

ARTÍCULO/ARTICLE

Notes on the breeding biology of the Tumbesian avifauna in southwest Ecuador and northwest Peru

Harold F. Greeney^{1*}, Fernando Angulo P.², Robert C. Dobbs¹, Segundo Crespo², Eliot T. Miller^{1,3}, Daniel Cáceres⁴, Rudolphe A. Gelis¹, Briana Angulo², Luis A. Salagaje M.¹

¹*Yanayacu Biological Station & Center for Creative Studies, km 5, via Las Caucheras, Cosanga, Napo, Ecuador.*

²*Centro de Ornitología y Biodiversidad (CORBIDI), Los Álamos 390, Dpto. 301, Chiclayo, Lambayeque, Perú.*

³*Cornell Lab of Ornithology, 159 Sapsucker Woods Rd., Ithaca, NY 14850, United States.*

⁴*Museo de Historia Natural, Universidad Nacional de San Agustín, Avenida Daniel Alcides Carrión s/n, Arequipa, Perú.*

*Autor para correspondencia/Corresponding author, e-mail: antpittanest@gmail.com

Editado por/Edited by: Juan Freile

Recibido/Received: 6 Junio 2018 Aceptado/Accepted: 18 Septiembre 2019

Publicado en línea/Published online: 22 Marzo 2020

Notas sobre la biología reproductiva de la avifauna tumbesina en el suroeste de Ecuador y noroeste de Perú**Resumen**

Este artículo contribuye a la creciente cantidad de literatura sobre la biología reproductiva de las aves de Sudamérica. Provee 823 registros sobre la reproducción de 197 especies al interior de la región Tumbesina de Perú y Ecuador. En los casos posibles, incluimos notas sobre el comportamiento de los adultos, arquitectura del nido, huevos, pichones, polluelos y volantones. En general, nuestras observaciones apoyan los reportes previos sobre la naturaleza estacional de la reproducción de las aves de esta región.

Palabras clave: Biología reproductiva, bosque nublado, huevo, volantón, historia natural, nido, polluelo, pichón, bosque seco tropical.

Abstract

This paper contributes to the growing body of literature on the reproductive biology of South American birds by providing 823 records of reproduction for 197 species breeding within the Tumbesian biome of Peru and Ecuador. Where applicable, we include notes on adult behaviour, nest architecture, eggs, nestlings, and fledglings. In general, our observations support previous reports of the seasonal nature of avian reproduction in the region.

Keywords: Breeding biology, cloud forest, egg, fledgling, natural history, nest, nestling, tropical dry forest.

INTRODUCTION

The Tumbesian Endemic Bird Area of southwestern Ecuador and northwestern Peru contains the great majority of the remaining coastal tropical deciduous forest in South America and is among the most important and threatened of the currently recognized Endemic Bird Areas (EBAs; Cracraft, 1985; Stattersfield *et al.*, 1998; BirdLife International, 2019). Most likely, less than 30% of the area remains forested, leaving a highly fragmented landscape of cropland surrounding small forest patches of native vegetation that are usually confined to areas with steeper slopes that are unproductive for agriculture and cattle (Best & Kessler, 1995; Portillo-Quintero & Sánchez-Azofeifa, 2010; Hansen *et al.*, 2013; BirdLife International, 2019). The Tumbesian region is one of the top five regions of the world with respect to the number of avian endemics, being home to more than 60 endemic species (Wege & Long, 1995), at least 15 of which are considered at risk (BirdLife International, 2019). According to BirdLife International (2019), the avifauna in this region faces five primary threats: deforestation, understory degradation, hunting, wild animal trade, and species' small range sizes. The most severely endangered species are those which suffer a combination of these threats (Collar *et al.*, 1992, 1994), and the conservation of remaining patches of habitat are of utmost importance (Parker & Carr, 1992; Williams & Tobias, 1994; Best & Kessler, 1995; Parker *et al.*, 1995; Espinosa *et al.*, 2012; Tapia-Armijos *et al.*, 2015).

Whilst Freile *et al.* (2006) noted the relative paucity of information published on the birds of mainland Ecuador during the 20th century, recent years have seen a dramatic increase in the amount of published data on Neotropical birds (Freile *et al.*, 2014). In particular, the reproductive biology of Ecuador's relatively understudied avifauna has received a good deal of attention in the past decade (e.g., Freile & Chaves, 2004; Cisneros-Heredia, 2006; Greeney & Nunnery, 2006; Greeney & Gelis, 2007, 2008; Solano-Ugalde *et al.*, 2007; Greeney *et al.*, 2010, 2011; Solano-Ugalde, 2011; Carrasco *et al.*, 2013). Although the aforementioned studies treat the avifauna of a large portion of Ecuador's diverse habitats, the Tumbesian region of Ecuador and northern Peru have been relatively neglected. Important recent contributions include life history information published by Freile *et al.* (2004) and Knowlton (2010), both building upon older studies from the region (Marchant, 1958, 1959, 1960a, 1960b; Best *et al.*, 1992, 1993, 1996; Parker *et al.*, 1995; Cook 1996). The remaining natural history information on the avifauna of the region is derived largely from a scattering of species-specific papers, most treating one or only a few species (Freile *et al.*, 2003; Miller & Greeney, 2008; Miller *et al.*, 2007, 2010; Greeney, 2010; Greeney *et al.*, 2012, 2013; Barrionuevo-García & Montes-Torres, 2015; Greeney & Valencia-Herverth, 2016). Importantly from a conservation point of view, however, many of these smaller works include threatened or near-threatened species, including: White-winged Guan *Penelope albipennis* (Angulo, 2004, 2008; Angulo & Barrio, 2004; Cavero & Angulo, 2011), Esmeraldas Woodstar *Chaetocercus berlepschi* (Ágreda, 2007; Juiña *et al.*, 2010), El Oro Parakeet *Pyrrhura orcesi* (López-Lanús & Lowen, 1999; Klauke *et al.*, 2013), Watkins' Antpitta *Grallaria watkinsi* (Martin & Dobbs, 2004; Greeney *et al.*, 2009), Henna-hooded Foliage-gleaner *Clibanornis erythrocephalus* (Miller *et al.*, 2012), Blackish-headed Spinetail *Synallaxis tithys* (Balchin, 1996; Crespo & More, 2013), Gray-breasted Flycatcher *Lathrotriccus griseipectus* (Greeney, 2014), Ochraceous Attila *Attila torridus* (Greeney, 2006), Slaty Becard *Pachyramphus spodiurus* (Rheindt, 2008; Gelis *et al.*, 2009), Peruvian Plantcutter *Phytotoma raimondii* (Flanagan *et al.*, 2008, 2009; Rosina & Romo, 2012; Nolazco & Roper, 2013), and Pale-headed Brush-Finch *Atlapetes pallidiceps* (Oppel *et al.*, 2003, 2004a, 2004b). With this contribution we provide 823 records of breeding activity for 197 species from the Tumbesian biome of Peru and Ecuador, including novel information on many of the aforementioned threatened species.

METHODS

All observations were made opportunistically during the course of other fieldwork in southwest Ecuador and northwest Peru between February 2000 and March 2018. Table 1 provides a list of the locations visited, their coordinates, and associated abbreviations. Because of the irregular and arbitrary dates that we were able to make observations, we emphasize that fact that our data may not be useful for some quantitative analyses. Most of the data we present is the result of brief observations and most nests were not monitored in detail. Where applicable, however, we include observations of behavior, nest architecture, eggs, and nest success. Table 2 provides a summary of all observations, including specific dates. For those species that were studied in more detail, or those whose data are worthy of additional discussion, we have expanded upon Table 2 with brief summaries of our observations in the following section. Species-level taxonomy follows Remsen *et al.* (2018), supplemented by the subspecific arrangement of del Hoyo & Collar (2016).

RESULTS AND DISCUSSION

Ecuadorian Trogon *Trogon mesurus*

The nest and eggs of *Trogon mesurus* have only recently been described (Schulenberg & Greeney, 2013), based on three nests studied at Jorupe. All three of the previously reported nests were unlined cavities within active arboreal termitaria. It is worth pointing out that two of the five additional nests we report (Table 2) were excavated within soft, rotting wood. Such variability in nesting substrates is also seen in other trogons (Skutch, 1999), but we provide the first documentation of such variation for *T. mesurus*.

Watkins's Antpitta *Grallaria watkinsi*

The breeding of this Tumbesian endemic antpitta is poorly studied (Greeney 2018). With only two nests described in the literature (Martin & Dobbs, 2004; Greeney *et al.*, 2009), published information on its biology is considered of high conservation priority (Freile & Rodas 2008). We found two active nests in 2014 at Jorupe, one nearly-complete nest on 6 March, and a second with two *c.* 3-day-old nestlings on 4 April. The first nest was 2.6 m up in a tangle of small branches and vines within thick vegetation, and had the following measurements: external diameter 24 cm, external height 10 cm, inner diameter 10.5 cm, inner depth 7 cm. The second was 2.1 m up in tangled vegetation and measured: external diameter 22 cm, external height 12 cm, inner

diameter 10 cm, inner depth 6.5 cm. These breeding records, but not the nest measurements, were presented in Greeney (2018).

Table 1: Summary of localities in southwest Ecuador and northwest Peru from whence breeding data were collected.

Locality	Department (Per) Province (Ecu)	Provincia (Per) Cantón (Ecu)	Code	Coordinates	Elev. (m)
Ecuador					
Cerro Blanco	Guayas	Guayaquil	EC1	-2.1167, - 80.0833	300
Buenaventura	El Oro	Piñas	EC2	-3.65, -79.7667	520
Jorupe	Loja	Macará	EC3	-4.3833, -79.95	700
Manglares-Churute	Guayas	Guayaquil	EC4	-2.4667, -79.65	50
Utuaña	Loja	Sozoranga	EC5	-4.3667, -79.75	2600
Vilcabamba	Loja	Loja	EC6	-4.25, -79.21667	1575
El Empalme	Loja	El Empalme	EC7	-4.11667, - 79.8333	760
Km 1047 Macará-Loja road	Loja	Celica	EC8	-4.1833, - 79.8667	650
Km 1046 Macará-Loja road	Loja	Celica	EC9	-4.2, -79.8667	660
Km 1048 Macará-Loja road	Loja	Celica	EC10	-4.2, -79.8667	780
Km 45, Hwy 68, Celica-Macará	Loja	Celica	EC11	-4.1333, - 79.91667	1600
Km 46, Hwy 68, Celica-Macará	Loja	Celica	EC12	-4.1333, - 79.91667	1560
Km 49, Hwy 68, Celica-Macará	Loja	Celica	EC13	-4.15, -79.9	1320
Celica	Loja	Celica	EC14	-4.1, -79.95	2000
Isla de la Plata	Manabí	Puerto López	EC15	-1.2667, - 81.0667	40
Km 1066 Macará-Loja road	Loja	Celica	EC16	-4.25, -79.8833	1120
Yunguilla	Azuay	Santa Isabel	EC17	-3.21667, - 79.2667	1750
Humedal La Segua	Manabí	Chone	EC18	-0.7167, - 80.1833	100
Isla Santay	Guayas	Guayaquil	EC19	-2.05, -79.85	30
Yangana-Tapichalaca Road	Loja	Loja	EC20	-4.4, -79.15	2300
Reserva Río Ayampe	Manabí	Puerto López	EC21	-1.6833, - 80.7833	100
Alamor	Loja	Puyango	EC22	-4.01667, - 80.0167	1260
Yangana	Loja	Loja	EC23	-4.3667, - 79.1667	1900
Lagunas Ecuasal	Santa Elena	Salinas	EC24	-2.2461, - 80.9471	0
South of Guayaquil	Guayas	Guayaquil	EC25	-2.2, -79.75	90
Small pond, San Vicente-Chone Road	Manabí	Chone	EC26	-0.65, -80.2667	50
Peru					
El Tutumo, Cuesta el Pitón	Tumbes	Zarumilla	TZA1	-3.75, -80.25	360
Manglares de Tumbes	Tumbes	Zarumilla	TZA2	-3.41667, - 80.2667	0
Mirador de Angostura	Tumbes	Tumbes	TTU1	-3.75, -80.35	340

Quebrada Angostura camino al Caucho	Tumbes	Tumbes	TTU2	-3.7667, -80.3	370
Quebrada Angostura camino al Caucho	Tumbes	Tumbes	TTU3	-3.7667, -80.333	110–350
El Caucho	Tumbes	Tumbes	TTU4	-3.81667, -80.2667	420
Bocana Murciélagos	Tumbes	Tumbes	TTU5	-3.91667, -80.1833	378
Quebrada Jurupe	Tumbes	Tumbes	TTU6	-3.9667, -80.2667	477
Canoas	Tumbes	Contralmirante Villar	TCO1	-3.91667, -80.9	0
ACP Amotape	Tumbes	Contralmirante Villar	TCO2	-3.65, -80.61667	3
Punta Pico	Tumbes	Contralmirante Villar	TCO3	-3.75, -80.7833	5
Pueblo Blas-Lancones	Piura	Sullana	PSU1	-4.25, -80.35	300–550
Quebrada Gramadal, Coto de Caza El Angolo	Piura	Sullana	PSU2	-4.41667, -80.7833	500
Cerro Pindo, Suyo	Piura	Ayabaca	PAY1	-4.5, -80.0	420
Cerro El Poto, Suyo	Piura	Ayabaca	PAY2	-4.51667, -79.9833	450
Bosque de Chonta	Piura	Ayabaca	PAY3	-4.633, -79.7667	2260
Quebrada Ancha	Piura	Talara	PTA1	-4.6, -81.033	300
Punta Balcones	Piura	Talara	PTA2	-4.667, -81.31667	0
Paltashaco	Piura	Morropón	PMO1	-5.1, -79.8833	845
Quebrada Caracucho	Piura	Morropón	PMO2	-5.1333, -79.91667	350
Villa Batanes, Chulucanas	Piura	Morropón	PMO3	-5.1333, -80.1	95
Algodonal	Piura	Morropón	PMO4	-5.1333, -79.9	400
Cerro Pilán, Chulucanas	Piura	Morropón	PMO5	-5.15, -80.05	140–450
Comunidad Ignacio Távara Pasapera	Piura	Morropón	PMO6	-5.2333, -80.333	210
Quebrada Tumberos, Mangamanguilla, Salitral	Piura	Morropón	PMO7	-5.2833, -79.85	340
Quebrada La Peña, Dotor	Piura	Morropón	PMO8	-5.35, -79.71667	266–500
Quebrada El Garabo, Serrán	Piura	Morropón	PMO9	-5.45, -79.7833	340
Laguna Santa Julia	Piura	Piura	PPI01	-5.2, -80.65	30
Huabal, Canchaque	Piura	Huancabamba	PHU1	-5.4, -79.65	726
Chignia Alta, Huarmaca	Piura	Huancabamba	PHU2	-5.5833, -79.667	725
La Pachinga, Tocto	Piura	Huancabamba	PHU3	-5.75, -79.6833	450
Limón de Porculla	Piura	Huancabamba	PHU4	-5.8667, -79.51667	1400
Quebrada Overall, Túpac Amaru	Piura	Huancabamba	PHU5	-5.91667, -79.6	560
Manglares San Pedro de Vice	Piura	Sechura	PSE1	-5.5, -80.8833	3
Laguna Ñapique	Piura	Sechura	PSE2	-5.51667, -80.7	7
Bosque aledaño a la Laguna Ramón	Piura	Sechura	PSE3	-5.55, -80.61667	10
El Peñal, Rio Piura, Chutuque	Piura	Sechura	PSE4	-5.61667, -80.65	4
Camino a la bocana de estuario de Virrilá	Piura	Sechura	PSE5	-5.81667, -80.8667	5
Bosque Seco Aledaño al estuario de Virrilá	Piura	Sechura	PSE6	-5.85, -80.81667	3

Caserío Huacrupe, Olmos	Lambayeque	Lambayeque	LLA1	-5.7833, -79.9333	120
Caserío Huacrupe a Abra de Huacrupe, Olmos	Lambayeque	Lambayeque	LLA2	-5.8, -79.9333	125
Cerro Huacrupe, Olmos	Lambayeque	Lambayeque	LLA3	-5.81667, -79.95	265
Abra de Huacrupe, Olmos	Lambayeque	Lambayeque	LLA4	-5.81667, -79.95	135
Sarismusa	Lambayeque	Lambayeque	LLA5	-6.01667, -79.533	1100
Bosque Palacios	Lambayeque	Lambayeque	LLA6	-6.05, -79.55	800
Cruz de Motupe	Lambayeque	Lambayeque	LLA7	-6.0833, -79.733	85
La Viña	Lambayeque	Lambayeque	LLA8	-6.3833, -79.75	80
Bosque de Pomac	Lambayeque	Ferreñafe	LFE1	-6.4666, -79.76667	70
Pítipo	Lambayeque	Ferreñafe	LFE2	-6.5667, -79.7833	55
Chiclayo	Lambayeque	Chiclayo	LCH1	-6.7833, -79.8333	30
Puerto Eten	Lambayeque	Chiclayo	LCH2	-6.933, -79.866	0

Line-cheeked Spinetail *Cranioleuca antisiensis*

Most authors (Schulenberg *et al.*, 2010; Dickinson & Christidis, 2014) have treated Baron's Spinetail *Cranioleuca baroni* as separate from Line-cheeked Spinetail *C. antisiensis* (but see Koepcke, 1961, 1970; Meyer de Schauensee, 1970). Seeholzer & Brumfield (2017), however, have suggested that the two are best considered conspecific. Regardless of their taxonomic status, however, the breeding biology of both taxa is poorly studied. The nest of Baron's Spinetail (subspecies *zaratensis*) was first described by Koepcke (1958, 1961), in rather general terms, as a large globular nest of moss with a side entrance. This description was slightly improved upon by Zyskowski & Prum (1999), who correctly noted that the entrance was a downward-facing tunnel, providing the same generalized description for *C. antisiensis* and, technically, providing the first nest description for the latter species. The first detailed, quantified description of the nest of *C. antisiensis* (n nominate *antisiensis*) should be credited to Cisneros-Heredia (2006). This last description, however, might be called into question, given that the location where the data were collected (Mashpi Protected Forest) is outside the species' recognized range (Dickinson & Christidis 2014); Red-faced Spinetail *C. erythrops* is common at this locality. The following observations supplement this description and provide the first egg description for *C. antisiensis*. On 17 March 2005, at Yunguilla, we discovered a nest of nominate *C. a. antisiensis* containing two immaculate white eggs: 21.4 × 16.4 mm, 2.96 g, slight development; 21.2 × 16.3 mm, 2.86 g, added. The nest was a bulky, teardrop-shaped nest of grasses, leaf strips, rootlets, and moss, hanging from tip of a low branch 2.4 m above the ground. The inner chamber was located within the bottom half of the structure, and was entered through short, downward-facing, tubular entrance. The internal chamber was lined with grass blades and leaf strips, while its lower portion (egg cup) was lined with fine grasses and lichens. Externally, the nest was 49 cm long (tall) and, at its widest point, was 33 cm wide. The entrance tunnel was 4 cm in diameter and 7.5 cm long, opening into a chamber 12 cm wide by 10 cm tall. Subsequently, at the same location, we examined a second nest, similar in form and composition to the first, attached at the end of a drooping branch, 4.5 m above the ground in a 15 m-tall tree. Its measurements were: external length 51 cm; maximum external width 35 cm; entrance diameter 4.5 cm; entrance tunnel length 9.5 cm; internal diameter 11 cm; internal height 10.5 cm. On 12 March 2009 this nest contained two immaculate white eggs, both measuring 21.0 × 16.0 mm. In addition to these two closely examined nests, we found an active nest on 23 February 2000, at Celica, that was *c.* 3–4 m above the ground and *c.* 60 cm long × 40 cm wide externally. On 11 April 2006, at Utuana we observed an adult singing while carrying insects through the canopy. The adult dropped down and returned without food, repeating the process in same place a few minutes later. We were unable to locate a nest in the foliage visited by the adult, and we suggest it was feeding a stationary fledgling hidden amongst the leaves. Finally, on 12 February 2007, along the Yangana-Tapichalaca road, we observed a pair of adults scolding an Emerald Toucanet *Aulacorhynchus prasinus* that was consuming the contents of their nest through a large hole torn in the side. We were unable to determine if *A. prasinus* consumed nestlings or eggs. As an additional record of *C. antisiensis* breeding in Ecuador, on 18 October 2016 Paúl Molina (IBC-1281660; hbw.com/ibc/1281660) videotaped a pair of adults at an active nest near Cuenca, Azuay. The behaviour of the adults suggests they were feeding nestlings.

Long-tailed Mockingbird *Mimus longicaudatus*

The nesting of this conspicuous member of western South America's arid coastal regions is fairly well documented (Taczanowski, 1884; Marchant, 1960a; Knowlton, 2010). On 7 March 2014, at Km 1046 on the Macará-Loja road, we examined a nest built 2.4 m up in a well-protected location amongst the branches of a spiny *Acacia* tree. The nest was a deep open bowl, loosely woven of long sticks externally (some spiny), and lined internally with light brown, thick, flexible leaf petioles and mammal hairs. It measured: internal diameter 10 cm, internal depth 7.5 cm, external diameter c. 28, external height 19 cm. The nest contained two light blue eggs marked with spots and blotches of lavender and various shades of brown: 29.7 × 20.2 mm, 6.23 g, addled; 29.8 × 20.0 mm, 6.26g, c. 1/3 developed. Additional data in Table 2.

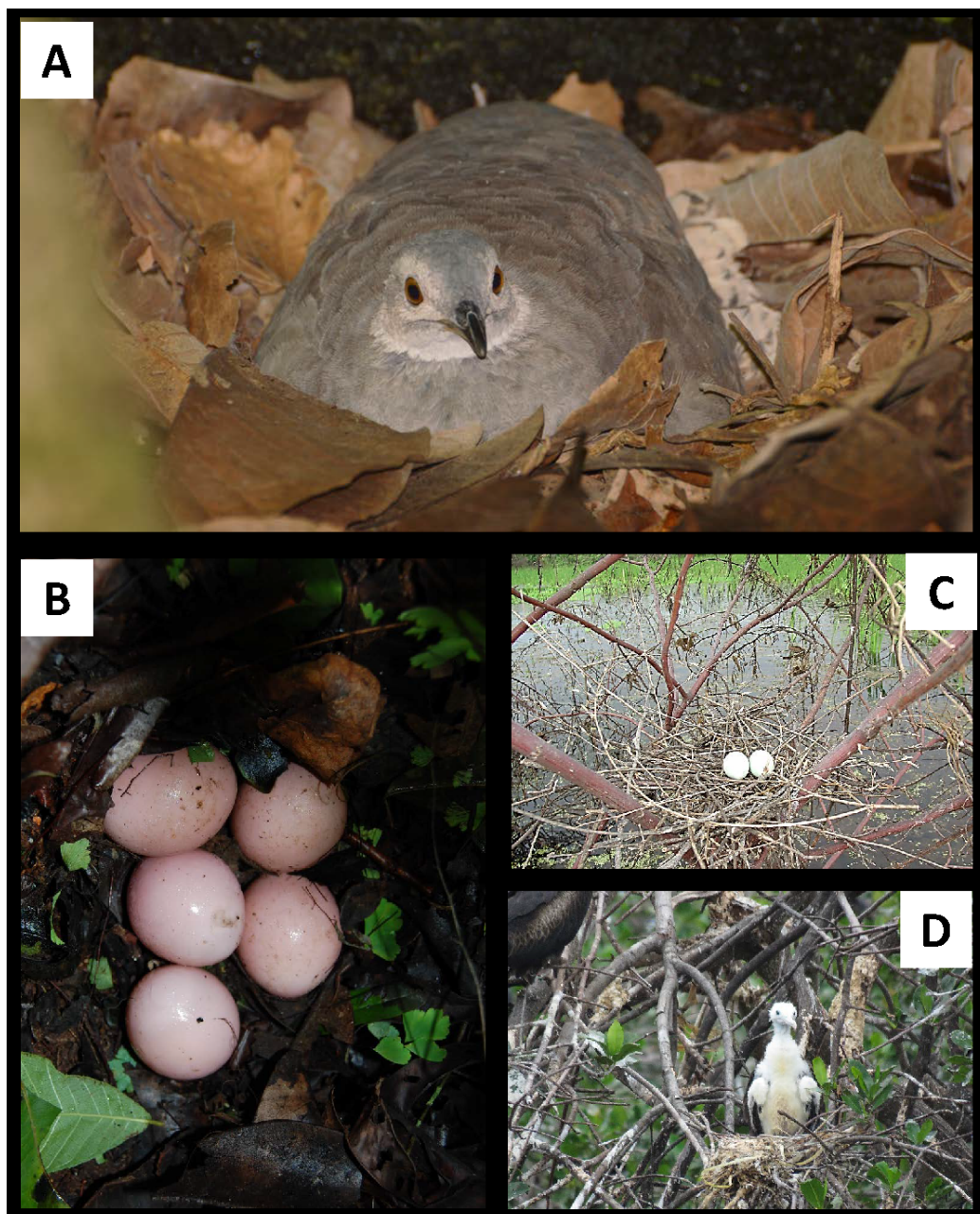


Figure 1: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult Pale-browed Tinamou *Crypturellus transfasciatus* incubating four eggs, 25 March 2014, Jorupe (LASM); B) complete clutch of Pale-browed Tinamou, 14 February 2010, Jorupe (HFG); C) nest and eggs of Striated Heron *Butorides striata* 27 February 2006, east of Guayaquil (HFG); D) nestling of Magnificent Frigatebird *Fregata magnificens*, 26 January 2016, Manglares de Tumbes (FAP).

