgely, R. S. & Greenfield, P. J. (2001) *The birds of Ecuador*. Ithaca, NY: Cornell University Press.
- Robinson, W. D. & Robinson, T. R. (2001) Observations on predation events at bird nests in central Panama. *J. Field Orn.* 72: 43–48.
- Schönwetter, M. (1967) *Handbuch der Oölogie*. Berlin: Akademie-Verlag.
- Schulenberg, T. S. (ed.) (2015) *Neotropical Birds Online*. Ithaca, NY: Cornell Lab of Ornithology. http://neotropical.birds.cornell.edu/portal/species/overview?p_p_spp=59636 (accessed 20 March 2015)
- Skutch, A. F. (1942) Life history of the Mexican Trogon. *Auk* 59: 341–363.
- Skutch, A. F. (1999) *Trogons, Laughing Falcons and other Neotropical birds*. College Station, TX: A. & M. Press.
- Sneathlage, E. (1935) Beiträge zur Fortpflanzungsbiologie brasilianischer Vögel. *J. Orn.* 83: 532–562.
- Snow, D. W. & Snow, B. K. (1964) Breeding seasons and annual cycles of Trinidad land-birds. *Zoologica* 49: 1–39.

Harold F. Greeney

Yanayacu Biological Station & Center for Creative Studies, Cosanga, Napo, Ecuador; c/o 721 Foch y Amazonas, Quito, Ecuador. E-mail: revmmoss@yahoo.com.

Héctor Cadena-Ortiz

Escuela de Biología, Pontificia Universidad Católica del Ecuador, Av. 12 de Octubre 1076 y Roca, Quito, Ecuador. E-mail: fercho_cada@yahoo.es.

Received 30 March 2015, final revision accepted 22 September 2015; published online 25 February 2016