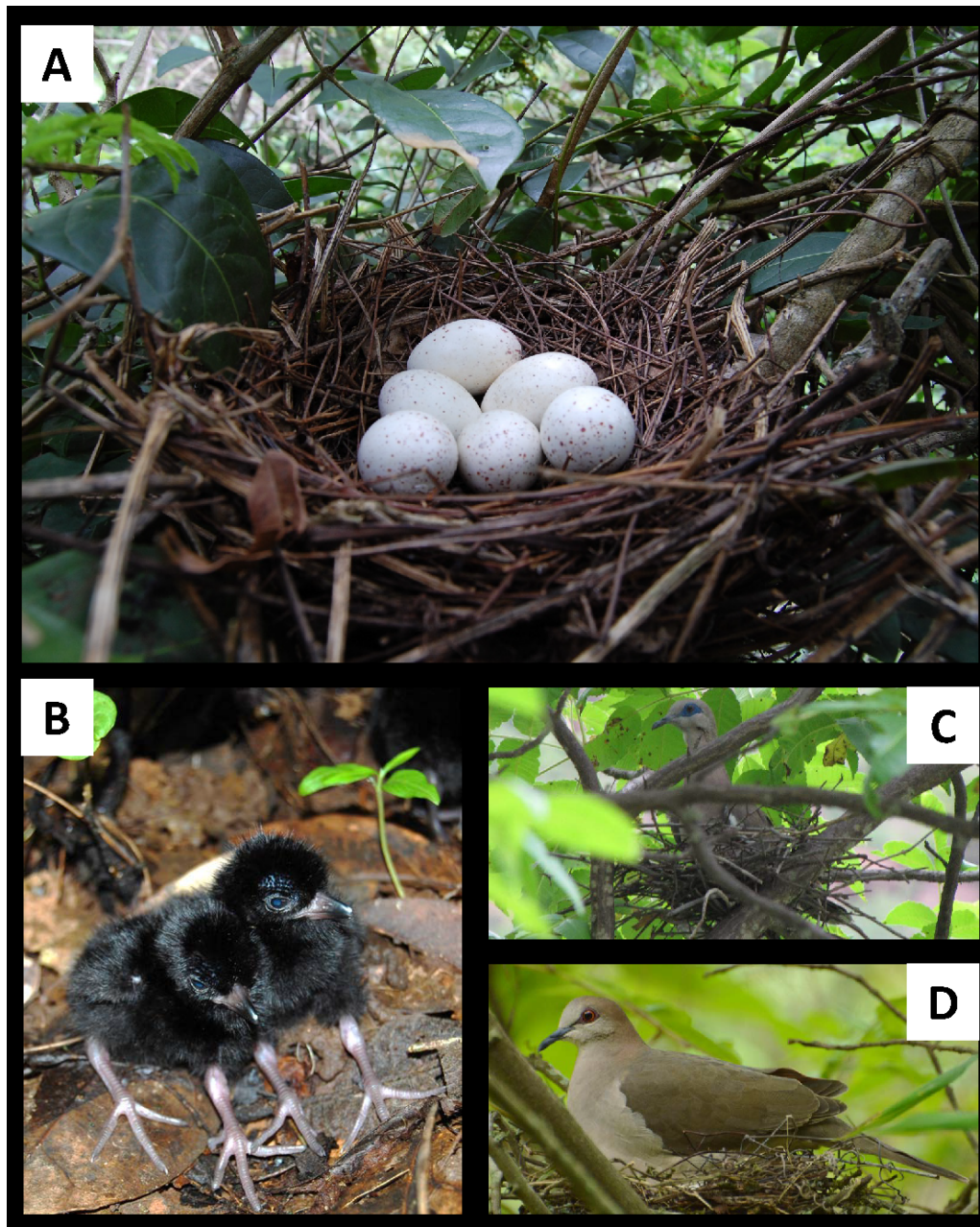


Figure 2: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) complete clutch of Rufous-necked Wood-Rail *Aramides axillaris*, 19 February 2010, Jorupe (HFG); B) newly hatched young of *A. axillaris*, 20 February 2010, Jorupe (HFG); C) adult West Peruvian Dove *Zenaida meloda* on its nest, 25 March 2009, Cerro Huacrupe (FAP); D) adult White-tipped Dove *Leptotila verreauxi* on its nest, 4 April 2014, Jorupe (LASM).

CONCLUDING REMARKS

The national systems of protected areas in both Peru and Ecuador offer protection to an important number of ecosystems and species within their respective countries (Fajardo *et al.*, 2014; Espinosa *et al.*, 2016; Ordóñez-Delgado *et al.*, 2016; Cuesta *et al.*, 2017; Escribano-Ávila *et al.*, 2017). Nevertheless, the high level of endemism in the Tumbesian region and the severe pressure facing its natural habitats combine to make its avifauna one of the most threatened in South America (BirdLife International, 2019) and one of the least protected ecosystems in Ecuador and Peru (Fajardo *et al.*, 2014; Lessmann *et al.*, 2014; Cuesta *et al.*, 2017). While a fair number of publications, mostly locality-based, have focused on distribution and conservation of the Tumbesian avifauna (Wiedenfeld *et al.*, 1985; Robbins & Ridgely, 1990; Krabbe, 1992; Berg, 1994; Walker, 2002; Álava *et al.*, 2007; Bonaccorso *et al.*, 2007), and although the records presented here represent a significant addition to our knowledge of the reproductive biology of birds in the Tumbesian biome, the basic natural history of only a small

percentage of its avifauna could be considered well-studied, and further research is urgently needed (Freile & Santander, 2005; Freile *et al.*, 2006; Freile & Rodas, 2008).



Figure 3: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult Common Pauraque *Nyctidromus albicollis* incubating, 26 February 2014, Jorupe (HFG); B) fledgling White-tipped Sicklebill *Eutoxeres aquila*, 20 March 2004, Buenaventura (HFG); C) older nestling of *N. albicollis*, 18 January 2011, Cerro Blanco (HFG).

It comes as little surprise that our data support the previously recognized seasonality of reproductive activity in this seasonally arid region of South America (Marchant, 1959; Best *et al.* 1993, 1996; Knowlton, 2010; Mischler, 2012; Barrionuevo-García & Montes-Torres, 2015), with most records derived from the rainy season (January–March). Climatic conditions in the Tumbesian biome, however, vary from year to year, especially in relation to the El Niño Southern Oscillation, with additional local climatic variation due to the region's topography and heterogeneous habitat mosaic (Munday & Munday, 1992; Best & Kessler, 1995). Thus, as has been pointed out by previous authors (Robbins *et al.*, 1994; Best *et al.*, 1996; Freile *et al.*, 2003), we should consider our understanding of avian reproductive seasonality in the region as highly preliminary. Its true nature, and how it varies across species, and through space and time, should be a research priority for future studies.

The accumulation, dissemination, and analysis of quantitative natural history information, including reproductive seasonality, habitat use, and behavior, is critical to the formation and testing of sound hypotheses of ecological, evolutionary, taxonomic, and conservation significance (Morton, 1971; Ricklefs, 1977; Greene, 1994; Martin, 1996; Dayton, 2003; Greeney *et al.*, 2008). It has not escaped our notice that similar such statements appear so frequently in the literature that the sentiment has taken on a mantra-like quality. Nevertheless, along with the authors of numerous papers lamenting the current academic devaluation of natural history research and the publication of descriptive results (Noss, 1996; Futuyma, 1998; Arnold, 2003; Dayton, 2003; Greene, 2005) we feel compelled to end with a similar message. We encourage others to gather and publish similar data to those presented here, for all regions of the world, but especially for the understudied and highly threatened Tumbesian biome.

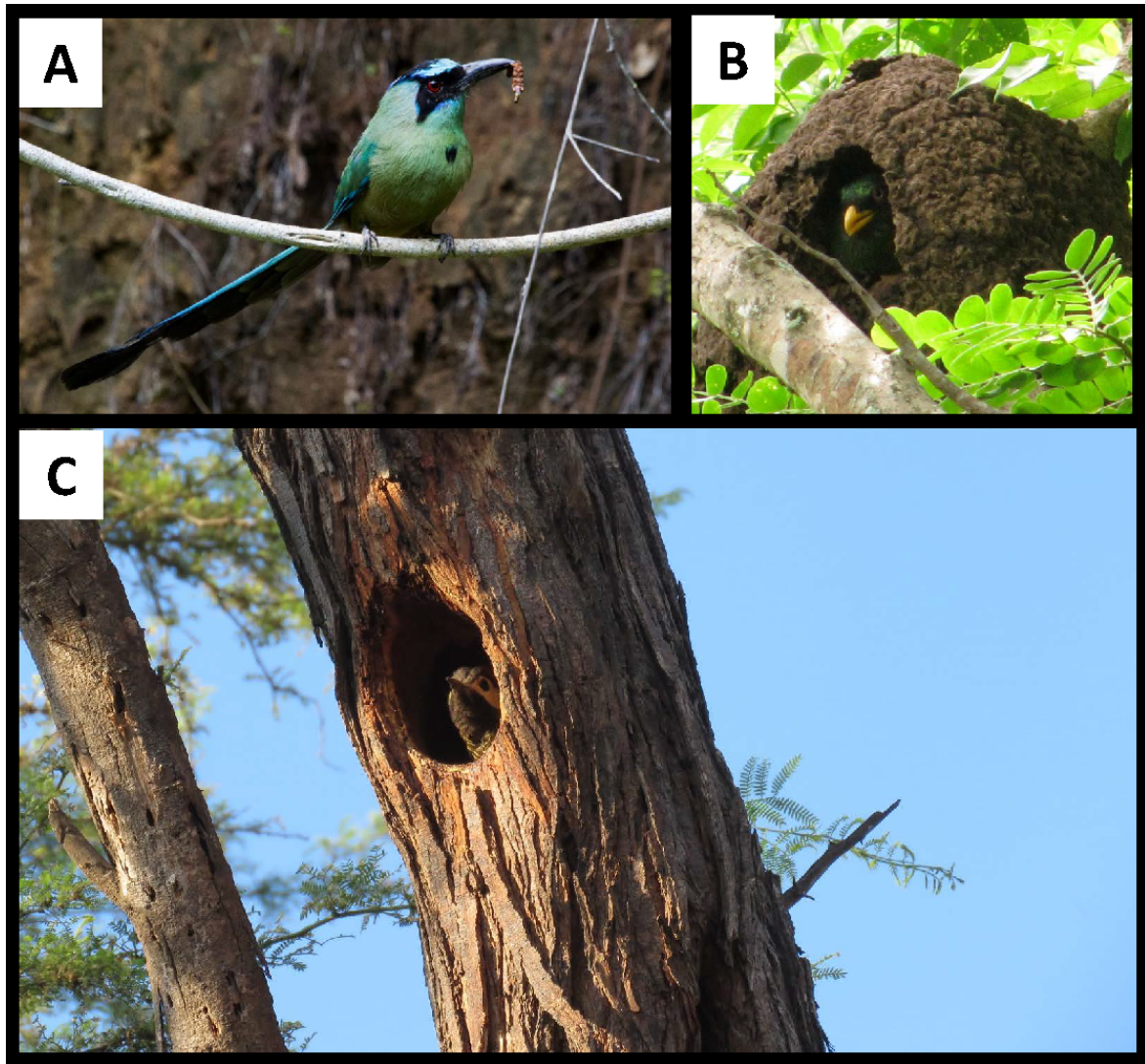


Figure 4: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult Whooping Motmot *Momotus subrufescens* carrying food towards its nest, 7 March 2014, Jorupe (HFG); adult male Ecuadorian Trogon *Trogon mesurus* peering from its active nest, 6 March 2014, Jorupe (HFG); adult Golden-olive Woodpecker *Colaptes rubiginosus* peering from its nest cavity, 2 January 2016, Bosque de Pomac (FAP).

ACKNOWLEDGEMENTS

HFG and ETM thank the Jocotoco Foundation, Field Guides Inc., Matt Kaplan, and John V. Moore for supporting travel and fieldwork. FAP and SC want to thank BirdLife International, Nature and Culture International and PROFONANPE. FAP and DC thank Golondrinas de las Américas project for facilitating and supporting fieldwork. We thank Juan Freile and two anonymous reviewers for thoughtful comments and suggested revisions that improved earlier drafts of this manuscript.

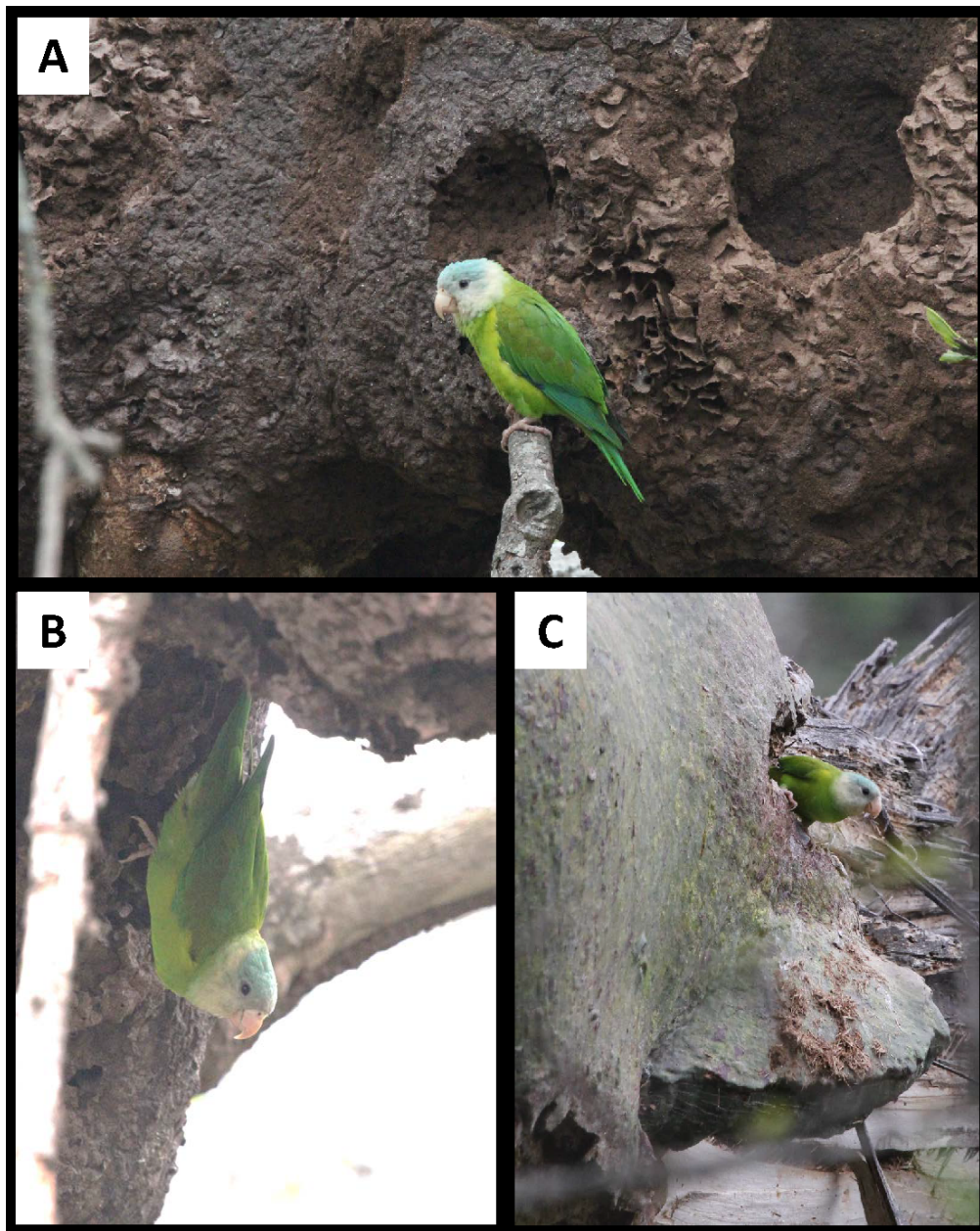


Figure 5: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. Adult Gray-cheeked Parakeets *Brotogeris pyrrhoptera* perched outside active nests at Jorupe. A) 28 February 2014; B-C) 27 February 2014 (HFG)

REFERENCES

Álava, J. J., Arosemena, X., Astudillo, E., Costantino, M., Peñafiel, M., & Bohórquez, C. (2007). Occurrence, abundance and notes on some threatened Ecuadorian birds in the El Canclón Lagoon, Manglares, Churute Ecological Reserve. *Ornitología Neotropical*, 18(2), 223–232. URL: <https://sora.unm.edu/node/133021>

Ágreda, A. E. (2007). Feeding ecology and conservation of Esmeraldas Woodstar *Chaetocercus berlepschi* in the Chongón-Colonche Hills, western Ecuador. *Cotinga*, 27, 38–41. URL: www.neotropicalbirdclub.org/wp-content/uploads/2015/05/C27-Agreda.pdf

Angulo, F. (2004). Dispersión, supervivencia y reproducción de la pava aliblanca *Penelope albipennis* Taczanowski 1877 (Cracidae) reintroducida a su hábitat natural en Perú. *Ecología Aplicada*, 3(1–2), 112–117. URL: http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S1726-22162004000100015

Angulo, F. (2008). Current status and conservation of wild and reintroduced White-winged Guan (*Penelope albipennis*) populations. *Ornitología Neotropical*, 19, S279–S286.

URL:

https://www.researchgate.net/publication/297717528_CURRENT_STATUS_AND_CONSERVATION_OF_WILD_AND_REINTRODUCED_WHITE-WINGED_GUAN_PENELOPE_ALBIPENNIS_POPULATIONS

Angulo, F., & Barrio, J. (2004). Evaluation of a potential reintroduction site for the white-winged guan *Penelope albipennis* (Aves, Cracidae) in northern Peru. *Oryx*, 38(4), 448–451.

DOI: <https://doi.org/10.1017/S0030605304000833>

Arnold, S. J. (2003). Anniversary essay: Too much natural history, or too little? *Animal Behaviour*, 65(6), 1065–1068. DOI: <https://doi.org/10.1006/anbe.2003.2143>

Balchin, C. S. (1996). The nest of Blackish-headed Spinetail *Synallaxis tithys*. *Bulletin of the British Ornithologists' Club*, 116(2), 126–127.

URL: <https://www.biodiversitylibrary.org/page/40029203#page/450/mode/1up>

Barrionuevo-García, R., & Montes-Torres, M. D. (2015). Estrategia reproductiva de las aves de los manglares de San Pedro de Vice – Piura. *Revista de Investigación para el Desarrollo Sustentable*, 3(1), 18–32. URL: <http://revistas.untrm.edu.pe/index.php/INDES/article/view/131>

Berg, K. S. (1994). New and interesting records of birds from a dry forest reserve in south-west Ecuador. *Cotinga*, 2, 14–19. URL: <https://www.neotropicalbirdclub.org/wp-content/uploads/2014/12/Cotinga-02-1994-14-19.pdf>

Best, B. J., & Kessler, M. (1995). *Biodiversity and conservation in Tumbesian Ecuador and Peru*. Cambridge, U.K.: BirdLife International.

Best, B. J., Broom, A. L., Checker, M., & Thewlis, R. (1992). An ornithological survey of El Oro and western Loja province, south-west Ecuador, January–March 1991. In B. J. Best (Ed.), *The threatened forests of south-west Ecuador* (pp. 137–210). Leeds, U.K.: Biosphere Publications.

Best, B. J., Checker, M., Thewlis, R. M., Best, A. L., & Duckworth, W. (1996). New bird breeding data from southwestern Ecuador. *Ornitología Neotropical*, 7(1), 69–73.

URL: http://www.ibiologia.unam.mx/pdf/links/neo/rev7/vol7_1/orni_7_1_69-73.pdf

Best, B. J., Clarke, C. T., Checker, M., Broom, A. L., Thewlis, R. M., Duckworth, W., & McNab, A. (1993). Distributional records, natural history notes and conservation of some poorly known birds from southwestern Ecuador and northwestern Peru. *Bulletin of the British Ornithologists' Club*, 113(2), 234–255. URL: <https://www.biodiversitylibrary.org/page/40028217#page/120/mode/1up>

BirdLife International (2019, 10 May) Endemic Bird Areas factsheet: Tumbesian region. URL: <http://datazone.birdlife.org/eba/factsheet/47>

Bonaccorso, E., Santander, T., Freile, J. F., Tinoco, B., & Rodas, F. (2007). Avifauna and conservation of the Cerro Negro-Cazaderos area, Tumbesian Ecuador. *Cotinga*, 27, 61–66.

URL: <http://www.neotropicalbirdclub.org/wp-content/uploads/2015/05/C27-Bonaccorso.pdf>

Carrasco, L., Berg, K. S., Litz, J., Cook, A., & Karubian, J. (2013). Avifauna of the Mache Chindul Ecological Reserve, northwest Ecuador. *Ornitología Neotropical*, 24(3), 321–334. URL:

<https://sora.unm.edu/node/133378>

Cavero, T., & Angulo, F. (2011). Health of the Critically Endangered white-winged guan *Penelope albipennis* and implications for its reintroduction and conservation in Peru. *International Journal of Galliformes Conservation*, 2, 43–53.

- Cisneros-Heredia, D. F. (2006). Notes on breeding, behaviour and distribution of some birds in Ecuador. *Bulletin of the British Ornithologists' Club*, 126(2), 153–164.
URL: <https://www.biodiversitylibrary.org/item/127046#page/75/mode/1up>
- Collar, N. J., Crosby, M. J., & Stattersfield, A. J. (1994). *Birds to watch 2: The world list of threatened birds*. Cambridge, U.K.: BirdLife International.
- Collar, N. J., Gonzaga, L. P., Krabbe, N., Madroño-Nieto, A., Naranjo, L. G., Parker, T. A., & Wege, D. C. (1992). *Threatened birds of the Americas: the ICBP/IUCN red data book, third edition, part 2*. Washington DC: Smithsonian Institution Press & International Council for Bird Preservation.
- Cook, A. G. (1996). Avifauna of North-western Peru Biosphere Reserve and its environs. *Bird Conservation International*, 6(2), 139–165. DOI: <https://doi.org/10.1017/S0959270900003038>
- Cracraft, J. (1985). Historical biogeography and patterns of differentiation within the South American avifauna: areas of endemism. *Ornithological Monographs*, 36, 49–84. URL: <https://www.jstor.org/stable/40168278>
- Crespo, S., & More, A. (2013). Distribución y estado de conservación del Cola-Espina de Cabeza Negra *Synallaxis tithys* en el noroeste de Perú. *Cotinga*, 35, 37–42. URL: www.neotropicalbirdclub.org/wp-content/uploads/2015/03/C35-Crespo-More.pdf
- Cuesta, F., Peralvo, M., Merino-Viteri, A., Bustamante, M., Baquero, F., Freile, J. F., Muriel, P., Torres-Carvajal, O. (2017). Priority areas for biodiversity conservation in mainland Ecuador. *Neotropical Biodiversity*, 3(1), 93–106. DOI: <https://doi.org/10.1080/23766808.2017.1295705>
- Dayton, P. K. (2003). The importance of natural sciences to conservation. *American Naturalist*, 162(1), 1–13. DOI: <https://doi.org/10.1086/376572>
- Dickinson, E. C., & Christidis, L. (Eds.). (2014). *The Howard and Moore complete checklist of the birds of the World. 4th Edition. Volume 2, Passerines*. Eastbourne, U.K.: Aves Press.
- Escribano-Avila, G., Cervera, L., Ordóñez-Delgado, L., Jara-Guerrero, A., Amador, L., Paladines, B., Briceño, J., Parés-Jiménez, V., Lizcano, D. J., Duncan, D. H., & Espinosa, C. I. (2017). Biodiversity patterns and ecological processes in Neotropical dry forest: The need to connect and management for long-term conservation. *Neotropical Biodiversity*, 3(1), 107–116.
DOI: <http://dx.doi.org/10.1080/23766808.2017.1298495>
- Espinosa, C. I., De La Cruz, M., Luzuriaga, A. L. & Escudero, A. (2012). Bosques tropicales secos de la región Pacífico Ecuatorial: diversidad, estructura, funcionamiento e implicaciones para la conservación. *Ecosistemas*, 21(1–2), 167–179. URL: <https://www.revistaecosistemas.net/index.php/ecosistemas/article/view/35>
- Espinosa, C. I., Jara-Guerrero, A., Cisneros, R., Sotomayor, J. D. & Escribano-Ávila, G. (2016). Reserva Ecológica Arenillas ¿un refugio de diversidad biológica o una isla en extinción? *Ecosistemas*, 25(2), 5–12. DOI: <https://doi.org/10.7818/ECOS.2016.25-2.02>
- Fajardo, J., Lessmann, J., Bonaccorso, E., Devenish, C., & Muñoz, J. (2014). Combined use of systematic conservation planning, species distribution modelling, and connectivity analysis reveals severe conservation gaps in a megadiverse country (Peru). *PLoS ONE*, 9(12), e114367.
DOI: <https://doi.org/10.1371/journal.pone.0114367>
- Flanagan, J. N. M., & Millen, B. M. (2008). First nest and egg records of the Peruvian Plantcutter *Phytotoma raimondii*, by O. D. Boggs. *Bulletin of the British Ornithologists' Club*, 128(4), 271.
URL: <https://www.biodiversitylibrary.org/page/45653875#page/295/mode/1up>
- Flanagan, J. N. M., Engblom, G., Franke, I., Valqui, T., & Angulo, F. (2009). Distribution of the Peruvian Plantcutter *Phytotoma raimondii* (Passeriformes: Cotingidae). *Revista Peruana de Biología*, 16(2), 175–182.
URL: <http://200.62.146.19/BVRevistas/biologia/v16n2/pdf/a08v16n2.pdf>

- Freile, J. F., & Chaves, J. A. (2004). Interesting distributional records and notes on the biology of bird species from a cloud forest reserve in north-west Ecuador. *Bulletin of the British Ornithologists' Club*, 124(1), 6–16. URL: <https://www.biodiversitylibrary.org/page/40056023>
- Freile, J. F., & Rodas, F. (2008). Conservación de aves en Ecuador: ¿cómo estamos y qué necesitamos hacer? *Cotinga*, 29, 48–55. URL: www.neotropicalbirdclub.org/wp-content/uploads/2017/08/C29-Freile-Rodas.pdf
- Freile, J. F., & Santander, T. (2005). *Áreas importantes para la conservación de las aves en Ecuador*. Quito, Ecuador: Aves & Conservación (Corporación Ornitológica del Ecuador).
- Freile, J. F., Bonaccorso, E., & Santander, T. (2003). First nesting report of the West Peruvian Screech-Owl (*Otus roboratus*). *Ornitología Neotropical*, 14(1), 107–111. URL: <https://sora.unm.edu/node/119504>
- Freile, J. F., Carrión, J. M., Prieto-Albuja, F., Suárez, L., & Ortiz-Crespo, F. (2006). La ornitología en Ecuador: un análisis del estado actual del conocimiento y sugerencias para prioridades de investigación. *Ornitología Neotropical*, 17(2), 183–202. URL: <https://sora.unm.edu/sites/default/files/journals/on/v017n02/p0183-p0202.pdf>
- Freile, J. F., Greeney, H. F., & Bonaccorso, E. (2014). Current Neotropical ornithology: Research progress 1996-2007. *Condor: Ornithological Applications*, 116(1), 84–96. DOI: <https://doi.org/10.1650/CONDOR-12-152-R1.1>
- Freile, J. F., Moreano V., M., Bonaccorso, E., Santander, T., & Chaves, J. A. (2004). Notas sobre la historia natural, distribución y conservación de algunas especies de aves amenazadas del suroccidente de Ecuador. *Cotinga*, 21, 18–24. URL: <https://www.neotropicalbirdclub.org/wp-content/uploads/2016/10/C21-Freile.pdf>
- Futuyma, D. J. (1998). Wherefore and whither the naturalist? *American Naturalist*, 151(1), 1–6. URL: <https://www.jstor.org/stable/10.1086/286097>
- Gelis, R. A., Greeney, H. F., & Miller, E. T. (2009). Further observations on nesting of Slaty Becard *Pachyramphus spodiurus*. *Cotinga*, 31, 70–71. URL: www.neotropicalbirdclub.org/wp-content/uploads/2016/10/C31-Gelis-et-al.pdf
- Greene, H. W. (1994). Systematics and natural history, foundations for understanding and conserving biodiversity. *American Zoologist*, 34(1), 48–56. DOI: <https://doi.org/10.1093/icb/34.1.48>
- Greene, H. W. (2005). Organisms in nature as a central focus for biology. *Trends in Ecology and Evolution*, 20(1), 23–27. DOI: <https://doi.org/10.1016/j.tree.2004.11.005>
- Greeney, H. F. (2006). The nest and eggs of the Ochraceous Attila *Attila torridus* in south-west Ecuador with notes on parental care. *Cotinga*, 25, 56–58. URL: www.neotropicalbirdclub.org/wp-content/uploads/2016/12/C25-Greeney.pdf
- Greeney, H. F. (2010). The nest, egg, and nesting success of Ecuadorian Thrush (*Turdus maculirostris*) in southwest Ecuador. *Ornitología Colombiana*, 10, 38–42. URL: <http://asociacioncolombianadeornitologia.org/wp-content/uploads/revista/oc10/Greeney.pdf>
- Greeney, H. F. (2014). Breeding biology of the Grey-breasted Flycatcher *Lathrotriccus griseipectus* in south-west Ecuador. *Bulletin of the British Ornithologists' Club*, 134(1), 14–18. URL: <https://boc-online.org/bulletins/downloads/BBOC1341-Greeney.pdf>
- Greeney, H. F. (2018). *Antpittas and gnateaters*. London, U.K.: Christopher Helm.

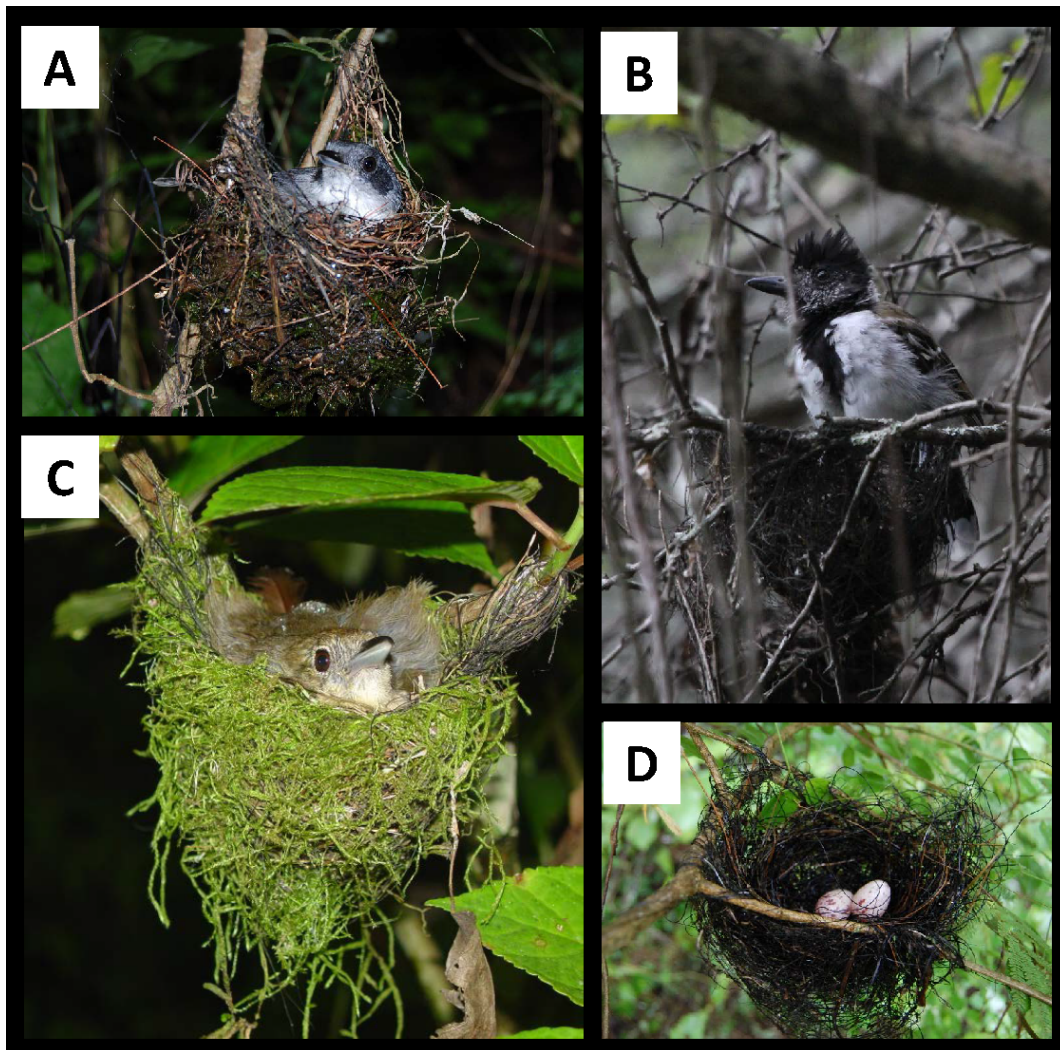


Figure 6: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult male Plain Antvireo *Dysithamnus mentalis* incubating, 21 February 2010, Jorupe (HFG); B) adult male Collared Antshrike *Thamnophilus bernardi* perched on the rim of its nest, 2 March 2014, Jorupe (HFG); C) adult female Black-crowned Antshrike *Thamnophilus atrinucha*, 11 February 2004, Buenaventura (HFG); D) *T. bernardi* nest with complete clutch, 22 February 2010, Jorupe (HFG).

Greeney, H. F., & Gelis, R. A. (2007). Breeding records from the north-east Andean foothills of Ecuador. *Bulletin of the British Ornithologists' Club*, 127(3), 236–241.

URL: <https://www.biodiversitylibrary.org/page/40877333#page/70/mode/1up>

Greeney, H. F., & Gelis, R. A. (2008). Further breeding records from the Ecuadorian Amazonian lowlands. *Cotinga*, 29, 62–68. URL: www.neotropicalbirdclub.org/articles/29/Amazon.pdf

Greeney, H. F., & Nunnery, T. (2006). Notes on the breeding of north-west Ecuadorian birds. *Bulletin of the British Ornithologists' Club*, 126(1), 38–45.

URL: <https://www.biodiversitylibrary.org/page/40881746#page/40/mode/1up>

Greeney, H. F., & Valencia-Herverth, R. (2016). Two “abnormal” clutches of Scaled Antpitta *Grallaria guatimalensis*. *Cotinga*, 38, 43–45. URL: www.neotropicalbirdclub.org/wp-content/uploads/2016/02/Greeney-Valencia-Herverth.pdf

Greeney, H. F., Dobbs, R. C., Martin, P. R., & Gelis, R. A. (2008). The breeding biology of *Grallaria* and *Grallaricula* antpittas. *Journal of Field Ornithology*, 79(2), 113–129. DOI: <https://doi.org/10.1111/j.1557-9263.2008.00153.x>

Greeney, H. F., Juiña-J., M. E., Harris, J. B. C., Wickens, M. T., Winger, B., Gelis, R. A., Miller, E. T. & Solano-Ugalde, A. (2010). Observations on the breeding biology of birds in south-east Ecuador. *Bulletin of the British Ornithologists' Club*, 130(1), 61–68.

URL: <https://www.biodiversitylibrary.org/page/47499620#page/65/mode/1up>

Greeney, H. F., Lichter-Marck, I., & Lichter-Marck, E. (2013). The nest, eggs, and nestlings of Grey-chinned Hermit *Phaethornis griseogularis*. *Cotinga*, 35, 112–113. URL: www.neotropicalbirdclub.org/wp-content/uploads/2015/03/C35-Greeney-et-al.pdf

Greeney, H. F., Martin, P. R., Gelis, R. A., Solano-Ugalde, A., Bonier, F., Freeman, B. G., & Miller, E. T. (2011). Notes on the breeding of high-Andean birds in northern Ecuador. *Bulletin of the British Ornithologists' Club*, 131(1), 24–31. URL: <https://www.biodiversitylibrary.org/item/206985#page/25/mode/1up>

Greeney, H. F., Miller, E. T., & Gelis, R. A. (2009). Observations on parental care and fledging of Watkins's Antpitta (*Grallaria watkinsi*). *Ornitología Neotropical*, 20(4), 619–622.

URL: <https://sora.unm.edu/node/133137>

Greeney, H. F., Solano-Ugalde, A., Juiña-J., M. E., & Gelis, R. A. (2012). Observations on the breeding of Ochre-breasted Antpitta (*Grallaricula flavirostris*) in Ecuador. *Ornitología Colombiana*, 12, 4–9. URL: <http://asociacioncolombianadeornitologia.org/wp-content/uploads/revista/oc12/GreeneyetalGFlavirostris.pdf>

Hansen, M. C., Potapov, P. V., Moore, R., Hancher, M., Turubanova, S. A., Tyukavina, A., Thau, D., Stehman, S. V., Goetz, S. J., Loveland, T. R., Kommareddy, A., Egorov, A., Chini, L., Justice, C. O., & Townshend, J. R. G. (2013). High-resolution global maps of 21st-century forest cover change. *Science*, 342, 850–853. DOI: [10.1126/science.1244693](https://doi.org/10.1126/science.1244693)

del Hoyo, J., & Collar, N.J. (2016). *HBW and BirdLife International illustrated checklist of birds of the world, vol. 2: Passerines*. Barcelona, Spain: Lynx Edicions.

Juiña J., M. E., Harris, J. B. C., Greeney, H. F., & Hickman, B. R. (2010). Descripción del nido y cuidado parental de la estrellita esmeraldeña (*Chaetocercus berlepschi*) en el occidente del Ecuador. *Ornitología Neotropical*, 21(3), 313–322. URL: <https://sora.unm.edu/node/133173>

Klauke, N., Segelbacher, G., & Schaefer, H. M. (2013). Reproductive success depends on the quality of helpers in the endangered, cooperative El Oro Parakeet (*Pyrrhura orcesi*). *Molecular Ecology*, 22(7), 2011–2027. DOI: [10.1111/mec.12219](https://doi.org/10.1111/mec.12219)

Knowlton, J. L. (2010). Breeding records of birds from Tumbesian region of Ecuador. *Ornitología Neotropical*, 21(1), 109–129. URL: <https://sora.unm.edu/sites/default/files/ON%202021%281%29%20109-129.pdf>

Koepcke, M. (1958). Die Vögel des Waldes von Zárate. *Bonner Zoologische Beiträge*, 9, 130–193. URL: <https://www.biodiversitylibrary.org/page/44733315#page/152/mode/1up>

Koepcke, M. (1961). Las razas geograficas de *Cranioleuca antisiensis* (Furnariidae, Aves), con la descripción de una nueva subespecie. *Publicaciones del Museo de Historia Natural Zoología*, 20, 1–17. URL: https://museohn.unmsm.edu.pe/docs/pub_zoologia/Publicaciones%20Zoología%20Serie%20A%20N°%2020.pdf

Koepcke, M. (1970). *The birds of the department of Lima, Peru (Translation from Spanish)*. Wynnewood, PA: Livingston Publishing Company.

Krabbe, N. (1992). Notes on distribution and natural history of some poorly known Ecuadorean birds. *Bulletin of the British Ornithologists' Club*, 112(3), 169–174.

URL: <https://www.biodiversitylibrary.org/page/40027922#page/473/mode/1up>

- Lessmann, J., Muñoz, J., & Bonaccorso, E. (2014). Maximizing species conservation in continental Ecuador: a case of systematic conservation planning for biodiverse regions. *Ecology and Evolution*, 4(12), 2410–2422. DOI: [10.1002/ece3.1102](https://doi.org/10.1002/ece3.1102)
- López-Lanús, B., & Lowen, J. C. (1999). Observations of breeding activity in El Oro Parakeet *Pyrrhura orcesi*. *Cotinga*, 11, 46–47. URL: www.neotropicalbirdclub.org/articles/11/C11-EOPA.pdf
- Marchant, S. (1958). The birds of the Santa Elena Peninsula, S. W. Ecuador. *Ibis*, 100(3), 349–387. DOI: <https://doi.org/10.1111/j.1474-919X.1958.tb00404.x>
- Marchant, S. (1959). The breeding season in S. W. Ecuador. *Ibis*, 101(2), 137–152. DOI: <https://doi.org/10.1111/j.1474-919X.1959.tb02370.x>
- Marchant, S. (1960a). The breeding of some S.W. Ecuadorian birds. *Ibis*, 102(3), 349–382. DOI: <https://doi.org/10.1111/j.1474-919X.1960.tb08415.x>
- Marchant, S. (1960b). The breeding of some S.W. Ecuadorian birds (cont.). *Ibis*, 102(4), 584–599. DOI: <https://doi.org/10.1111/j.1474-919X.1960.tb07134.x>
- Martin, P. R., & Dobbs, R. C. (2004). Description of the nest, egg and nestling of Watkin's Antpitta *Grallaria watkinsi*. *Cotinga*, 21, 35–37. URL: www.neotropicalbirdclub.org/wp-content/uploads/2016/10/C21-Martin.pdf
- Martin, T. E. (1996). Life history evolution in tropical and south temperate birds: What do we really know? *Journal of Avian Biology*, 27(4), 263–272. DOI: [10.2307/3677257](https://doi.org/10.2307/3677257)
- Meyer de Schauensee, R. (1970). *A guide to the birds of South America*. Wynnewood, PA: Livingston Publishing Company.
- Miller, E. T., & Greeney, H. F. (2008). Clarifying the nest architecture of the *Silvicultrix* clade of *Ochthoeca* chat-tyrants (Tyrannidae). *Ornitología Neotropical*, 19(4), 361–370. URL: [https://sora.unm.edu/sites/default/files/ON \(19\) 361-370.pdf](https://sora.unm.edu/sites/default/files/ON%20(19)%20361-370.pdf)
- Miller, E. T., Greeney, H. F., Lichter-Marck, I., Lichter-Marck, E., & Cabrera, L. F. (2012). The breeding of the Henna-hooded Foliage-gleaner, *Hylocryptus erythrocephalus*, with notes on conservation concerns. *Ornitología Neotropical*, 23(4), 517–527. URL: <https://sora.unm.edu/sites/default/files/ON%2023%284%29%20517-527.pdf>
- Miller, E. T., Greeney, H. F., & Valdez, U. (2010). Breeding behavior of the Laughing Falcon (*Herpetotheres cachinnans*) in southwestern Ecuador and northwestern Peru. *Ornitología Colombiana*, 10, 43–50. URL: <http://asociacioncolombianadeornitologia.org/wp-content/uploads/revista/oc10/Miller.pdf>
- Miller, E. T., Greeney, H. F., Zyskowski, K., & Gelis, R. A. (2007). First description of the nest and eggs of the Gray-and-gold Warbler (*Basileuterus fraseri*). *Ornitología Neotropical*, 18(4), 617–621. URL: <https://sora.unm.edu/sites/default/files/ON%20%2818%29%20617-622.pdf>
- Mischler, T. C. (2012). Status, abundance, seasonality, breeding evidence and an updated list of the birds of Cerro Blanco, Guayaquil, Ecuador. *Cotinga*, 34, 60–72. URL: <https://www.neotropicalbirdclub.org/wp-content/uploads/2018/06/C34-Mischler.pdf>
- Morton, E. S. (1971). Nest predation affecting the breeding season of the Clay-colored Robin, a tropical song bird. *Science*, 171, 920–921. DOI: <https://doi.org/10.1126/science.171.3974.920>

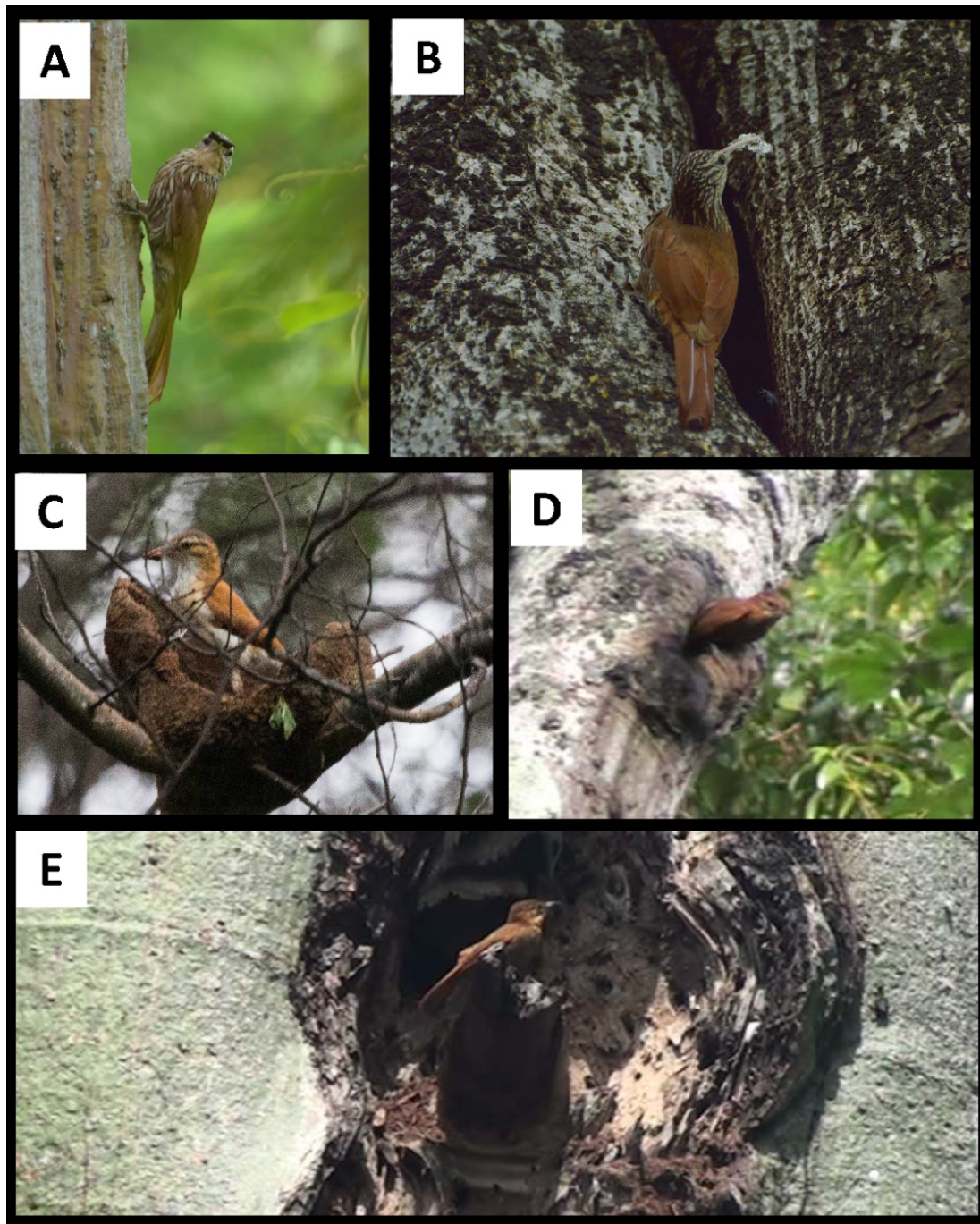


Figure 7: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A–B) adult Streak-headed Woodcreepers *Lepidocolaptes souleyetii* carrying bark chips to their nests at Jorupe on 2 April 2014 and 26 March 2014 (LASM); C) adult Pale-legged Hornero *Furnarius leucopus* building its nest, 6 March 2014, Jorupe (HFG); D–E) adult Rufous-necked Foliage-gleaners *Syndactyla ruficollis* near their nest entrances at Jorupe, 5 March and 21 February 2010 (HFG).

Munday, M., & Munday, G. (1992). The climate of south-west Ecuador. In B. J. Best (Ed.), *The threatened forests of south-west Ecuador* (pp. 7–78). Leeds, U.K.: Biosphere Publications.

Nolazco, S., & Roper, J. J. (2013). Descriptive note of reproduction in the Peruvian Plantcutter (*Phytotoma raimondii*) in the Bosque de Pomac Historical Sanctuary, Lambayeque, Perú. *Boletín de la Unión de Ornítólogos del Perú (UNOP)*, 8, 6–13. URL: <https://boletinunop.weebly.com/volumen-8-nordm-2---2013.html>

- Noss, R. F. (1996). The naturalists are dying off. *Conservation Biology*, 10(1), 1–3. DOI: <https://doi.org/10.1046/j.1523-1739.1996.10010001.x>
- Oppel, S., Schaefer, H. M., & Schmidt, V. (2003). Description of the nest, eggs, and breeding behavior of the endangered Pale-headed Brush-Finch (*Atlapetes pallidiceps*) in Ecuador. *Wilson Bulletin*, 115(4), 360–366. DOI: <https://doi.org/10.1676/03-020>
- Oppel, S., Schaefer, H. M., Schmidt, V., & Schroder, B. (2004a). Cowbird parasitism of Pale-headed Brush-finch *Atlapetes pallidiceps*: implications for conservation and management. *Bird Conservation International*, 14(2), 63–75. DOI: <https://doi.org/10.1017/S0959270904000103>
- Oppel, S., Schaefer, H. M., Schmidt, V., & Schroder, B. (2004b). Habitat selection by the Pale-headed Brush-Finch (*Atlapetes pallidiceps*) in southern Ecuador: implications for conservation. *Biological Conservation*, 118(1), 33–40. DOI: <https://doi.org/10.1016/j.biocon.2003.07.006>
- Ordóñez-Delgado, L., Tomás, G., Armijos-Ojeda, D., Jara-Guerrero, A., Cisneros, R., & Espinosa, C. I. (2016). Nuevos aportes al conocimiento de avifauna en la región Tumbesina; implicaciones para la conservación de la Reserva de Biosfera del Bosque Seco, Zapotillo, Ecuador. *Ecosistemas*, 25(2), 13–23. DOI: <https://doi.org/10.7818/ECOS.2016.25-2.03>
- Parker, T. A., III, & Carr, J. L. (1992). Status of forest remnants in the Cordillera de la Costa and adjacent areas of southwestern Ecuador. *RAP Working Papers*, 2, 1–172. URL: https://bibdigital.epn.edu/bitstream/15000/4788/1/RAP02_Cordillera_Costa_Ecuador_Oct-1992.pdf
- Parker, T. A., III, Schulenberg, T. S., Kessler, M., & Wust, W. (1995). Natural history and conservation of the endemic avifauna of north-west Peru. *Bird Conservation International*, 5(2–3), 201–232. DOI: <https://doi.org/10.1017/S0959270900001015>
- Portillo-Quintero, C. A. & Sánchez-Azofeifa, G. A. (2010). Extent and conservation of tropical dry forests in the Americas. *Biological Conservation*, 143(1), 144–155. DOI: <https://doi.org/10.1016/j.biocon.2009.09.020>
- Remsen, J. V., Jr., Areta, J. I., Cadena, C. D., Claramunt, S., Jaramillo, A., Pacheco, J. F., Pérez-Emán, J., Robbins, M. B., Stiles, F. G., Stotz, D. F. & Zimmer, K. J. (2018, 30 January). *A classification of the bird species of South America*. American Ornithologists' Union. URL: <http://www.museum.lsu.edu/~Remsen/SACCBaseline.html>.
- Rheindt, F. E. (2008). Descripción preliminar del nido de *Pachyramphus spodiurus*, especie amenazada. *Cotinga*, 29, 162–163. URL: www.neotropicalbirdclub.org/articles/29/Nido.pdf
- Ricklefs, R. E. (1977). On the evolution of reproductive strategies in birds: reproductive effort. *American Naturalist*, 111(979), 453–478. DOI: <https://doi.org/10.1086/283179>
- Robbins, M. B., & Ridgely, R. S. (1990). The avifauna of an upper tropical cloud forest in southwestern Ecuador. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 142, 59–71. URL: <https://www.jstor.org/stable/4064971>
- Robbins, M. B., Ridgely, R. S., & Cardiff, S. W. (1994). Voice, plumage and natural history of Anthony's Nightjar (*Caprimulgus anthonyi*). *Condor*, 96(2), 224–228. DOI: [10.2307/1369085](https://doi.org/10.2307/1369085)
- Rosina, M., & Romo, M. (2012). Reproducción y alimentación de *Phytotoma raimondii*, cortarrama peruana en El Gramadal, Ancash. *Revista Peruana de Biología*, 19(2), 167–173. URL: www.scielo.org.pe/pdf/rpb/v19n2/a07v19n2.pdf
- Schulenberg, T. S., & Greeney, H. F. (2013). Ecuadorian Trogon (*Trogon mesurus*). In T. S. Schulenberg (Ed.), *Neotropical Birds Online*. Ithaca, NY: Cornell Lab of Ornithology. URL: <https://neotropical.birds.cornell.edu/Species-Account/nb/species/bkttro2/overview>

- Schulenberg, T. S., Stotz, D. F., Lane, D. F., O'Neill, J. P., & Parker, T. A., III. (2010). *Birds of Peru: Revised and updated edition*. Princeton, NJ: Princeton University Press.
- Seeholzer, G. F., & Brumfield, R. T. (2017). Isolation by distance, not incipient ecological speciation, explains genetic differentiation in an Andean songbird (Aves: Furnariidae: *Cranioleuca antisiensis*, Line-cheeked Spinetail) despite near threefold body size change across an environmental gradient. *Molecular Ecology*, 27(1), 279–296. DOI: <https://doi.org/10.1111/mec.14429>
- Skutch, A. F. (1999). *Trogons, laughing falcons, and other neotropical birds*. College Station, TX: Texas A & M University Press.
- Solano-Ugalde, A. (2011). Notes on the distribution and natural history of bird species in the Chocó bioregion of Ecuador. *Bulletin of the British Ornithologists' Club*, 131(4), 149–255. URL: <https://www.biodiversitylibrary.org/page/50795731#page/27/mode/1up>
- Solano-Ugalde, A., Arcos-Torres, A., & Greeney, H. F. (2007). Additional breeding records for selected avian species in northwest Ecuador. *Boletín de la Sociedad Antioqueña de Ornitología*, 17, 17–25. URL: http://www.sao.org.co/publicaciones/boletinsao/AP2_XVII_1_2007.pdf
- Stattersfield, A. J., Crosby, M. J., Long, A. J., & Wege, D. C. (1998). *Endemic bird areas of the World. Priorities for biodiversity conservation*. Cambridge, U.K.: BirdLife International.
- Taczanowski, L. (1884). *Ornithologie du Pérou* (Vol. 1). Berlin, Germany: R. Friedländer & Sohn.
- Tapia-Armijos, M. F., Homeier, J., Espinosa, C. I., Leuschner, C. & De La Cruz, M. (2015). Deforestation and forest fragmentation in south Ecuador since the 1970s – Losing a hotspot of biodiversity. *PLoS ONE*, 10(9), e0133701. DOI: <https://doi.org/10.1371/journal.pone.0133701>
- Walker, B. (2002). Observations from the Tumbes Reserved Zone, dpto. Tumbes, with notes on some new taxa for Peru and a checklist of the area. *Cotinga*, 18, 37–43. URL: www.neotropicalbirdclub.org/wp-content/uploads/2016/05/Cotinga-18-2002-37-43.pdf
- Wege, D. C., & Long, A. J. (1995). *Key areas for threatened birds in the Neotropics*. Cambridge, U.K.: BirdLife International.
- Wiedenfeld, D. A., Schulenberg, T. S., & Robbins, M. B. (1985). Birds of a tropical deciduous forest in extreme northwestern Peru. *Ornithological Monographs*, 36, 305–315. URL: <https://www.jstor.org/stable/i40004512>
- Williams, R. S. R., & Tobias, J. A. (Eds.). (1994). *The conservation of southern Ecuador's threatened avifauna. Final report of the Amaluza Projects, 1990-1991*. Cambridge, U.K.: International Council for Bird Preservation.
- Zyskowski, K., & Prum, R. O. (1999). Phylogenetic analysis of the nest architecture of Neotropical ovenbirds (Furnariidae). *Auk*, 116(4), 891–911. DOI: <https://doi.org/10.2307/4089670>

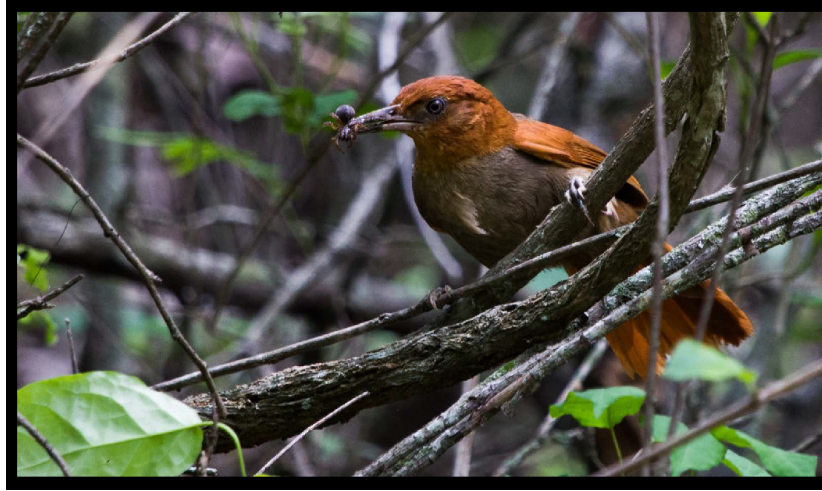


Figure 8: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult Henna-hooded Foliage-gleaner *Clibanornis erythrocephalus* carrying a spider for its nestlings, 7 March 2014, Jorupe (HFG).

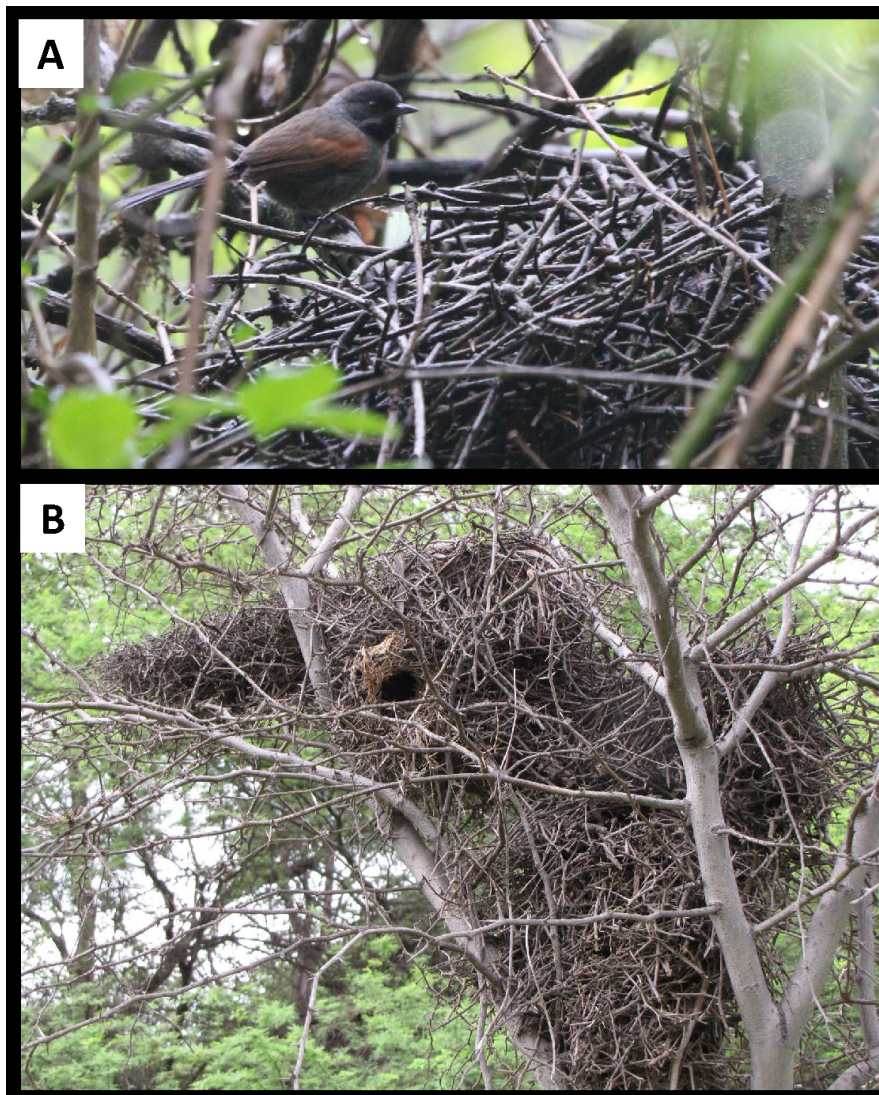


Figure 9: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult Blackish-headed Spinetail *Synallaxis tithys* perched atop its nest, 1 March 2014, Jorupe (HFG); B) Nest of Necklaced Spinetail *Synallaxis stictothorax*, 24 March 2009, Abra de Huacrupe (FAP).

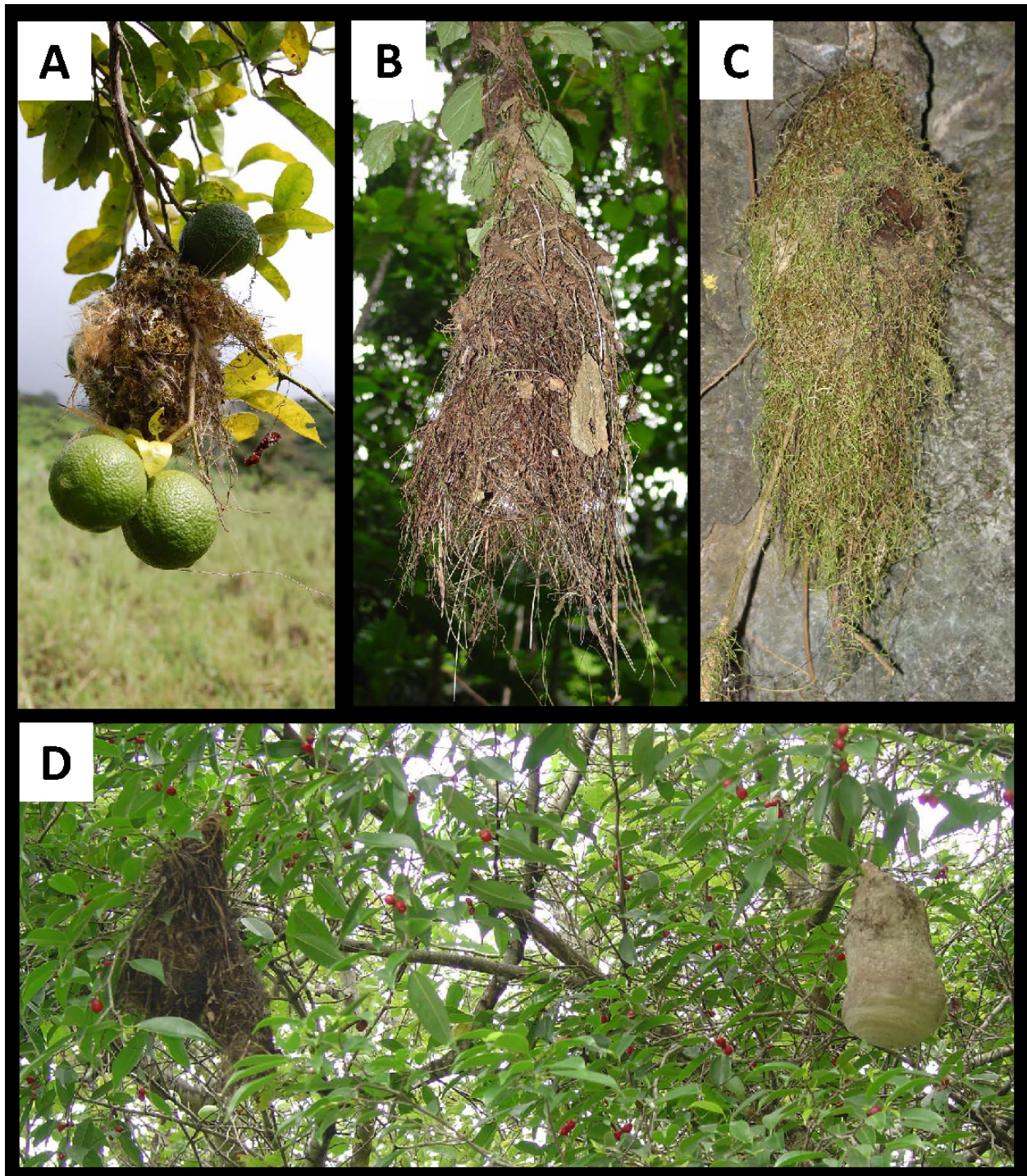


Figure 10: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Nest of Southern Beardless-Tyrannulet *Camptostoma obsoletum*, 17 February 2010, Jorupe (HFG); B) Nest of Sulphur-rumped Flycatcher *Myiobius barbatus*, 31 January 2004, Buenaventura (HFG); C) Nest of Ochre-bellied Flycatcher *Mionectes oleagineus*, 31 January 2004, Buenaventura (HFG); D) Nest of Yellow-olive Flycatcher *Tolmomyias sulphureus* near an active wasp (Vespidae) nest, 24 February 2006, Jorupe (HFG).

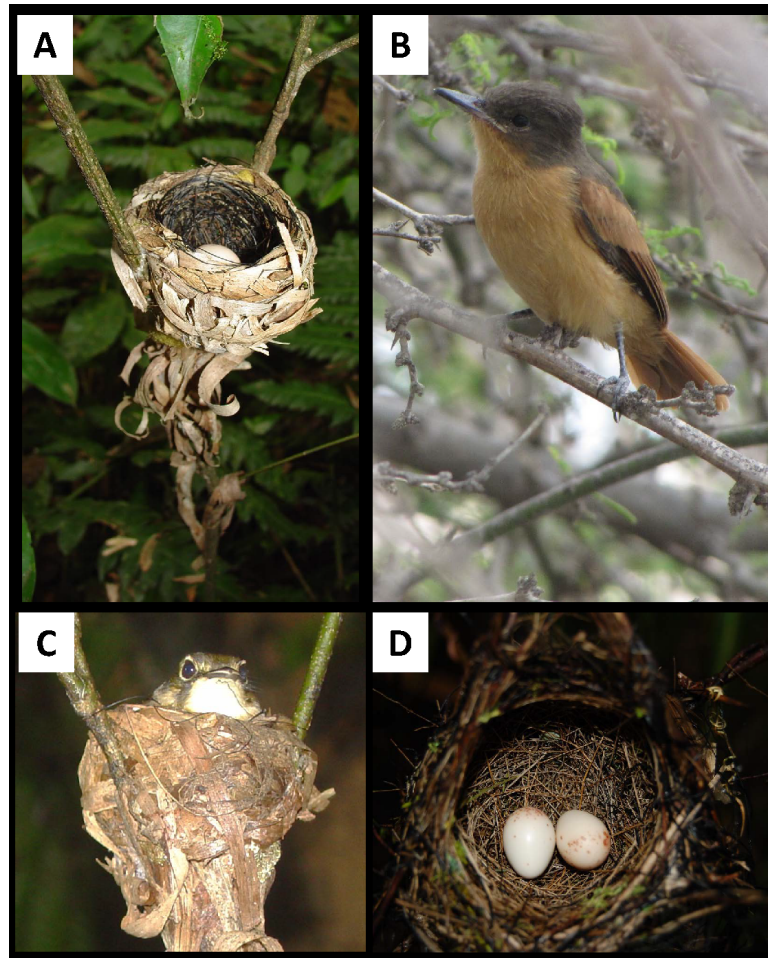


Figure 11: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Nest and single-egg clutch of White-throated Spadebill *Platyrinchus mystaceus*, 1 February 2004, Buenaventura (HFG); B) Fledgling Rufous Flycatcher *Myiarchus semirufus*, 26 February 2009, Estuario de Virrila (FAP); C) Adult *P. mystaceus* on its nest, 12 February 2004, Buenaventura (HFG); D) Nest and complete clutch of Bran-colored Flycatcher *Myiophobus fasciatus*, 16 February 2010, Jorupe (HFG).

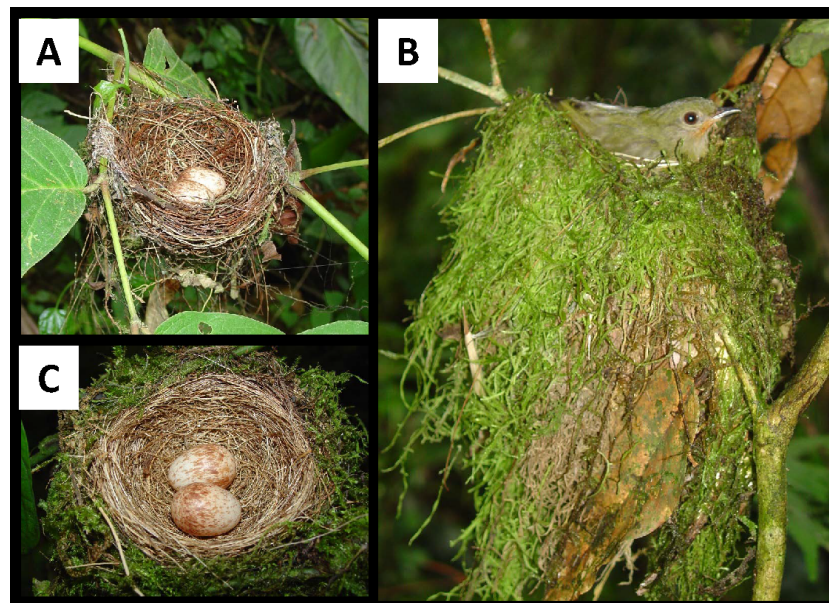


Figure 12: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Nest and complete clutch of White-bearded Manakin *Manacus manacus*, 30 January 2004, Buenaventura (HFG); B) Adult female Club-winged Manakin *Machaeopterus deliciosus* on its nest, 6 February 2004, Buenaventura (HFG); C) Nest and complete clutch of *M. deliciosus*, 10 February 2004, Buenaventura (HFG).

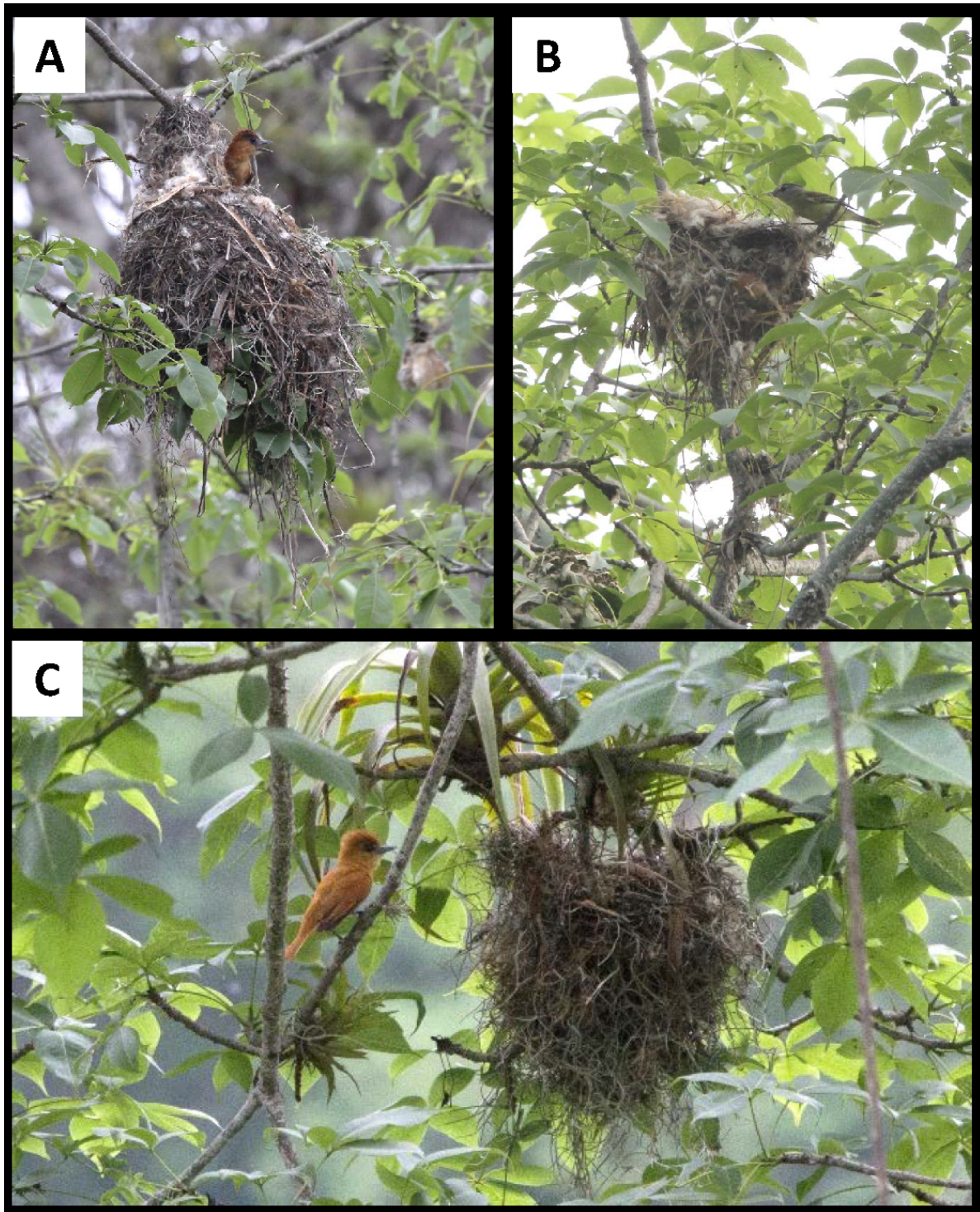


Figure 13: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult female One-colored Becard *Pachyramphus homochrous* at nest, 26 February 2010, Jorupe; B) Adult female Black-and-white Becard *Pachyramphus albogriseus* at its nest, 7 March 2014, Jorupe; C) Adult female Slaty Becard *Pachyramphus spodiurus* at its nest, 25 February 2014 (HFG).

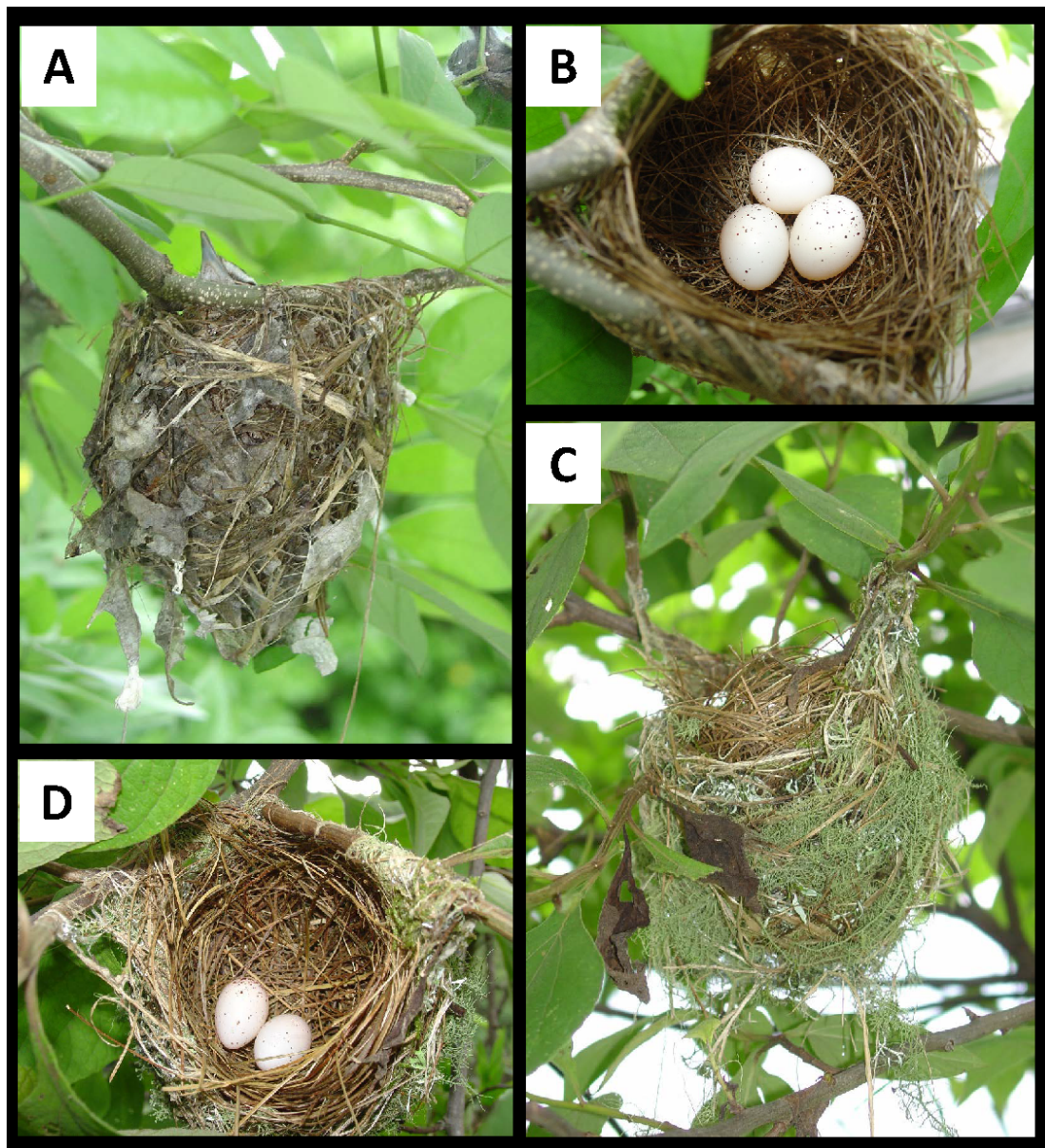


Figure 14: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A-B) Nest and complete clutch of Red-eyed Vireo *Vireo olivaceus*, 26 February 2006, Cerro Blanco (HFG); C-D) Nest, with two fresh eggs, of Rufous-browed Peppershrike *Cyclarhis gujanensis*, 15 March 2005, Yunguilla (HFG).

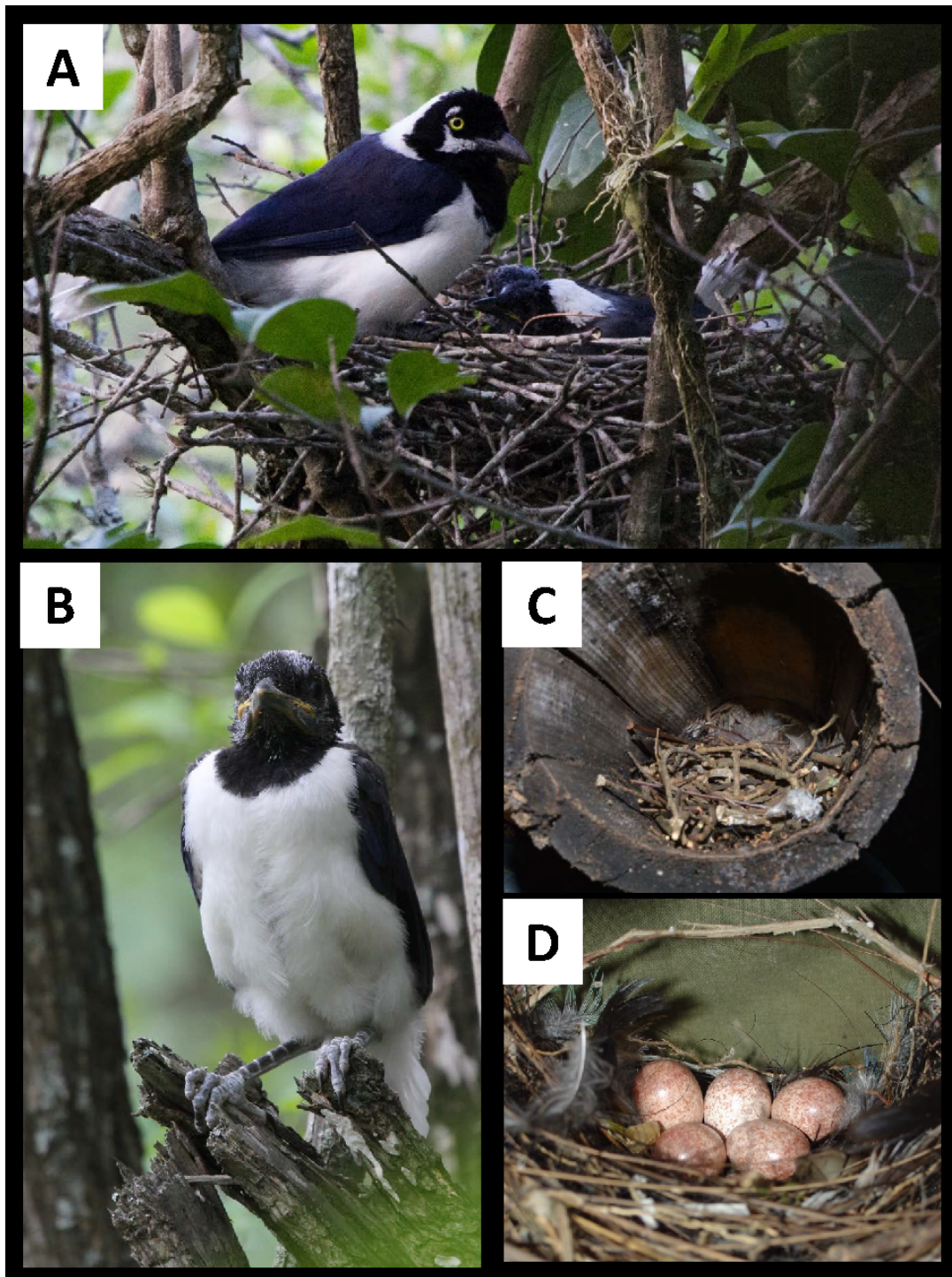


Figure 15: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult White-tailed Jay *Cyanocorax mystacalis* attending older nestlings, 7 March 2014, Jorupe (HFG); B) Fledgling *C. mystacalis*, 7 March 2014, Jorupe (HFG); C) Nest of House Wren *Troglodytes aedon*, 28 March 2014, Jorupe (LASM); D) Nest and complete clutch of *T. aedon*, 11 February 2004, Buenaventura (HFG).



Figure 16: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Nest of Bay Wren *Cantorchilus nigricapillus*, 24 February 2004, Buenaventura (HFG); B) Adult Fasciated Wren *Campylorhynchus fasciatus* outside its nest, 10 June 2009, Chignia Alta (FAP); C) Nest of *Campylorhynchus fasciatus*, 27 March 2014, Jorupe (LASM).

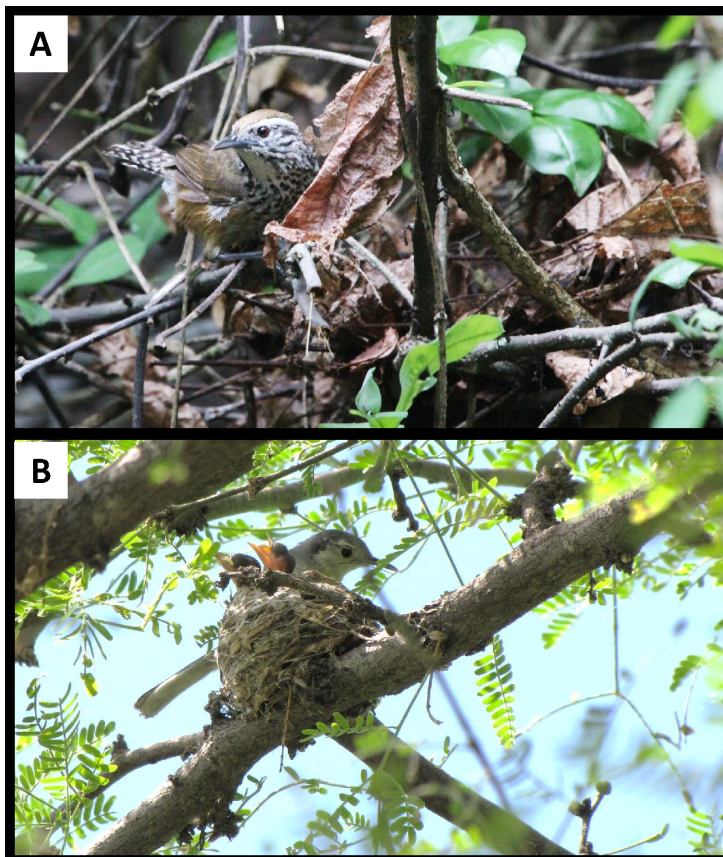


Figure 17: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult Speckle-breasted Wren *Pheugopedius sclateri* just beginning nest construction, 2 March 2014, Jorupe (HFG); B) Tropical Gnatcatcher *Polioptila plumbea* attending nest with young nestlings, 25 March 2009, Abra de Huacrupe (FAP).

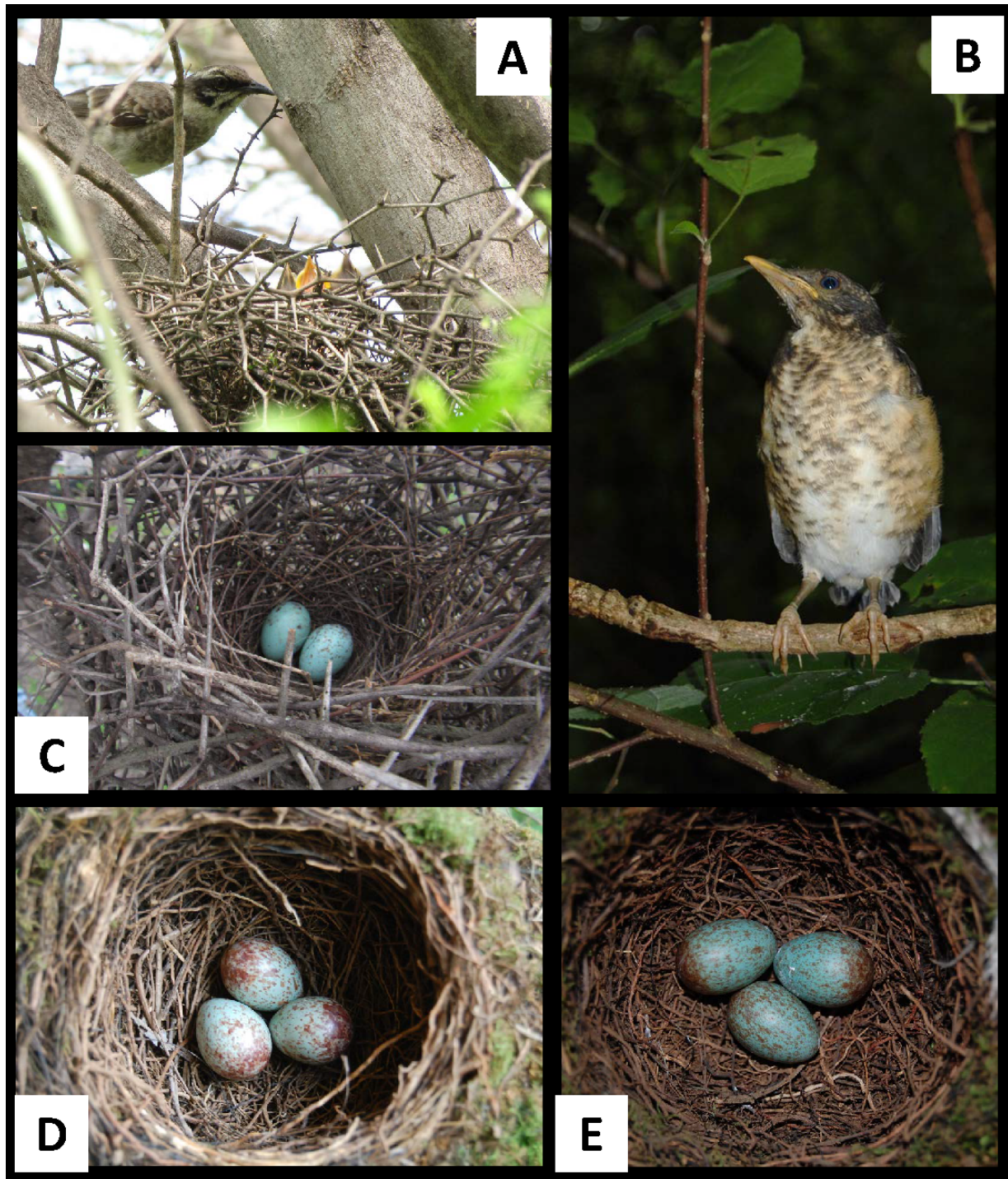


Figure 18: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult Long-tailed Mockingbird *Mimus longicaudatus* feeding nestlings, 25 March 2009, Abra de Huacrupe (FAP); B) Recently fledged young of Plumbeous-backed Thrush *Turdus reevei*, 21 February 2010, Jorupe (HFG); C) Nest and complete clutch of *M. longicaudatus*, 7 March 2014, Macará-Loja road (HFG); D) Complete clutch of *T. reevei*, 11 February 2010, Jorupe (HFG); E) Complete clutch of Ecuadorian Thrush *Turdus maculirostris*, 11 February 2010, Jorupe (HFG).

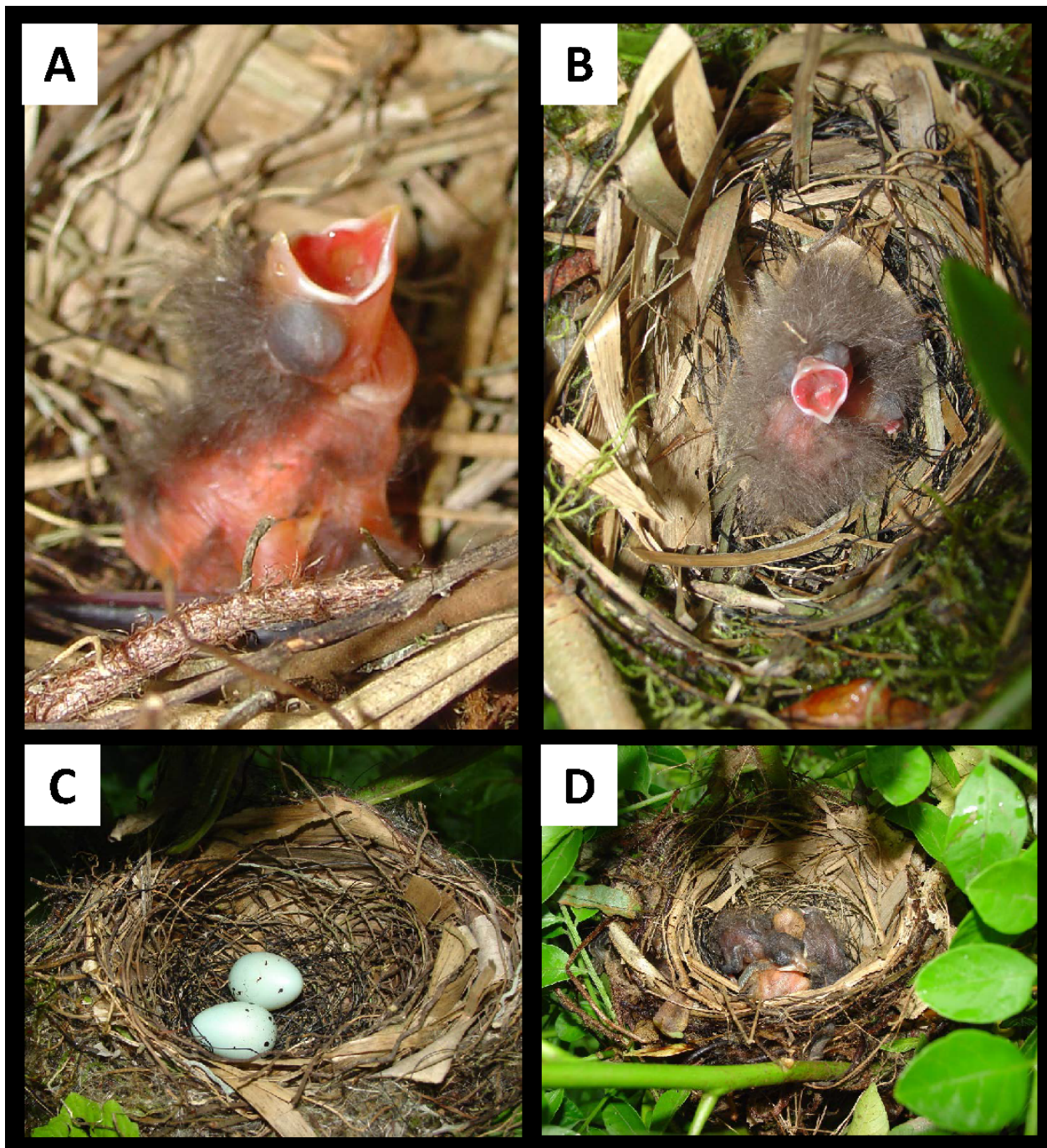


Figure 19: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Newly hatched young of Palm Tanager *Thraupis palmarum*, 11 February 2004, Buenaventura (HFG); B) Nest and two newly-hatched young of Blue-gray Tanager *Thraupis episcopus*, 7 February 2004, Buenaventura (HFG); C) Nest and complete clutch of Flame-rumped Tanager *Ramphocelus flammigerus*, 15 February 2004, Buenaventura (HFG); D) Nest of *R. flammigerus* containing two young tanager nestlings and one of Shiny Cowbird *Molothrus bonariensis*, 15 February 2004, Buenaventura (HFG).

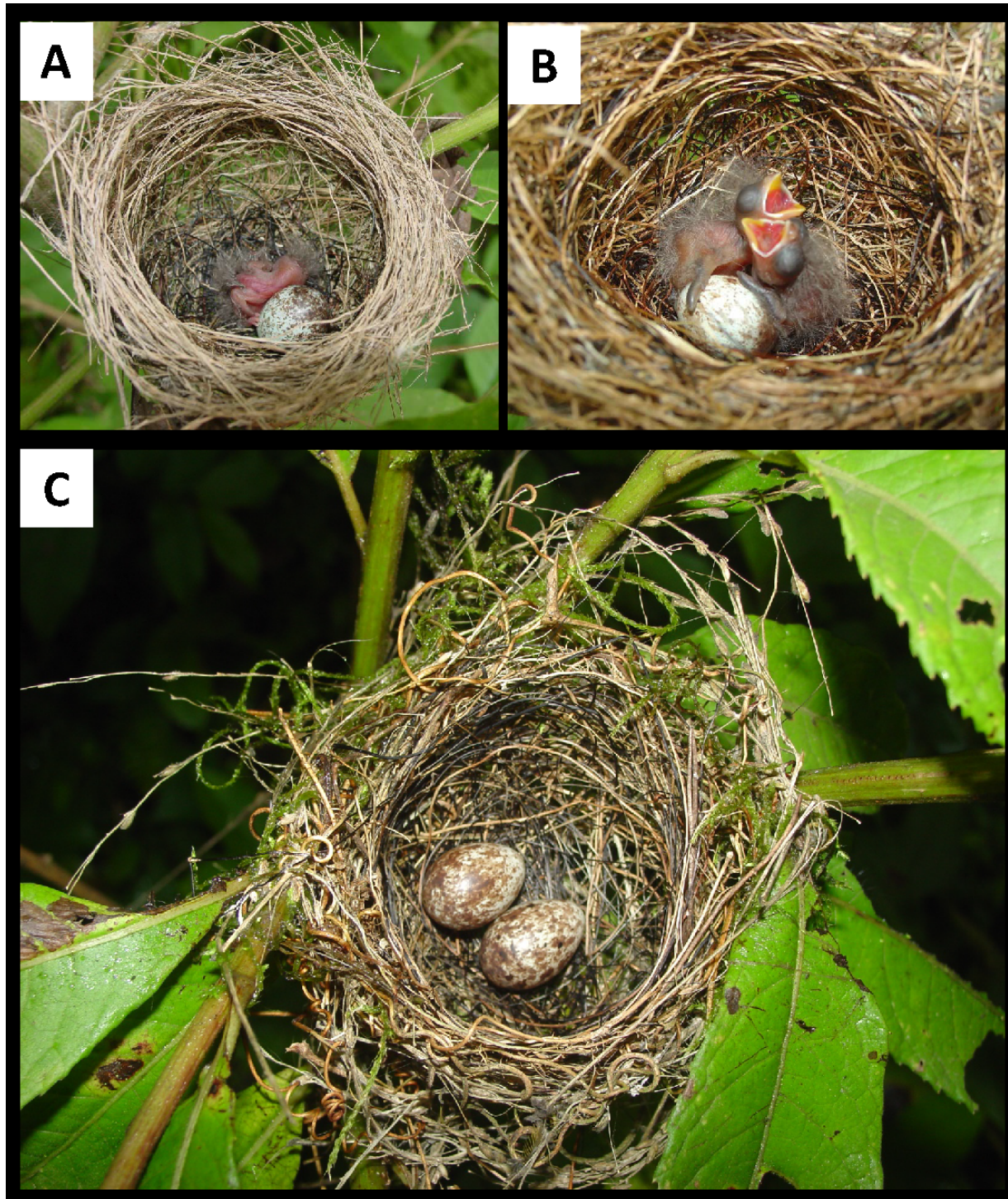


Figure 20: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Newly hatched nestling and unhatched egg of Yellow-bellied Seedeater *Sporophila nigricollis*, 23 March 2004, Buenaventura (HFG); B) Newly hatched nestlings and unhatched egg of Thick-billed Seed-Finch *Sporophila funerea*, 3 February 2004, Buenaventura (HFG); C) Nest and complete clutch of Variable Seedeater *Sporophila corvina*, 11 February 2004, Buenaventura (HFG).

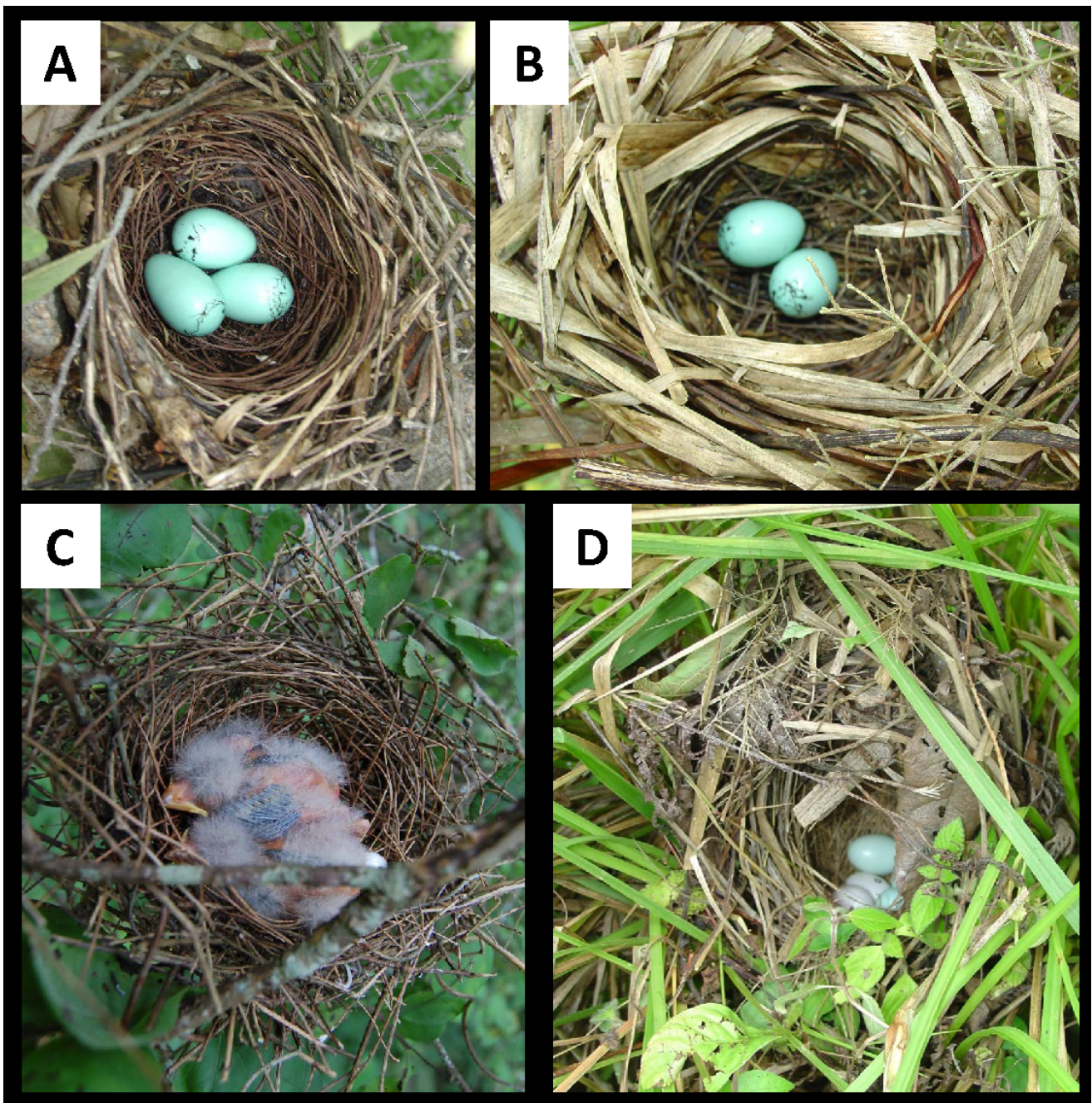


Figure 21: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Nest and complete clutch of Streaked Saltator *Saltator striatipectus*, 25 February 2006, Cerro Blanco (HFG); B) Nest and complete clutch of Buff-throated Saltator *Saltator maximus*, 7 February 2004, Buenaventura (HFG); C) Nest with two young nestlings of Golden Grosbeak *Pheucticus chrysogaster*, 18 February 2010, Jorupe (HFG); D) Nest of Black-striped Sparrow *Arremonops conirostris* containing four sparrow eggs and two eggs of Shiny Cowbird *Molothrus bonariensis*, 11 February 2004, Buenaventura (HFG).

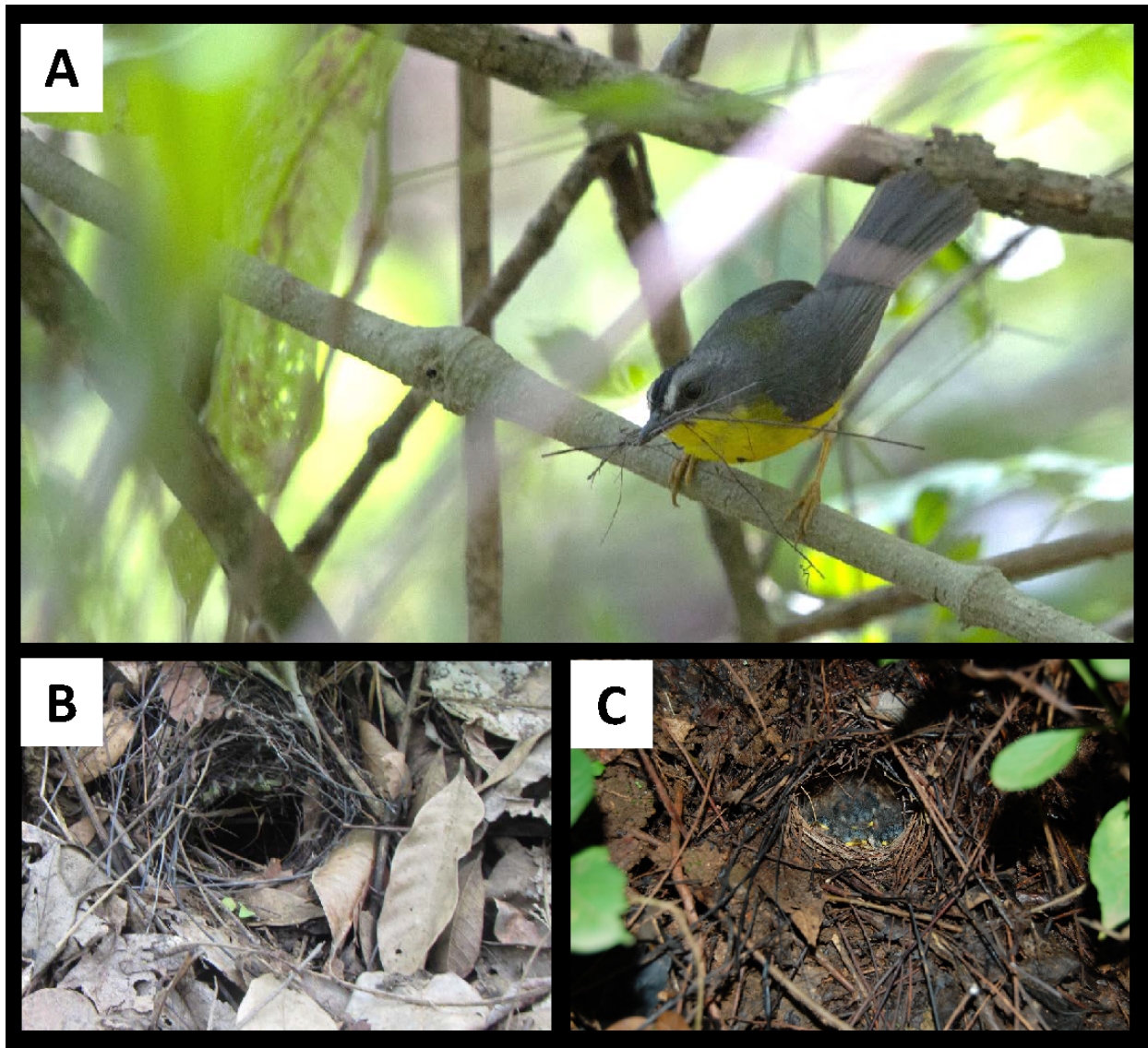


Figure 22: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A-B) Adult Gray-and-gold Warbler *Myiothlypis fraseri* carrying nesting material to nearly completed nest, 6 March 2014, Jorupe (HFG); Nest of *M. fraseri* with four mid-aged nestlings, 14 February 2010, Jorupe (HFG).

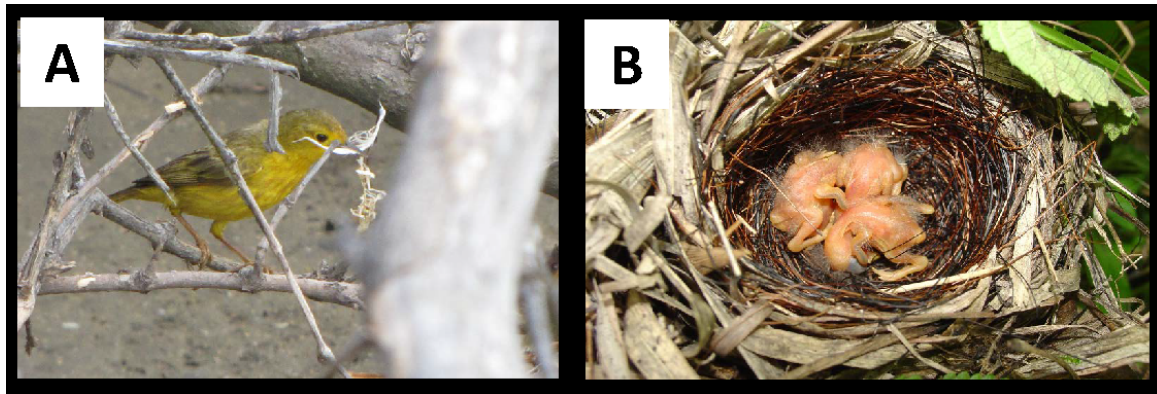


Figure 23: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Adult Yellow Warbler *Setophaga petechia* carrying nesting material, 29 February 2009, Manglares San Pedro de Vice (FAP); B) Nest with three newly-hatched nestlings of Masked Yellowthroat *Geothlypis aequinoctialis*, 18 March 2005, Yunguilla (HFG).

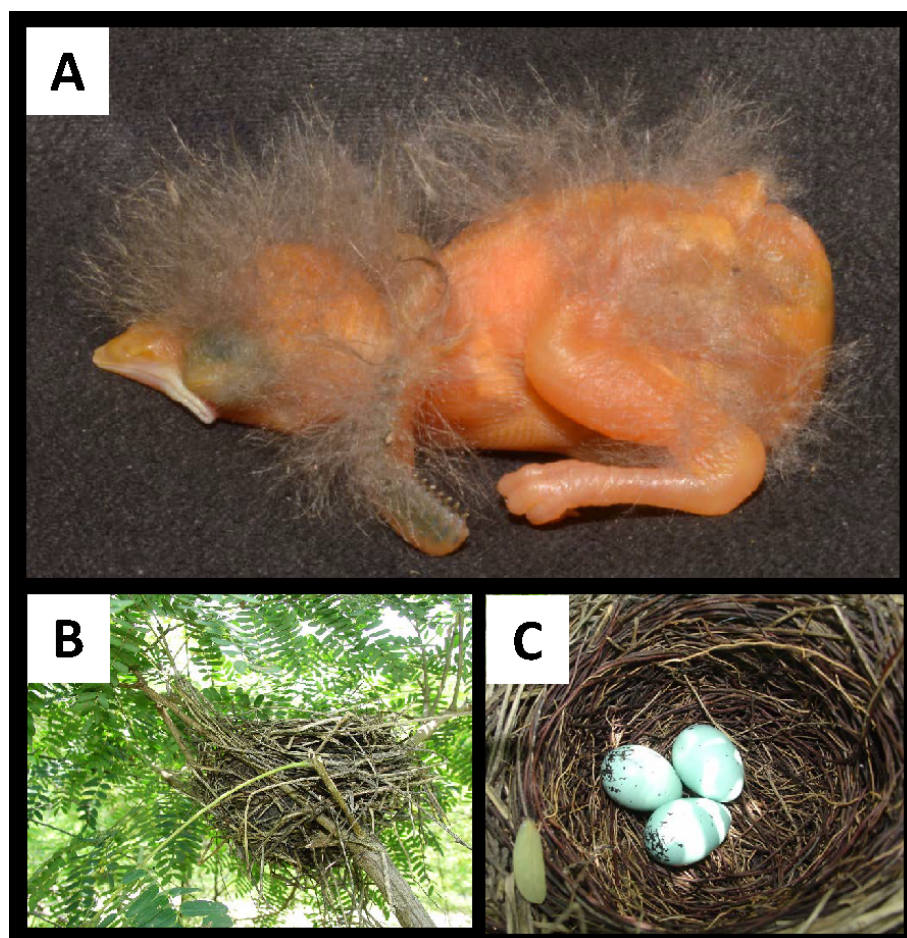


Figure 24: Nesting biology of birds of the Tumbesian Bioregion of Ecuador and Peru. For location details see Table 1. A) Recently-hatched nestling of Yellow-tailed Oriole *Icterus mesomelas*, 5 April 2014, Jorupe (LASM); B-C) Nest and completed clutch of Scrub Blackbird *Dives waczewiczi*, 28 February 2006, Jorupe (HFG).

Table 2: Summary of breeding observations for 197 species of birds in the Tumbesian region of southwest Ecuador and northwest Peru. See Table 1 for a list of locality abbreviations. In addition, we use the following abbreviations for reproductive activity: (B) building; (L) laying, clutch still being completed; (I) incubating; (N) nestlings; (F) fledglings; (J) juvenile; (AN) active nest at unknown stage; (CF) adult carrying food, but unknown if intended delivery was for a mate, nestlings, or fledglings; (CM) carrying nesting material but nest unseen.

English name Scientific name	Date	Breed. activ.	Locality	Observations
Pale-browed Tinamou <i>Crypturellus</i> <i>transfasciatus</i>	19 Apr 2006	J	EC3	immature individual with pink legs.
	18 Jun 2008	J	TTU6	
	25 Mar 2014	I	EC3	4 eggs (47 × 38 mm, 31.8 g; 46 × 36 mm, 29.8 g; 45 × 36 mm, 25.7 g; 46 × 35 mm, 28.2 g) (Fig. 1a).
	15 Apr 2009	F	TZA1	
	11 Feb 2010	I	EC3	5 eggs, last one laid 15 Feb (45.8 × 37.4 mm, 25.23 g; 45.4 × 38.0 mm, 36.49 g; 43.2 × 37.1 mm, 32.65 g; 44.5 × 37.7 mm, 34.16 g; 44.2 × 36.9 mm, 33.15 g) (Fig. 1b).
	5 Jul 2010	J	TTU4	
Fulvous-bellied Whistling-Duck <i>Dendrocygna</i> <i>bicolor</i>	6 Apr 2011	F	EC18	2 adults followed by 4 young ducklings.
Black-bellied Whistling-Duck <i>D.</i> <i>autumnalis</i>	16 Apr 2011	F	EC26	8 young, recently hatched, following adult, brood was attacked by an adult, biting they young.
	16 Apr 2011	F	EC26	7 young about half adult sized, following adult.
White-cheeked Pintail <i>Anas</i> <i>bahamensis</i>	5 Mar 2016	F	LCH2	many adults (c. 40), at least 30 older young on a small pond.
Chilean Flamingo <i>Phoenicopterus</i> <i>chilensis</i>	27 Jan 2016	J	PPI01	6 immature birds.
Least Grebe <i>Tachybaptus</i> <i>dominicus</i>	24 Feb 2006	F	EC1	4 fledglings following adults.
	22 May 2012	J	LLA8	at least 10 juveniles on a pond.
	16 Apr 2011	I	EC18	3 eggs.
	16 Apr 2011	I	EC18	3 eggs.
	16 Apr 2011	N	EC18	adult with recently hatched chick capable of swimming.
	16 Apr 2011	N	EC18	3 chicks, just hatched.
	16 Apr 2011	N	EC18	3 chicks in nest, maybe one day old.
	16 Apr 2011	F	EC18	adult with two young, estimated 1 week old.
	16 Apr 2011	F	EC18	adult with 2 young about half of adult size.
	16 Apr 2011	F	EC18	2 chicks, near adult size, following adult.
Pied-billed Grebe <i>Podilymbus</i> <i>podiceps</i>	16 Apr 2011	AN	EC18	adult sitting on floating nest, second adult nearby.
	16 Apr 2011	F	EC18	two young following adults.
	16 Apr 2011	F	EC18	adult followed by 2 chicks.
	24 Mar 2015	F	EC18	adult with 2 tiny, spotted young perched on its back.
White-tipped Dove <i>Leptotila verreauxi</i>	25 Feb 2006	N	EC1	2 eggs, one just hatched and other hatching.
	8 Jun 2009	L	PHU2	both eggs just starting development.
	8 Jun 2009	Copul.	PHU2	
	12 Feb 2010	I	EC3	2 buffy-white eggs 30.53 × 21.83 mm, 7.43 g and 28.04 × 21.18 mm, 6.57 g, hatched 21 Feb fledged 7 Mar.
	19 Feb 2010	I	EC3	2 buffy-white eggs 29.38 × 22.72 mm, 7.63 g and 28.98 × 23.13 mm, 7.95 g.
	27 Feb 2010	I	PAY2	1.6 m up in <i>Prosopis pallida</i> tree.
	17 Jan 2011	I	EC1	2 m up, 2 eggs.

	4 Apr 2014	I	EC3	4 m up, 2 eggs (Fig. 2d).
	30 Mar 2014	B	EC3	3 m up, 2 eggs laid between 30 Mar and 6 Apr.
	2 Apr 2014	I	EC3	20 m up.
	31 Mar 2006	N	EC6	
	1 Apr 2006	N	EC6	6 m up.
Pallid Dove <i>L. pallida</i>	8 Mar 2004	AN	EC2	
West Peruvian Dove <i>Zenaida meloda</i>	25 Mar 2009	I	LLA3	nest 3 m up (Fig. 2c).
	16 Dec 2015	N	TCO2	a fledgling on the ground being fed by an adult (ebird.org/view/checklist/S26327147).
	6 Nov 2015	I	LCH1	2 eggs, second laid 6 Nov.
	13 Mar 2016	I	LCH1	adult incubating.
	20 Mar 2016	F	LCH1	3 young in a tree in a city park.
	22 Jan 2017	I	TCO3	adult incubating (see https://ebird.org/view/checklist/S33872351).
	23 Aug 2017	C/I	LCH1	after copulating, one adult started incubation, suggesting the two eggs were recently laid (ebird.org/peru/view/checklist/S43808459)
Eared Dove <i>Z. auriculata</i>	29 Dec 2015	CM	LCH1	adult carrying nesting material in town.
Croaking Ground Dove <i>Columbina cruziana</i>	25 Mar 2009	I	LLA3	2 white eggs, 1 m up in <i>Cordia lutea</i> bush (Boraginaceae).
	27 May 2010	N	PMO3	adult regurgitating to fledgling.
	16 Apr 2011	N	EC18	nest built into the fruiting body of banana tree.
Groove-billed Ani <i>Crotophaga sulcirostris</i>	24 Feb 2006	B	EC1	copulations observed.
	24 Feb 2006	AN	EC1	
	21 Apr 2006	F	EC3	adult feeding fledgling a spider and its egg sac.
	1 Apr 2006	CF	EC6	adult carrying katydid towards grass, alarmed called but did not consume prey.
	4 Apr 2006	N	EC23	
Striped Cuckoo <i>Tapera naevia</i>	11 Mar 2009	I	EC17	parasitized Azara's Spinetail <i>Synallaxis azarae</i> .
Squirrel Cuckoo <i>Piaya cayana</i>	13 Apr 2006	F	EC3	adult feeding very young fledgling.
	1 Apr 2006	F	EC6	adult feeding fledgling.
Gray-capped Cuckoo <i>Coccyzus lansbergi</i>	13 Feb 2010	B	EC3	still empty on 17 Feb.
Common Potoo <i>Nyctibius griseus</i>	18 Dec 2010	I	LFE1	1 egg (30 × 24 mm).
Common Pauraque <i>Nyctidromus albicollis</i>	2 Feb 2004	I	EC2	1 egg (29.0 × 20.8 mm), adult incubating (Fig. 3a).
	24 Feb 2014	I	EC3	1 egg.
	18 Jan 2011	I	EC2	2 eggs.
	18 Jan 2011	N	EC2	2 large nestlings, almost able to fly short distances.
	5 Feb 2004	N	EC2	1 nestling.
	15 Feb 2004	I	EC2	1 egg (28.8 × 19.7 mm), male incubating.
	16 Feb 2004	I	EC2	1 egg (28.2 × 20.7 mm).
	23 Feb 2006	I	EC1	1 egg.
	12 Feb 2010	I	EC3	1 egg.
Scrub Nightjar <i>N. anthonyi</i>	16 Dec 2010	I	LFE1	adult incubating 1 egg, hatched 19 Dec.
White-tipped Sicklebill <i>Eutoxeres aquila</i>	1 Feb 2004	I	EC2	2 eggs.
	20 Mar 2004	F	EC2	fledgling fresh from the nest (Fig. 3b).
Gray-chinned Hermit <i>Phaethornis griseogularis</i>	1 Apr 2006	F	EC6	adult regurgitating for well-developed fledgling.

Rufous-tailed Hummingbird <i>Amazilia tzacatl</i>	21 Mar 2004	AN	EC2	3 m up, saddled over leaf petiole of unknown plant, well attached to stem and petiole with spider webs.
	18 Mar 2005	CM	EC17	adult carrying lichens.
Amazilia Hummingbird A. <i>amazilia</i>	10 Apr 2006	B	EC3	adult observed removing material from an abandoned <i>Pachyramphus</i> sp. nest.
	29 Mar 2014	B	EC3	3.5 m up saddled over a thin branch.
Purple Gallinule <i>Porphyrio martinica</i>	21 May 2012	F	LLA8	2 downy black chicks with an adult, walking on floating vegetation in a pond.
	16 Apr 2011	F	EC18	2 young with adult.
	16 Apr 2011	F	EC18	1 young with adult.
	16 Apr 2011	F	EC18	2 downy, black young with adult.
	16 Apr 2011	F	EC18	2 downy, black young with adult.
	16 Apr 2011	F	EC18	adult with two young, about half adult size.
	16 Apr 2011	F	EC18	adult with single, young juvenile.
White-throated Crake <i>Laterallus albigularis</i>	6 Apr 2011	B	EC18	see previous record.
	6 Apr 2011	N	EC18	at least 10 adults followed by young juveniles, many more followed by older young.
Rufous-necked Wood-Rail <i>Aramides axillaris</i>	9 Apr 2006	J	EC3	adult foraging with at least one juvenile.
	21 Apr 2006	J	EC3	flushed juvenile up into low branch, adult scolding nearby.
	12 Feb 2010	I	EC3	second egg laid 12 Feb, final (6th) egg laid 17 Feb (Fig. 2a), first hatch on 10 Mar, last on 11 or 12 Mar.
	18 Feb 2010	I	EC3	5.2 m up in tangle of branches, 6 eggs, eggs hatch 20-21 Feb (Fig. 2b).
	29 Feb 2010	B	EC3	found with 2 eggs, 6th (final) egg laid 6 Mar, 2.5 m up.
Common Gallinule <i>Gallinula galeata</i>	16 Apr 2011	F	EC18	2 adults bringing dead, brown grass or sedge leaves to a recently started nest, 15cm above wet ground, one adult followed by small chick with blackish down, at one point this chick climbed into new, on 16 Apr 2011 nest underwater and empty.
Wilson's Plover <i>Charadrius wilsonia</i>	6 Aug 2010	F	PSE1	
	21 Jan 2017	I	TZA2	adult incubating a single egg. We found a second egg, a few m away, possibly moved by rain water during the previous night. We placed the egg with that being incubated, and the adult immediately covered them both (see https://ebird.org/view/checklist/S33871390).
American Oystercatcher <i>Haematopus palliatus</i>	5 Mar 2016	F	LCH2	adult with two older young.
	18 Jan 2018	F	PTA2	2 different pairs, attending 1 and 2 fledglings each (ebird.org/view/checklist/S42044614).
Black-necked Stilt <i>Himantopus mexicanus</i>	24 Mar 2015	AN	EC18	nest composed of rotting vegetation, only a few cm above water.
Peruvian Thick-knee <i>Burhinus superciliaris</i>	23 Jan 2011	I	LFE1	2 eggs, hatched ca. 2 weeks later.
	18 Mar 2012	I	LFE1	2 eggs.
Wattled Jacana <i>Jacana jacana</i>	16 Apr 2011	N	EC18	2 young nestlings.
	16 Apr 2011	N	EC18	2 older nestlings.
	16 Apr 2011	N	EC18	1 older nestling.
	16 Apr 2011	N	EC18	1 young nestling.
	16 Apr 2011	M	EC18	1 newborn nestling.
Gray-hooded Gull <i>Chroicocephalus cirrocephalus</i>	12 Apr 2011	I	EC24	
	12 Apr 2011	AN	EC24	
	12 Apr 2011	AN	EC24	

	12 Apr 2011	AN	EC24	
	12 Apr 2011	AN	EC24	
Waved Albatross <i>Phoebastria irrorata</i>	15 Aug 2007	N	EC15	1 nestling about 2/3 adult size.
Magnificent Frigatebird <i>Fregata magnificens</i>	26 Jan 2016	N	TZA2	nest with one mid-aged nestling (Fig. 1d).
Black-crowned Night-Heron <i>Nycticorax nycticorax</i>	21 Jan 2017	N	TZA2	nesting colony, 30+ active nests (ebird.org/view/checklist/S34612250).
Striated Heron <i>Butorides striata</i>	29 Dec 2015	N	LCH1	many adults and at least 8 older juveniles seen, two recently dead young were found on the ground, one ca. 1 day old, one ca. 1 week old.
	13 Mar 2018	J	LCH1	several juveniles sitting along a water channel.
	22 May 2012	F	LLA8	3 fledglings seen along the margin of a pond.
	27 Feb 2006	I	EC25	2 eggs, 1 m above water level in flooded agricultural field (Fig. 1c).
Cattle Egret <i>Bubulcus ibis</i>	2 May 2017	I/N	LFE2	A nesting colony of four heron species (<i>Ardea alba</i> , <i>Egretta thula</i> , <i>E. caerulea</i> and <i>Bubulcus ibis</i>). There were multiple nests of this species with nestlings and adults incubating.
Great Egret <i>Ardea alba</i>	11 Feb 2017	C	LFE2	copula (ebird.org/view/checklist/S34325381).
	2 May 2017	I/N	LFE2	A nesting colony of four heron species (<i>Ardea alba</i> , <i>Egretta thula</i> , <i>E. caerulea</i> and <i>Bubulcus ibis</i>). There were multiple nests of this species with nestlings and adults incubating.
Snowy Egret <i>Egretta thula</i>	2 May 2007	I/N	LFE2	A nesting colony of four heron species (<i>Ardea alba</i> , <i>Egretta thula</i> , <i>E. caerulea</i> and <i>Bubulcus ibis</i>). There were multiple nests of this species with nestlings and adults incubating.
Little Blue Heron <i>E. caerulea</i>	2 May 2017	I/N	LFE2	A nesting colony of four heron species (<i>Ardea alba</i> , <i>Egretta thula</i> , <i>E. caerulea</i> and <i>Bubulcus ibis</i>). There were multiple nests of this species with nestlings and adults incubating.
Andean Condor <i>Vultur gryphus</i>	25 Mar 2009	J	LLA3	
	5 Jul 2010	J	TTU2	
Swallow-tailed Kite <i>Elanoides forficatus</i>	6 Feb 2004	CM	EC2	adult carrying stick.
Ornate Hawk-Eagle <i>Spizaetus ornatus</i>	19 May 2009	J	TZA1	
Snail Kite <i>Rostrhamus sociabilis</i>	16 Apr 2011	N	EC18	single young near fledging.
	27 Feb 2006	CM	EC25	adult carrying long stick.
Bicolored Hawk <i>Accipiter bicolor</i>	15 May 2009	F	TTU1	fledglings making loud begging calls.
	14 Feb 2011	F	LFE1	two juveniles, recently from the nest, tame.
Savanna Hawk <i>Buteogallus meridionalis</i>	11 Apr 2006	N	EC3	adults feeding single, mid-aged nestling snakes and lizards.
	1 Mar 2009	AN	PSE3	copulations observed.
	24 Apr 2009	N	PMO3	c. 1-week-old nestling brought to town by local resident.
	16 Jun 2009	J	PMO9	
	4 Jul 2009	J	PAY3	
	Aug 2009	J	PMO3	young recently from the nest.
	Oct 2009	J	PMO3	young recently from the nest.
	Sep 2009	J	PMO3	young recently from the nest.
	5 Apr 2014	CM	EC2	adult carry nest material in talons
Great Black Hawk <i>B. urubitinga</i>	12 Nov 2015	F	EC2	nest c. 15 m up in isolated pasture tree, fledgling arrived from another tree and received one small prey from an adult, consuming it while perched in nest.
	12 Apr 2006	AN	EC3	

Harris's Hawk <i>Parabuteo unicinctus</i>	11 Dec 2007	J	EC3	adult with juvenile, fully feathered, flying well.
Black-chested Buzzard-Eagle <i>Geranoaetus melanoleucus</i>	24 Feb 2009	J	PSE1	
	25 Feb 2009	J	LLA3	
	22 Jun 2009	J	LLA5	
	9 Mar 2009	F	EC17	recently fledged juvenile soaring in front of white-washed nest on rock ledge.
Gray-lined Hawk <i>Buteo nitidus</i>	18 May 2009	J	TZA1	
Peruvian Pygmy-Owl <i>Glaucidium peruanum</i>	27 Feb 2006	N	EC4	
	23 Apr 2006	AN	EC3	nest in hollowed-out Pale-legged Hornero <i>Furnarius leucopus</i> nest.
Burrowing Owl <i>Athene cunicularia</i>	22 Dec 2010	AN	LFE1	2 adults observed attending the nest for several days.
	5 Mar 2016	N	LCH2	2 older nestlings.
Ecuadorian Trogon <i>Trogon mesurus</i>	17 Feb 2010	AN	EC3	female flushed from hole 6.8 m up in giant rotting <i>Ceiba</i> stump, 8.5 m tall.
	1 Mar 2014	AN	EC3	male flushed at 1530 from hole in giant <i>Ceiba</i> stump, 8 m up.
	6 Mar 2014	AN	EC3	5.5 m up in termitaria (Fig. 4b).
	6 Mar 2014	B	EC3	5 m up in termitarium, excavation just beginning.
	6 Mar 2014	B	EC3	6.5 m up in termitarium.
Whooping Motmot <i>Momotus subrufescens</i>	13 Apr 2006	B	EC3	excavating.
	14 Apr 2006	B	EC3	excavating.
	15 Apr 2006	AN	EC3	
	16 Apr 2006	B	EC3	excavating.
	18 Apr 2006	B	EC3	excavating.
	28 Apr 2006	I	EC3	excavating.
	12 Feb 2010	N	EC3	
	14 Feb 2010	N	EC3	4 mid-aged nestlings.
	17 Feb 2010	N	EC3	2 m up in road cut, 30 cm from top.
	21 Feb 2010	N	EC3	at least 2 nestlings, wing pin feathers emerging sheaths.
	7 Mar 2014	N	EC3	adult feeding nestlings (Fig. 4a).
	28 Feb 2010	J	PAY2	
Collared Araçari <i>Pteroglossus torquatus</i>	2 Mar 2004	N	EC2	
Ecuadorian Piculet <i>Picumnus sclateri</i>	8 Apr 2006	B	EC3	still excavating, 4 m up in dead trunk 30 cm from top, trunk c. 20 cm in diameter at nest.
Black-cheeked Woodpecker <i>Melanerpes pucherani</i>	3 Feb 2004	N	EC2	2 adults feeding at least one nestling from outside hole at 07h15, 12 m up in dead vertical branch of <i>Ochroma</i> tree.
Scarlet-backed Woodpecker <i>Veniliornis callonotus</i>	21 Dec 2010	I	LFE1	3 eggs.
	10 Jan 2011	N	LFE1	1 nestling, 2 eggs.
	10 Jan 2011	N	LFE1	2 nestlings.
	11 Jan 2011	I	LFE1	2 eggs.
Golden-olive Woodpecker <i>Colaptes rubiginosus</i>	10 Apr 2006	AN	EC3	male came in and fed female on nest, female stayed, presumably incubating, 5.5 m up in 30 cm diameter dead, 7.5 m-tall overall trunk.
	15 Mar 2005	N	EC17	2 nestlings, 2 m up in dead trunk out in field, nestlings 20 cm below opening, opening 10 cm wide by 8 cm tall.
	21 Dec 2010	B	LFE1	adult male excavating.

	16 Jan 2011	I	LFE1	1 adult sitting long periods in nest, possibly incubating.
	2 Jan 2016	B	LFE1	adults excavating (Fig. 4c).
Crested Caracara	28 Feb 2009	CM	PSE4	adult carrying material.
<i>Caracara cheriway</i>	6 Mar 2009	J	PAY3	juvenile accompanied by an adult.
	5 Mar 2011	N	PSE5	at least one older nestling.
Bat Falcon <i>Falco rufigularis</i>	10 Mar 2010	J	PMO8	fledgling, perched 12 m up in <i>Ceiba trichistandra</i> tree, begging and being fed by adults.
	26 Feb 2014	AN	EC3	12 m up in giant <i>Ceiba</i> stump.
Canary-winged Parakeet <i>Brotogeris versicolurus</i>	21 Jan 2015	AN	EC19	adult entering termite nest, c. 2.5 m up, second adult singing 5 m away.
Gray-cheeked Parakeet	10 Aug 2008	AN	TTU5	
<i>B. pyrrhoptera</i>	16 Dec 2009	J	PSU1	
	28 Jun 2010	AN	TTU6	
	27 Feb 2014	AN	EC3	5 m up in termitarium (Fig. 5b).
	28 Feb 2014	AN	EC3	6.5 m up in termitarium (Fig. 5a).
	27 Feb 2014	AN	EC3	12 m up in natural hole in <i>Ceiba</i> tree (Fig. 5c).
	27 Feb 2014	AN	EC3	16 m up in natural hole in <i>Ceiba</i> .
Rose-faced Parrot <i>Pyrilia pulchra</i>	25 Feb 2014	F	EC2	adults feeding begging fledgling.
Pacific Parrotlet <i>Forpus coelestis</i>	24 Feb 2006	B	EC1	adult excavating.
	9 Jun 2009	J	PHU2	
	Late-Dec 2010	AN	LFE1	2 adults entering and exiting abandoned woodpecker hole.
	Mid-Jan 2011	AN	LFE1	2 adults entering and exiting abandoned woodpecker hole.
	16 Apr 2011	N	E18	inside an inclined <i>Guadua</i> bamboo pole, entrance 1.6 m above ground.
Red-masked Parakeet <i>Psittacara erythrogaena</i>	22 Jun 2005	J	PHU3	2 fledglings taken from the nest by local residents.
	14 Jun 2009	J	PMO9	
Great Antshrike <i>Taraba major</i>	16 Apr 2006	J	EC3	not fully independent juvenile foraging independently near adults.
	30 Apr 2006	J	EC3	not fully independent juvenile foraging alone in underbrush.
	13 Feb 2010	N	EC3	
Collared Antshrike <i>Thamnophilus bernardi</i>	18 Apr 2006	CF	EC3	adult carrying food, alarm calling in response to observer presence, active nest suspected, possibly fledgling.
	10 Feb 2010	CM	EC3	male and female carrying leaves and thin fibers.
	17 Feb 2010	B	EC3	
	6 Mar 2014	B	EC3	male fed female as she carried material to a nearly completed nest, 1.6 m up.
	2 Mar 2014	B	EC3	nest nearly complete (Fig. 6b).
	25 Feb 2010	B	EC3	nest nearly complete.
	6 Mar 2010	I	EC3	3 eggs.
Black-crowned Antshrike <i>T. atrinucha</i>	4 Feb 2004	I	EC2	2 eggs (Fig. 6c).
	15 Feb 2004	B	EC2	construction just beginning.
	22 Feb 2004	B	EC2	adult with nesting material.
Uniform Antshrike <i>T. unicolor</i>	23 Feb 2000	N	EC14	2 adults at nest with 2 nestlings (pin feathers broken 2 mm). Nest open cup of small vines, moss; c. 2 m up in sapling.
Plain Antvireo <i>Dysithamnus mentalis</i>	10 Feb 2010	I	EC3	2 eggs.
	19 Feb 2010	B	EC3	2 eggs eventually (Fig. 6a).

Chestnut-backed Antbird <i>Poliocrania exsul</i>	13 Feb 2004	N	EC2	1 nestling.
Chestnut-crowned Antpitta <i>Grallaria ruficapilla</i>	1 Mar 2005	I	EC17	2 eggs, date and nest measurements in Greeney (2018).
Watkins's Antpitta <i>G. watkinsi</i>	6 Mar 2014	B	EC3	see text.
	4 Apr 2014	N	EC3	see text.
Coastal Miner <i>Geositta peruviana</i>	24 Jan 2011	N	LFE1	at least 2 nestlings and one adult delivering food, behavior two weeks earlier suggested incubation.
Olivaceous Woodcreeper <i>Sittasomus griseicapillus</i>	23 Apr 2006	F	EC3	juvenile foraging with adults, occasionally being fed.
Wedge-billed Woodcreeper <i>Glyphorynchus spirurus</i>	1 Mar 2004	F	EC2	fledgling following adults.
Red-billed Scythebill <i>Campylorhamphus trochilirostris</i>	25 Feb 2006	CM	EC1	Adult carrying material (bark strip).
	13 Feb 2010	I	EC3	
	15 Feb 2010	N	EC3	
Streak-headed Woodcreeper <i>Lepidocolaptes souleyetii</i>	31 Jan 2004	I	EC2	
	14 Feb 2004	B	EC2	
	24 Feb 2006	B	EC1	both sexes carrying bark strips into gap cabin wall, 3 m up.
	11 Apr 2006	F	EC3	at least one fledgling being fed.
	12 Feb 2010	B	EC3	
	21 Dec 2010	AN	LFE1	inside abandoned <i>F. leucopus</i> nest.
	18 Mar 2012	N	LFE1	three nestlings.
	25 Mar 2014	B	EC3	4.8 m up in natural cavity formed by overlapping <i>Ficus</i> roots.
	2 Apr 2014	B	EC3	0.6 m up in natural cavity in living <i>Ceiba</i> tree (Fig. 7a).
Plain Xenops <i>Xenops minutus</i>	7 Feb 2004	F	EC2	adults feeding fledgling.
Pale-legged Hornero <i>Furnarius leucopus</i>	2 Feb 2004	B	EC2	
	5 Feb 2004	B	EC2	9 m up, both adults building.
	4 Dec 2003	N	EC6	
	30 Mar 2006	AN	EC6	adult flushed from nest.
	30 Mar 2006	I	EC6	nest 4.5 m up in <i>Acacia</i> .
	3 Apr 2006	CM	EC6	adult carrying mud.
	24 Feb 2006	N	EC1	
	24 Feb 2006	B	EC1	
	25 Feb 2006	I	EC1	
	27 Feb 2006	CM	EC4	adult carrying material (straw).
	27 Feb 2006	I	EC4	
	8 Apr 2006	B	EC3	2 adults building with mud mixed with small fibers, 3 m up.
	10 Apr 2006	B	EC3	
	11 Apr 2006	AN	EC3	5.5 m up in thorny tree.
	11 Apr 2006	N	EC3	2 nestlings, 3.5 m up in spiny tree.
	14 Apr 2006	AN	EC3	adult sitting long periods, presumed incubation or early nestling.
	11 Feb 2010	B	EC3	dome complete, entrance not well formed, 8 m up.

	11 Feb 2010	AN	EC3	
	11 Feb 2010	B	EC3	
	13 Feb 2010	B	EC3	2 adults building, just a cup so far, 5.5 m up in spiny tree.
	18 Feb 2010	N	EC3	2 adults bringing food, 18 m up in 30 m-tall <i>Ceiba</i> sp.
	21 Feb 2010	N	EC3	3 nestlings ready to fledge, 3.6 m up.
	11 Jan 2011	B	LFE1	
	11 Feb 2010	AN	EC3	building, 5.5 m up over road (Fig. 7c).
	11 Feb 2010	B	EC3	6 m up near road.
Buff-fronted	18 Mar 2004	N	EC2	
Foliage-gleaner				
<i>Philydor rufum</i>				
Rufous-necked	17 Feb 2010	AN	EC3	adult arrives with material; remains inside for long periods, presumed incubation (Fig. 7e).
Foliage-gleaner				
<i>Syndactyla ruficollis</i>	5 Mar 2010	AN	EC3	Fig. 7d.
Henna-hooded	8 Apr 2006	AN	EC3	for the following records of this species, those marked with *** had the details (but not date) published previously (Miller <i>et al.</i> 2012).
Foliage-gleaner				
<i>Clibanornis erythrocephalus</i>	8 Apr 2006	B	EC3	***
	8 Apr 2006	B	EC3	***
	8 Apr 2006	AN	EC3	***
	9 Apr 2006	AN	EC3	***
	16 Apr 2006	I	EC3	***
	20 Apr 2006	AN	EC3	***
	21 Apr 2006	AN	EC3	***
	22 Apr 2006	AN	EC3	***
	18 Jan 2008	AN	TTU6	adult entering cavity.
	10 Feb 2010	I	EC3	***
	10 Feb 2010	AN	EC3	***
	10 Feb 2010	AN	EC3	***
	13 Feb 2010	B	EC3	***
	13 Feb 2010	AN	EC3	***
	13 Feb 2010	AN	EC3	***
	13 Feb 2010	AN	EC3	***
	14 Feb 2010	B	EC3	***
	14 Feb 2010	B	EC3	***
	15 Feb 2010	AN	EC3	***
	20 Feb 2010	AN	EC3	***
	1 Mar 2014	AN	EC3	1.7 m up in 2 m bank, under 35 cm overhang, oriented 65°. Brood depredated by <i>DryMaron</i> sp. snake (Colubridae).
	1 Mar 2014	N	EC3	2.5 m up in 2.8 m bank roadside, under 20 cm overhang, oriented 120°.
	2 Mar 2014	I	EC3	1.8 m up in 2.4 m bank, under 45 cm overhang, oriented 140°.
	3 Mar 2014	AN	EC3	1.4 m up in 1.6 m bank, under 40 cm overhang.
	4 Mar 2014	AN	EC3	1.4 m up in 1.6 m bank, under 20 cm overhang.
	7 Mar 2014	AN	EC3	1.6 m up in 1.9 m bank, under 30 cm overhang (Fig. 8).
	1 Mar 2014	AN	EC3	5.2 m up on 5.3 m bank, under 25 cm overhang.
Line-cheeked	23 Feb 2000	AN	EC14	see text.
Spinetail	11 Apr 2006	CF	EC5	see text.
<i>Cranioleuca antisiensis</i>	12 Feb 2007	AN	EC20	see text.
	17 Mar 2005	I	EC17	see text.

	12 Mar 2009	I	EC17	see text.
Necklaced Spinetail	24 Mar 2009	AN	LLA4	Fig. 9b.
<i>Synallaxis stictothorax</i>	21 Dec 2010	B	LFE1	3 adults bringing material to nest.
Slaty Spinetail <i>S. brachyura</i>	7 Feb 2004	I	EC2	60 cm up, 3 fresh eggs: 20.8 × 16.1, 22.3 × 16.8, 22.1 × 16.2.
Azara's Spinetail <i>S. azarae</i>	17 Apr 2006	J	EC5	adults with at least one fledgling.
	17 Apr 2006	J	EC5	adults with at least one fledgling.
	17 Apr 2006	J	EC5	adults with at least one fledgling.
	11 Mar 2005	Laying	EC17	nest 1.7 m up, 1 very fresh, immaculate white egg (18.8 x 15.5 mm, 2.48 g), suspected incomplete clutch.
	18 Mar 2005	Laying	EC17	nest 1.1 m up, 1 very fresh, immaculate white egg (22.1 x 16.8 mm), suspected incomplete clutch.
	17 Mar 2005	CM	EC17	nest 2.1 m up, empty, adults nearby carrying sticks.
	4 Mar 2009	I	EC17	nest 1.9 m up, 1 egg, adult flushed, do not know if clutch complete.
Blackish-headed Spinetail <i>S. tithys</i>	9 Apr 2006	I	EC3	1.5 m up in thick tangle of <i>Barnadesia</i> sp. (Asteraceae), very spiny around nest, 5 eggs.
	12 Apr 2006	CM	EC3	adult traveling through understory carrying a long stick.
	24 Apr 2006	F	EC3	older fledgling foraging with adults.
	11 Feb 2010	B	EC3	nest ball forming, but no entrance tunnel formed.
	13 Feb 2010	AN	EC3	
	13 Feb 2010	AN	EC3	
	10 Mar 2010	F	PHU1	
	10 Mar 2010	CM	PHU1	adult carrying small stick.
	10 Mar 2010	N	PHU1	adults entering nests with food.
	28 Feb 2014	B	EC3	5 m up in tangle of vines and branches in 7 m tall tree, adults adding material to all portions, looks complete (Fig. 9a).
Sooty-headed Tyrannulet <i>Phyllomyias griseiceps</i>	9 Feb 2004	N	EC2	at least two young nestlings, 6 m up in horizontal fork with lots of moss.
	14 Feb 2004	B	EC2	
Pacific Elaenia <i>Myiopagis subplacens</i>	9 Apr 2006	B	EC3	
	12 Apr 2006	B	EC3	
Yellow-bellied Elaenia <i>Elaenia flavogaster</i>	2 Feb 2004	B	EC2	
	29 Feb 2004	CM	EC2	adult carrying moss.
	16 Dec 2013	B	EC21	adult moving nesting materials from an old nest to a new one.
Southern Beardless-Tyrannulet <i>Camptostoma obsoletum</i>	24 Feb 2006	B	EC1	
	24 Feb 2006	I	EC1	
	25 Feb 2006	B	EC1	
	25 Feb 2006	I	EC1	
	28 Feb 2009	CM	PSE3	adult carrying material.
	15 May 2009	F	TTU1	
	13 Feb 2010	AN	EC3	Fig. 10a.
White-banded Tyrannulet	29 Apr 2006	F	EC5	adult followed by two fledglings.

<i>Mecocerculus stictopterus</i>					
Yellow Tyrannulet	18 Feb 2004	B	EC2		adult carrying material.
<i>Capsiempis flaveola</i>					
Tawny-crowned Pygmy-Tyrant	26 Dec 2010	B	LFE1		nest nearly complete.
<i>Euscarthmus meloryphus</i>					
Gray-and-white Tyrannulet	24 Mar 2009	I	LLA3		
	24 Mar 2009	N	LLA3		
<i>Pseudelaenia leucospodia</i>					
Olive-striped Flycatcher	1 Feb 2004	I	EC2		
	2 Feb 2004	N	EC2		
<i>Mionectes olivaceus</i>					
Ochre-bellied Flycatcher <i>M. oleagineus</i>	31 Jan 2004	I	EC2		
	31 Jan 2004	N	EC2		Fig. 10c.
	1 Feb 2004	N	EC2		
	1 Feb 2004	N	EC2		
Slaty-capped Flycatcher	17 Mar 2004	B	EC2		construction just beginning.
<i>Leptopogon superciliaris</i>					
Rufous-crowned Tody-Flycatcher	26 Feb 2009	I	EC17		2 eggs, 1.9 m up, hanging from drooping tip of <i>Chusquea</i> bamboo shoot.
<i>Poecilatriccus ruficeps</i>					
Common Tody-Flycatcher	2 Feb 2004	B	EC2		
	10 Feb 2004	B	EC2		
<i>Todirostrum cinereum</i>	13 Feb 2010	B	EC3		5 m up, at least one adult building, other nearby, no wasp nest nearby.
<i>Yellow-olive Flatbill Tolmomyias sulphureus</i>	24 Feb 2006	I	EC1		3 m up, 1.2 m from active wasp nest (Vespidae) (Fig. 10d), 3 eggs (23.0 × 9.4, 22.0 × 9.1, 21.9 × 9.4 mm).
	7 Apr 2006	N	EC3		3.5 m up, fledged at least two nestlings on 9 Apr.
	12 Apr 2006	B	EC3		15 m up in lower, outer branches of a large <i>Ceiba</i> tree, 1.5 m from active wasp nest (Vespidae).
	14 Apr 2006	F	EC3		fledgling following adults.
	14 Apr 2006	F	EC3		fledgling following adults.
	14 Apr 2006	N	EC3		two adults bringing food into nest.
	16 Apr 2006	F	EC3		fledgling following adults.
	11 Feb 2010	B	EC3		construction just beginning.
	13 Feb 2010	AN	EC3		20 m up in 35 m <i>Ceiba</i> tree, 2.5 m from active wasp nest (Vespidae).
	13 Feb 2010	AN	EC3		
	14 Feb 2010	N	EC3		5 m up, 30 cm from active wasp nest (Vespidae), both adults bringing food at 09h45.
	15 Feb 2010	N	EC3		10 m up, 2 m from active wasp nest (Vespidae).
	17 Feb 2010	AN	EC3		14 m up, 30 cm from wasp nest (Vespidae).
	17 Feb 2010	N	EC3		
	19 Feb 2010	AN	EC3		26 m up in 35 m <i>Ceiba</i> tree, 60 cm from active wasp nest (Vespidae).

	1 Mar 2010	N	EC3	7.5 m up.
	8 Mar 2010	N	EC3	10 m up over dry stream bed.
	26 Feb 2014	AN	EC3	5 m up, 70 cm from inactive wasp nest (Vespidae).
	26 Feb 2014	B	EC3	ca. 35 m up in crown of <i>Ceiba</i> tree, 30 cm from active wasp nest (Vespidae).
	26 Feb 2014	AN	EC3	over stream inside forest, 9 m up tip of a branch.
	1 Mar 2014	B	EC3	4 m up, 30 cm from active wasp nest (Vespidae).
	3 Mar 2014	B	EC3	adult gathering dark fibers from below a branch 6 m above ground.
	4 Mar 2014	AN	EC3	2.6 m, old nest nearby, no wasp nest.
	4 Mar 2014	AN	EC3	8 m up at tip of a vine, no wasp nest, inside forest, near a stream.
	6 Mar 2014	AN	EC3	40 cm from wasp nest (Vespidae), 7 m up inside forest.
	6 Mar 2014	B	EC3	adult gathering long dark fibers and flying to nest 25 m up in 30 m <i>Ceiba</i> tree, 1 m from wasp nest (Vespidae), ca. half finished.
	31 Mar 2014	B	EC3	10 m up.
White-throated Spadebill <i>Platyrinchus mystaceus</i>	1 Feb 2004	I	EC2	Figs. 11a, 11c.
Bran-colored Flycatcher <i>Myiophobus fasciatus</i>	17 Mar 2004	B	EC2	gathering rootlets and flying over hill at least 25 m.
	27 Feb 2006	I	EC4	
	11 Feb 2010	I	EC3	
	11 Feb 2010	I	EC3	
	16 Feb 2010	I	EC3	Fig. 11d.
	7 Mar 2014	B	EC3	1.9 m up at tip of drooping branch.
Sulphur-rumped Flycatcher <i>Myiobius barbatus</i>	30 Jan 2004	N	EC2	
	31 Jan 2004	I	EC2	Fig. 10b.
Tropical Pewee <i>Contopus cinereus</i>	12 Mar 2005	I	EC17	2 eggs.
	1 Apr 2010	B	PHU5	
	18 Dec 2013	B	EC21	nest in a large horizontal forking of thick branches, 27 m up in 29 m tree.
Black Phoebe <i>Sayornis nigricans</i>	30 Mar 2006	B	EC6	2 m up, about half way done, on ledge under a bridge.
	30 Mar 2006	I	EC6	2 eggs, one infertile, 1.4 m up on natural cliff-face.
Vermilion Flycatcher <i>Pyrocephalus rubinus</i>	24 Jan 2011	F	LFE1	2 fledglings following adults.
	23 Feb 2011	N	PMO3	2 nestlings.
	13 Mar 2012	N	LFE1	2 m up in <i>Prosopis</i> tree, three nestlings, nest composed largely of pale fibers.
Masked Water-Tyrant <i>Fluvicola nengeta</i>	16 Apr 2011	AN	EC18	2 adults entering and exiting a nest 1.6 m over water.
Social Flycatcher <i>Myiozetetes similis</i>	31 Jan 2004	I	EC2	
	3 Feb 2004	I	EC2	
	5 Feb 2004	B	EC2	6 m up in a bromeliad clump, nest ball forming.
	8 Feb 2004	AN	EC2	3.5 m up in an isolated <i>Citrus</i> tree.

Baird's Flycatcher <i>Myiodynastes bairdii</i>	13 Mar 2012	N	LLA7	nest in a hole in a rock wall, both adults bring food (including lepidopteran larvae).
Streaked Flycatcher <i>M. maculatus</i>	8 Apr 2006	F	EC3	
	14 Apr 2006	F	EC3	
	15 Apr 2006	F	EC3	
	18 Apr 2006	F	EC3	well-developed fledgling, still fed by adults.
	13 Feb 2010	CM	EC3	adult carrying material.
	13 Feb 2010	CM	EC3	adult carrying material.
	14 Feb 2010	AN	EC3	
	14 Feb 2010	N	EC3	
	18 Feb 2010	N	EC3	both adults provisioning, nest in abandoned <i>F. leucopus</i> nest, 16 m up, one adult feeding regularly but other spending a great deal of time chasing horneros from active nest 6 m away in same tree.
	27 Feb 2014	AN	EC3	20 m up at the broken end of a <i>Ceiba</i> branch.
	7 Mar 2014	B	EC3	8 m up in old woodpecker cavity.
Boat-billed Flycatcher <i>Megarynchus pitangua</i>	14 Feb 2004	B	EC2	nest just beginning to form.
	17 Feb 2004	CM	EC2	adult carrying material.
	20 Apr 2006	F	EC3	adult fed adult <i>Papilio</i> (Lepidoptera: Papilionidae) to one of 2 fledglings.
	18 Feb 2010	N	EC3	both adults feeding nestlings, 15 m up.
Tropical Kingbird <i>Tyrannus melancholicus</i>	6 Feb 2004	CM	EC2	adult carrying material.
	7 Feb 2004	B	EC2	7 m up in crown of isolated tree.
Rufous Flycatcher <i>Myiarchus semirufus</i>	26 Feb 2009	F	PSE6	adult followed by begging fledgling (Fig. 11b).
	31 Dec 2010	N	LFE1	3 chicks, adults provisioning with insects.
	31 Dec 2010	I	LFE1	3 eggs in abandoned woodpecker cavity.
	9 Jan 2011	L	LFE1	3 eggs.
Dusky-capped Flycatcher <i>M. tuberculifer</i>	1 Mar 2004	B	EC2	
	28 Feb 2006	CM	EC1	adult carrying material.
Sooty-crowned Flycatcher <i>M. phaeocephalus</i>	10 Apr 2006	B	EC3	subsequently laid a clutch of two eggs.
Red-crested Cotinga <i>Ampelion rubrocristatus</i>	11 Apr 2006	CM	EC5	adults regularly carrying material in same direction.
White-bearded Manakin <i>Manacus manacus</i>	30 Jan 2004	I	EC2	2 eggs (23.1 × 16.4, 23.1 × 15.9 mm) (Fig. 12a).
	3 Feb 2004	I	EC2	2 eggs, first egg laid 3 Feb (24.2 × 15.6 mm).
	3 Feb 2004	I	EC2	2 eggs (22.7 × 15.4, 22.6 × 15.9 mm) first laid 3 Feb, second laid 5 Feb.
	13 Feb 2004	I	EC2	2 eggs, 20.6 × 16.0 mm, 2.65 g; 20.8 × 15.7 mm, 2.56 g).
	3 Mar 2004	I	EC2	
	10 Mar 2004	F	EC2	adult feeding fledgling.
	18 Mar 2004	I	EC2	2 eggs (20.9 × 15.4, 22.0 × 15.6 mm).
Club-winged Manakin <i>Machaeropterus deliciosus</i>	30 Jan 2004	I	EC2	2 eggs (19.3 × 14.4, 19.9 × 14.6 mm), hatched 17 Feb, fledged 5 Mar.
	31 Jan 2004	I	EC2	2 eggs (19.7 × 13.9, 20.8 × 14.6 mm), hatched 14 Feb, both nestlings eaten, several hours after hatching, by Yellow-throated Toucan <i>Ramphastos ambiguus</i> .
	31 Jan 2004	I	EC2	2 eggs (20.0 × 14.3, 20.9 × 14.1 mm).

	2 Feb 2004	I	EC2	2 eggs, laid 2 and 4 Mar (20.6 x 14.3, 20.3 x 14.5 mm, respectively).
	5 Feb 2004	I	EC2	1 undeveloped egg (20.5 x 14.6 mm) (Fig. 12b).
	5 Feb 2004	B	EC2	
	8 Feb 2004	I	EC2	second egg laid 9 Feb (19.4 x 14.3, 19.1 x 14.2 mm) (Fig. 12c).
	19 Feb 2004	I	EC2	2 eggs, pipped.
	19 Feb 2004	B	EC2	supporting branch collapsed prior to nest completion.
	1 Mar 2004	I	EC2	2 eggs.
	2 Mar 2004	B	EC2	
	3 Mar 2004	N	EC2	2 nestlings.
	3 Mar 2004	I	EC2	2 eggs.
	17 Mar 2004	I	EC2	2 eggs, undeveloped (20.2 x 14.8, 20.4 x 15.0 mm).
	18 Mar 2004	N	EC2	2 nestlings.
Masked Tityra	5 Feb 2004	B	EC2	
<i>Tityra semifasciata</i>	2 Mar 2004	N	EC2	
Slaty Becard	16 Apr 2006	F	EC3	pair with at least one fledgling.
<i>Pachyrhamphus spodiurus</i>	24 Apr 2006	F	EC3	
	13 Feb 2010	AN	EC3	
	18 Feb 2010	N	EC3	both adults bringing food to nest, 25 m up in 30 m <i>Ceiba</i> sp. tree, 1.5 from end, 13 m from trunk.
	5 Jul 2010	J	TTU3	
	25 Feb 2014	AN	EC3	Fig. 13c.
Black-and-white Becard <i>P. albogriseus</i>	25 Feb 2006	B	EC1	
	25 Feb 2006	B	EC1	
	18 Apr 2006	F	EC3	
	13 Feb 2010	AN	EC3	
	17 Feb 2010	B	EC3	
	21 Feb 2010	B	EC3	in small branches near crown, 18 m up in 20 m-tall tree, 30 cm from active wasp nest.
	1 Mar 2014	B	EC3	20 m up in <i>Ceiba</i> , just beginning construction when found (Fig. 13b).
One-colored Becard <i>P. homochrous</i>	24 Feb 2006	B	EC1	
	26 Feb 2006	B	EC1	Fig. 13a.
	27 Feb 2006	AN	EC4	
	8 Apr 2006	N	EC3	10 m up at lowest branch of <i>Ceiba</i> tree, male and female bringing food, male had delivered adult Lepidoptera.
	8 Apr 2006	AN	EC3	15 m up at outer edge of <i>Ceiba</i> tree, adults repelled a pair of Fasciated Wren <i>Campylorhynchus fasciatus</i> .
	8 Apr 2006	F	EC3	adult female feeding fledgling.
	10 Apr 2006	AN	EC3	
	15 Apr 2006	AN	EC3	female spending long periods inside nest, presumed incubation.
	16 Apr 2006	J	EC3	juvenile similar to adult female below, upper parts with large black patches.
	10 Feb 2010	B	EC3	active building during most of day.
	11 Feb 2010	I	EC3	adults spending long periods in nest, presumed incubation.
	13 Feb 2010	AN	EC3	
	13 Feb 2010	AN	EC3	
	14 Feb 2010	AN	EC3	30 m up in lowest branch of 35 m <i>Ceiba</i> tree.

	17 Feb 2010	N	EC3	
	18 Feb 2010	I	EC3	17 m up in 30 m <i>Ceiba</i> tree, female sitting long periods, male adding material to top of nest.
	25 Feb 2010	AN	PAY1	
	8 Mar 2010	AN	PHU1	
Rufous-browed Peppershrike <i>Cyclarhis gujanensis</i>	15 Mar 2005	I	EC17	2.5 m up, two undeveloped eggs (23.4 × 16.2 mm, 3.12 g; 23.7 × 15.7 mm, 3.05 g) (Figs. 14c, 14d).
	18 Mar 2005	B	EC17	nest went from skeletal scraps of material to completed nest in 6 days, 3.5 m up.
Red-eyed Vireo <i>Vireo olivaceus</i>	26 Feb 2006	I	EC1	3 eggs (Figs. 14a, 14b).
	17 May 2009	F	TZA1	begging fledgling following adult.
White-tailed Jay <i>Cyanocorax mystacalis</i>	8 Apr 2006	N	EC3	3 nestlings.
	10 Feb 2010	Courtship	EC3	group of c. 7 individuals, one fed a hairless, green lepidopteran larvae to another.
	15 Feb 2010	CM	EC3	adult dropped fine, pale nest-lining material as soon observer was detected.
	19 Feb 2010	I	EC3	
	23 Mar 2009	F	LLA4	fledgling following adult.
	8 Jun 2009	J	PHU2	
	13 Jun 2009	J	PMO9	
	4 Mar 2010	B	EC3	7 m up in vine tangle.
	18 Feb 2010	CM	EC3	pair of adults carrying material.
	27 Feb 2014	N	EC3	2 nearly fledged nestlings.
	3 Mar 2014	N	EC3	2 well-feathered nestlings (Fig. 15a).
	7 Mar 2014	F	EC3	1 stub-tailed fledgling being fed by several adults (Fig. 15b).
	7 Mar 2014	CF	EC3	group of four adults carrying food repeatedly to same location.
	28 Feb 2014	B	EC3	6.5 m up.
	27 Feb 2014	CF	EC3	group of five adults carrying food repeatedly to same location.
Blue-and-white Swallow <i>Pygochelidon cyanoleuca</i>	7 Mar 2014	AN	EC22	adults entering and exiting cavity under eaves of house in town (2.5 m up), likely feeding.
	7 Mar 2014	AN	EC22	adults entering and exiting cavity under eaves of house in town (8 m up), likely feeding.
	13 Feb 2000	F	EC14	
	7 Mar 2009	B	EC17	in rocky bank.
Southern Rough-winged Swallow <i>Stelgidopteryx ruficollis</i>	31 Jan 2004	I	EC2	
Brown-chested Martin <i>Progne tapera</i>	15 Jun 2002	AN	EC4	nest inside abandoned <i>F. leucopus</i> nest.
	8 Apr 2012	F	TCO1	fledglings being fed by adult.
Gray-breasted Martin <i>P. chalybea</i>	5 Feb 2004	AN	EC2	
	11 Jan 2011	I	LFE1	3 eggs (c. 27 × 24 mm).
	16 Dec 2015	J	TCO2	several juveniles with adults (https://ebird.org/view/checklist/S26327147)
Tumbes Swallow <i>Tachycineta stolzmanni</i>	11 Dec 2010	I	LFE1	2 eggs in a cavity old woodpecker cavity.
Chestnut-collared Swallow <i>Petrochelidon rufocollaris</i>	23 Jan 2011	I	LFE1	3 eggs.
	25 Jan 2011	N	LFE1	2 adults bringing food.
	Early-Jan 2011	L	LFE1	2 eggs.
	Early Jan 2011	AN	LFE1	

	Late-Dec 2010	I	LFE1	3 eggs.
	Mid-Dec 2010	I	LFE1	3 eggs.
	24 Mar 2010	AN	PMO1	c. 50 nests on an abandoned house.
	13 Feb 2000	AN	EC4	many active nests at various stages.
	2 Apr 2014	AN	EC14	c. 115 active nests in various stages under bridge, at least some building some with nestlings.
House Wren <i>Troglodytes aedon</i>	30 Jan 2004	I	EC2	Fig. 15d.
	14 Feb 2004	B	EC2	
	24 Feb 2006	AN	EC1	
	10 Mar 2010	N	EC3	1 m up in crevice in cabin wall, six nestlings, 5.5–6.5g.
	3 Mar 2014	B	EC3	same nest used in 2010 by <i>L. souleyetii</i> , 1 m up in crack-like cavity in living <i>Ceiba</i> tree trunk.
	28 Mar 2014	I	EC3	15 cm down from broken top of bamboo post, four eggs (Fig. 15c).
Fasciated Wren <i>Campylorhynchus fasciatus</i>	5 Feb 2004	B	EC2	
	17 Feb 2004	B	EC2	adult carrying material to well-formed nest.
	1 Mar 2004	B	EC2	
	11 Apr 2006	N	EC3	
	21 Apr 2006	N	EC3	3 adults simultaneously brought food into nest.
	28 Apr 2006	N	EC3	
	11 Feb 2010	N	EC3	
	11 Feb 2010	B	EC3	
	18 Feb 2010	N	EC3	20 m up in 30 m <i>Ceiba</i> tree, at least three individuals bringing food.
	19 Feb 2010	B	EC3	2 adults building, 6.3 m up over road.
	3 Feb 2011	I	PSE2	adult captured with active incubation patch.
	27 Mar 2014	I	EC3	4 eggs (Fig. 15c).
	10 Jun 2009	AN	PHU2	Fig. 15b.
	4 Dec 2003	AN	EC6	
	9 Feb 2010	B	EC6	2 adults bringing feathers to nest in town park, 8 m up in small branches of 25 m tall tree near tip of branch.
Speckle-breasted Wren <i>Pheugopedius sclateri</i>	16 Feb 2010	B	EC3	
Bay Wren <i>Cantorchilus nigricapillus</i>	2 Mar 2014	B	EC3	20 cm up in a branch tangle and overlapping sticks in dense undergrowth.
	6 Mar 2014	B	EC3	10 cm up in a branch tangle.
	7 Mar 2014	B	EC3	adult carrying material repeatedly into thicket.
	7 Mar 2014	CM	EC3	pair of adults carrying material.
	30 Jan 2004	I	EC2	
	3 Feb 2004	I	EC2	Fig. 16a.
Superciliated Wren <i>C. superciliaris</i>	24 Feb 2006	I	EC1	
	26 Feb 2006	I	EC1	
	28 Feb 2006	B	EC1	
	31 May 2010	F	PMO5	begging fledgling.
	4 Feb 2011	N	PSE2	
Gray-breasted Wood-Wren <i>Henicorhina leucophrys</i>	23 Feb 2000	I	EC14	3 eggs.

Song Wren <i>Cyphorhinus</i> <i>phaeocephalus</i>	6 Feb 2004	B	EC2	
Half-collared Gnatwren <i>Microbates</i> <i>cinereiventris</i>	11 Mar 2004	B	EC2	adult with nesting material.
Tropical Gnatcatcher <i>Polioptila plumbea</i>	24 Feb 2006	CM	EC1	
	24 Mar 2009	N	LLA4	Fig. 17b.
	8 Jun 2009	J	PHU2	
	31 May 2010	F	PMO5	begging fledgling following adults.
	7 Jan 2011	AN	LFE1	female sitting long periods, presumably incubating.
	3 Feb 2011	I	PSE2	
	27 Feb 2014	B	EC3	7.5 m up saddled over small horizontal branch in shady mid-story, incubating by 7 Mar.
	2 Apr 2014	I	EC3	15 m up saddled over tree (Euphorbiaceae) branch similar in diameter to nest.
Plumbeous-backed Thrush <i>Turdus</i> <i>reevei</i>	8 Apr 2006	J	EC3	numerous independent juveniles flocking at fruiting <i>Ficus</i> sp.
	15 Apr 2006	F	EC3	young fledgling, barely able to fly.
	16 Jun 2009	J	PMO7	
	10 Feb 2010	I	EC3	adult sitting long periods, presumed incubation.
	10 Feb 2010	I	EC3	adult sitting long periods, presumed incubation.
	10 Feb 2010	I	EC3	adult sitting long periods, presumed incubation.
	10 Feb 2010	I	EC3	3 eggs (Fig. 18d).
	11 Feb 2010	AN	EC3	8 m up in 10 m tall tree in small branches in area of dense foliage behavior suggested incubation.
	13 Feb 2010	N	EC3	
	16 Feb 2010	I	EC3	
	17 Feb 2010	I	EC3	
	17 Feb 2010	I	EC3	
	17 Feb 2010	AN	EC3	
	21 Feb 2010	F	EC3	2 young fledglings attended by adults (Fig. 18b).
	31 Mar 2010	J	PHU5	
	4 Mar 2014	B	EC3	3.2 m up in major fork of 8 m tall tree.
	6 Mar 2014	B	EC3	3 m up in large fork of a tree.
	6 Mar 2014	B	EC3	3.5 m up.
	6 Mar 2014	B	EC3	3.5 m up on a broken nubbin of a branch.
	7 Mar 2014	B	EC3	3.5 m up in major fork of tree.
	26 Mar 2014	N	EC3	4 m up under eaves of building, single nestling, 12.6 g.
	29 Apr 2000	N	EC14	
	7 Apr 2014	N	EC3	under awning of building.
	7 Apr 2014	N	EC3	under awning of building.
	7 Apr 2014	N	EC3	
Ecuadorian Thrush <i>T. maculirostris</i>	9 Apr 2006	J	EC3	juvenile foraging independently, with buff spots on wing coverts.
	4 Dec 2003	N	EC6	
	23 Feb 2014	I	EC2	4 m up on top of broken trunk, well hidden by bromeliads.
	8 Mar 2010	I	EC3	3 m up, three eggs.

	17 Jan 2011	I	EC1	3 eggs (28.7 × 20.9 mm, 6.2 g; 28.6 × 21.1 mm, 6.2 g; 30.3 × 21.1 mm, 6.4 g), 90 cm up, measurements: external diameter 14 cm; external height 9 cm; internal diameter 8 cm; internal depth 5.5 cm.
	17 Jan 2011	AN	EC1	5 m up.
	11 Feb 2010	I	EC3	3 eggs (Fig. 18e).
	13 Feb 2010	N	EC3	
	15 Feb 2010	F	EC3	at least one very young fledgling, just below nest, 2.3 m up in fork of 4.5 m sapling.
	11 Feb 2010	B	EC3	
	7 Mar 2014	B	EC3	8 m up in 15 m tall tree in thick fork.
Long-tailed Mockingbird	24 Mar 2009	N	LLA4	Fig. 18a.
<i>Mimus longicaudatus</i>	12 Apr 2006	B	EC3	
	31 May 2010	F	PMO5	begging fledgling.
	22 Jan 2012	F	LCH1	begging fledgling.
	7 Mar 2014	CM	EC7	adult carrying long stick.
	7 Mar 2014	AN	EC8	0.5 m up in <i>Acacia</i> .
	7 Mar 2014	AN	EC10	3.5 m up in <i>Acacia</i> .
	7 Mar 2014	I	EC9	see text (Fig. 18c).
	7 Mar 2014	CM	EC11	1.5 m up in major fork near center of spiny <i>Acacia</i> tree, both adults near nest, one carrying stick.
	7 Mar 2014	AN	EC12	adult sitting in nest.
	7 Mar 2014	AN	EC13	2.5 m up in <i>Acacia</i> .
House Sparrow	8 Apr 2012	N	TCO1	nest in crevice in a building.
<i>Passer domesticus</i>				
Thick-billed Euphonia	3 Feb 2004	I	EC2	
<i>Euphonia laniirostris</i>	3 Mar 2004	I	EC2	
	28 Feb 2006	CM	EC1	
	8 Apr 2006	F	EC3	male fed fledgling two different types of crushed fruits.
	12 May 2009	J	TTU4	
Orange-bellied Euphonia	3 Feb 2004	I	EC2	
<i>E. xanthogaster</i>	15 Feb 2004	CM	EC2	male and female carrying moss.
	27 Feb 2004	CM	EC2	male carrying material, female nearby.
Black-striped Sparrow	3 Feb 2004	CM	EC2	
<i>Arremonops conirostris</i>	5 Feb 2004	B	EC2	in dense pasture grass, four sparrow eggs and two <i>M. bonariensis</i> eggs (Fig. 21d).
	19 Feb 2004	I	EC2	found with a single, freshly laid egg.
	15 Mar 2004	B	EC2	adult with nesting material.
Orange-billed Sparrow	26 Feb 2004	F	EC2	2 recently fledged young.
<i>Arremon aurantiirostris</i>	26 Feb 2004	F	EC2	
	8 Mar 2004	B	EC2	
	16 Mar 2004	N	EC2	adults nearby with food, alarm calling.
	24 Mar 2004	F	EC2	fledglings can barely fly, feedings by adults observed.
Rufous-collared Sparrow	24 Jan 2016	F	LCH1	fledgling following adult.
<i>Zonotrichia capensis</i>	18 Mar 2016	F	LCH1	adult sparrow feeding fledgling <i>M. bonariensis</i> .
White-headed Brush-Finch	13 Mar 2012	Nest	LLA7	nest behind a big bromeliad, at the base, well hidden.

<i>Atlapetes albiceps</i>	18 Jun 2002	F	EC7	adult feeding fledgling.
	7 Mar 2014	CM	EC16	adult carrying pale fiber into a brush and branch tangle about 1 m above the ground.
Yellow-breasted Brush-Finch <i>A. latinuchus</i>	14 Feb 2000	F	EC14	fledgling following adults.
White-winged Brush-Finch <i>A. leucopterus</i>	18 Jun 2002	F	EC7	adult seen feeding fledgling.
	21 Apr 2015	F	PHU4	older fledgling.
Pale-headed Brush-Finch <i>A. pallidiceps</i>	11 Mar 2005	I	EC17	2 eggs (24.3 × 17.4, 25.0 × 17.5 mm).
	11 Mar 2005	I	EC17	2 eggs (23.6 × 17.1 mm, 3.62 g; 23.3 × 17.1 mm, 3.60 g).
	11 Mar 2005	I	EC17	2 eggs (23.5 × 17.5 mm, 3.79 g; 23.3 × 17.3 mm, 3.75 g).
	12 Mar 2005	I	EC17	2 eggs (24.5 × 17.5 mm, 3.97 g; 24.3 × 17.5 mm, 3.94 g).
	15 Mar 2005	N	EC17	2 nestlings.
	16 Mar 2005	I	EC17	2 eggs.
Bay-crowned Brush-Finch <i>A. seebohmi</i>	9 Apr 2012	F	PHU4	fledgling being fed by an adult, loudly begging for food.
Peruvian Meadowlark <i>Leistes bellicosa</i>	23 Mar 2009	N	LLA2	
	24 Mar 2009	J	LLA4	
Yellow-rumped Cacique <i>Cacicus cela</i>	1 Aug 2009	J	PSU2	
	24 Feb 2006	AN	EC1	most nests in a small colony were under construction.
	24 Feb 2006	B	EC1	
White-edged Oriole <i>Icterus graceannae</i>	25 Feb 2006	B	EC1	
	16 Jun 2009	J	PMO7	
Yellow-tailed Oriole <i>I. mesomelas</i>	5 Jul 2010	J	TTU3	
	22 Feb 2007	B	EC3	
	15 May 2009	J	TTU1	
	8 Jun 2009	J	PHU2	
Shiny Cowbird <i>Molothrus bonariensis</i>	6 Apr 2014	N		3 nestlings weighing 4.8, 8.2, and 8.3 g, respectively (Fig. 24a).
	15 Mar 2009	N	LCH1	nestling found on ground.
	3 Apr 2009	N	PMO3	fledgling fed by <i>C. fasciatus</i> for period of at least two weeks.
	16 May 2009	J	TTU1	
	17 Jun 2009	J	PMO7	
	10 Mar 2012	AN	LCH1	copulation observed.
	8 Feb 2004	I	EC2	2 cowbird eggs laid on same day in nest of <i>A. conirostris</i> .
	8 Feb 2004	I	EC2	single egg in nest of <i>R. flammigerus</i> .
Scrub Blackbird <i>Dives waczewiczi</i>	18 Mar 2016	F	LCH1	fed by adult <i>Z. capensis</i> .
	30 Jan 2004	N	EC2	
	24 Feb 2006	AN	EC1	
	24 Feb 2006	I	EC1	
	25 Feb 2006	I	EC1	
	26 Feb 2006	I	EC1	
	27 Feb 2006	I	EC4	
	27 Feb 2006	I	EC4	
	28 Feb 2006	I	EC1	3 eggs (Figs. 24b, 24c).
10 Apr 2006	F	EC3	adults feeding at least one fledgling.	
11 Apr 2006	F	EC3	begging juvenile with adults, but no feeds seen.	

	12 Apr 2006	F	EC3	pair feeding stub-tailed fledgling.
	30 Mar 2006	F	EC6	pair feeding 2 spotty-breasted fledglings.
	30 Mar 2006	F	EC6	
	7 Mar 2014	CF	EC22	adult carrying food into the top of vine covered tree, 6 m up.
	24 Feb 2014	AN	EC2	3.5 m up in spiny <i>Citrus</i> sp. tree in re-growing pasture.
	30 Mar 2006	CM	EC6	
	30 Mar 2006	B	EC6	
	4 Apr 2006	I	EC23	
	9 Feb 2010	I	EC3	
	11 Feb 2010	N	EC3	6.3 m up in an <i>Acacia</i> sp. tree, 9 m from center of tree, 1.5 from end, tree 10 m tall, both adults feeding.
	11 Feb 2010	AN	EC3	
	13 Feb 2010	AN	EC3	
	13 Feb 2010	I	EC3	
Masked Yellowthroat	9 Jun 2009	N	PHU2	
<i>Geothlypis aequinoctialis</i>	18 Mar 2005	N	EC17	3 newly-hatched nestlings (Fig. 23b).
Tropical Parula	29 Feb 2004	AN	EC2	
<i>Setophaga pitiayumi</i>	12 Apr 2006	B	EC3	male following female and singing as she builds.
	24 Mar 2010	J	PMO2	
Yellow Warbler S.	25 Feb 2009	CM	PSE1	Fig. 23a.
<i>petechia</i>				
Gray-and-gold Warbler	10 Feb 2010	I	EC3	2 eggs about half-way developed.
<i>Myiothlypis fraseri</i>	10 Feb 2010	B	EC3	ready to lay.
	10 Feb 2010	B	EC3	
	12 Feb 2010	B	EC3	
	12 Feb 2010	N	EC3	
	12 Feb 2010	N	EC3	4 mid-aged nestlings (Fig. 22c).
	14 Feb 2010	B	EC3	just starting to form ball.
	16 Feb 2010	CM	EC3	carrying material, female gathering fine dark fibers, male singing and following.
	18 Feb 2010	N	EC3	
	18 Feb 2010	N	EC3	
	28 Mar 2014	B	EC3	2 eggs laid by 3 Apr.
	6 Mar 2014	B	EC3	nest nearly complete (Figs. 22a, 22b).
	3 Apr 2014	N	EC3	2 older nestlings.
Three-banded Warbler	9 Apr 2012	F	PHU4	fledging being fed by an adult.
<i>Basileuterus trifasciatus</i>				
Slate-throated Redstart	5 Feb 2004	B	EC2	5 m up in hanging clump of moss and epiphytes.
<i>Myioborus miniatus</i>	28 Feb 2004	CM	EC2	
	4 Mar 2005	AN	EC17	2.5 m up in bromeliad clump.
	13 Mar 2005	B	EC17	
	1 Mar 2009	F	EC17	adult feeding older fledgling.
	6 Mar 2009	F	EC17	1 fledgling being fed by adult.
	6 Mar 2009	I	EC17	2 eggs, on ground in a bank cut.
Spectacled Redstart	7 Mar 2009	B	EC17	nest on a steep bank, nearly finished.
<i>M. melanocephalus</i>				
Hepatic Tanager	19 May 2009	J	TZA1	
<i>Piranga flava</i>				

Golden Grosbeak	24 Feb 2006	N	EC1	
<i>Pheucticus</i>	25 Feb 2006	I	EC1	
<i>chrysogaster</i>	8 Apr 2006	N	EC3	2 nestlings, died after apparent abandonment.
	8 Apr 2006	F	EC3	
	9 Jun 2009	F	PHU2	begging fledgling following adults.
	11 Feb 2010	I	EC3	Fig. 21c.
	13 Feb 2010	N	EC3	
	13 Feb 2010	AN	EC3	
	31 Mar 2006	I	EC6	
	17 Mar 2005	B	EC17	
	1 Mar 2009	F	EC17	adult feed older fledgling.
	27 Mar 2014	I	EC3	10 m up, at least one egg visible through bottom of nest.
	31 Mar 2014	I	EC3	5 m up, two eggs (28 × 19 mm, 5.3 g; 26 × 19 mm, 4.7 g).
	6 Mar 2014	B	EC3	3.8 m up saddled between two bromeliads on horizontal branch.
Green	3 Mar 2004	B	EC2	
Honeycreeper	18 Feb 2004	CM	EC2	adult female carrying large dead leaf.
<i>Chlorophanes spiza</i>				
Saffron Finch	13 Feb 2004	B	EC2	
<i>Sicalis flaveola</i>	16 Mar 2004	F	EC2	4 fledglings, no feed seen, but copious, loud begging.
	2 Apr 2006	F	EC6	
	18 Mar 2012	N	LFE1	4 young nestlings, 1 egg.
	20 Mar 2012	N	LFE1	6 nestlings.
	2 Dec 2015	F	LCH1	at least 4 juveniles seen.
	21 Jan 2016	F	LCH1	at least 5 older fledglings traveling with two pairs of adults.
Ash-breasted	7 Jun 2009	F	PMO3	
Sierra-Finch	6 Aug 2010	J	PMO3	
<i>Phrygilus plebejus</i>				
White-sided	11 Apr 2006	CM	EC5	female carrying bill-full of light green moss.
Flowerpiercer				
<i>Diglossa albilatera</i>				
Flame-rumped	4 Feb 2004	I	EC2	2 eggs, estimated hatch 6 Feb.
Tanager	4 Feb 2004	I	EC2	2 eggs, hatched 8 Feb.
<i>Ramphocelus</i>				
<i>flammigerus</i>				
	4 Feb 2004	N	EC2	
	4 Feb 2004	I	EC2	
	5 Feb 2004	I	EC2	
	7 Feb 2004	CM	EC2	female carrying material.
	7 Feb 2004	CM	EC2	female carrying material, male following (carrying piece of bark) at 07h45.
	7 Feb 2004	I	EC2	
	8 Feb 2004	I	EC2	2 tanager eggs, one of <i>M. bonariensis</i> , all hatched by 15 Feb (Fig. 19d).
	10 Feb 2004	CM	EC2	female carrying material at 10h00.
	11 Feb 2004	AN	EC2	female sitting on nest, contents not seen.
	14 Feb 2004	CM	EC2	female carrying material.
	15 Feb 2004	I	EC2	Fig. 19c.
	17 Feb 2004	B	EC2	
	19 Feb 2004	N	EC2	nest taken by Swallow-tailed Kite <i>E. forficatus</i> that swooped down and hit nest, picked up whole nest, carried it up and away, extracted one nestling, other dropped to ground.
	17 Mar 2004	B	EC2	
	21 Oct 2009	I	EC2	

Black-faced Dacnis <i>Dacnis lineata</i>	29 Feb 2004	B	EC2	female with nesting material.
Parrot-billed Seedeater <i>Sporophila</i> <i>peruviana</i>	24 Mar 2009	F	LLA4	1 begging fledgling with adults.
Thick-billed Seed- Finch <i>S. funerea</i>	2 Feb 2004	I	EC2	3 eggs, 2 hatched on 3 Feb (Fig. 20b).
	5 Feb 2004	I	EC2	
	19 Feb 2004	N	EC2	
	28 Feb 2004	I	EC2	
	3 Mar 2004	I	EC2	
Variable Seedeater <i>S. corvina</i>	1 Feb 2004	B	EC2	4 m up suspended in hanging clump of epiphytes in Guayaba tree (<i>Psidium</i> sp.), 2 eggs. Fig. 20c. female building at 09h00, 5.5 m up in bromeliad clump in isolated pasture tree.
	2 Feb 2004	B	EC2	
	8 Feb 2004	I	EC2	
	8 Feb 2004	I	EC2	
	9 Feb 2004	B	EC2	
	17 Mar 2004	I	EC2	
	17 Mar 2004	I	EC2	
Yellow-bellied Seedeater <i>S. nigricollis</i>	1 Feb 2004	CM	EC2	female carrying seed down at 09h15, male chasing. eggs hatch 23 Mar. Fig. 20a.
Buff-throated Saltator <i>Saltator maximus</i>	20 Mar 2004	I	EC2	clutch complete (2 eggs) by 7 Feb. Fig. 21b.
Streaked Saltator <i>S.</i> <i>striatipectus</i>	2 Feb 2004	B	EC2	
	24 Feb 2006	I	EC1	3 eggs (Fig. 21a).
	26 Feb 2006	I	EC1	
	9 Apr 2006	B	EC3	building 3.7 m up in multiple small branches near outside of tree crown.
	11 Apr 2006	F	EC3	
	10 Feb 2010	B	EC3	actively building.
	16 Feb 2010	AN	EC3	
	31 Mar 2014	I	EC3	1.8 m up, 3 saltator eggs (29 × 18 mm, 5.2 g; 29 × 19 mm, 5.4 g; 29 × 19 mm, 5.4 g), one <i>M. bonariensis</i> egg (20 × 17 mm, 3.5 g).
	28 Mar 2014	I	EC3	6 m up, two 2–3 days old nestlings.
	6 Mar 2014	B	EC3	2 m up in branch tangle, almost complete.
Black-cowled Saltator <i>S. nigriceps</i>	17 Apr 2006	J	EC5	pair with older, begging fledgling.
Cinereous Finch <i>Piezorina cinerea</i>	23 Mar 2009	J	LLA4	
	3 Aug 2009	J	PTA1	
	13 Mar 2012	N	LFE1	
Collared Warbling Finch <i>Poospiza</i> <i>hispaniolensis</i>	23 Mar 2009	J	LLA4	
	8 Apr 2011	N	EC15	2 nestlings.
	1 Aug 2009	J	PSU2	
Bananaquit <i>Coereba flaveola</i>	1 Feb 2004	CM	EC2	adult carrying dead leaves and bromeliad seed down.
	1 Feb 2004	B	EC2	
	2 Feb 2004	B	EC2	
	10 Feb 2004	B	EC2	9 m up at end of branch.
	11 Feb 2004	B	EC2	8 m up in bromeliad clump.
	2 Mar 2004	B	EC2	
Dull-colored Grassquit	7 Feb 2004	I	EC2	

<i>Asemospiza</i>				
<i>obscura</i>				
Fawn-breasted Tanager	3 Feb 2004	B	EC2	1 adult bringing moss, fibers, and strips of dead leaves into moss hanging directly below horizontal branch.
<i>Pipraeidea</i>				
<i>melanonota</i>				
Blue-necked Tanager	3 Feb 2004	F	EC2	fledgling being fed by adults, traveling away from flock.
<i>Stilpnia cyanicollis</i>				
	4 Feb 2000	CM	EC14	
	9 Feb 2004	F	EC2	fledgling being fed by adults.
	2 Mar 2004	N	EC2	
Bay-headed Tanager	5 Mar 2004	AN	EC2	
<i>Tangara gyrola</i>				
Blue-gray Tanager	31 Jan 2004	I	EC2	
<i>Thraupis episcopus</i>				
	4 Dec 2003	N	EC6	
	3 Feb 2004	F	EC2	begging fledgling following adults.
	5 Feb 2004	F	EC2	fledgling fed by adults.
	6 Feb 2004	N	EC2	in bromeliad clump, two adults feeding.
	7 Feb 2004	N	EC2	Fig. 19b.
	8 Feb 2004	N	EC2	5 m up on side of trunk in bromeliad clump, both adults feeding at least one nestling.
	10 Feb 2004	I	EC2	
	17 Feb 2004	N	EC2	
	2 Mar 2004	I	EC2	
	5 Mar 2004	B	EC2	
	24 Feb 2006	B	EC1	
	1 Apr 2006	F	EC6	pair feeding 2 fledglings.
	2 Apr 2006	F	EC6	
	12 Apr 2006	F	EC3	adult gave masticated <i>Solanum</i> sp. fruit to one of two fledglings, retrieved it and then gave to other fledgling, then repeated.
	12 Apr 2006	F	EC3	
	21 Mar 2011	F	PMO3	adult feeding two fledglings.
Palm Tanager <i>T. palmarum</i>				
	31 Jan 2004	N	EC2	
	31 Jan 2004	N	EC2	
	1 Feb 2004	I	EC2	Fig. 19a.
Blue-capped Tanager	14 Feb 2000	B	EC14	adult carrying material.
<i>Thraupis</i>				
<i>cyancephala</i>				
Rufous-throated Tanager	5 Feb 2004	F	EC2	fledgling fed small fruit by attending adult.
<i>Ixothraupis rufigula</i>				