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BREEDING RECORDS OF BIRDS FROM THE TUMBESIAN REGION OF ECUADOR

Jessie L. Knowlton

650 Life Sciences Bldg, Stony Brook, NY 11794, USA. *E-mail:* jlknowlton@gmail.com

Resumen. – Registros reproductivos de las aves de la región Tumbesina del Ecuador. – Poco se conoce acerca de la reproducción de aves tropicales, especialmente de aquellas endémicas a ciertas regiones geográficas. Obtener información acerca de la arquitectura y ubicación de nidos, tamaños de puesta, periodos de incubación y cria, no solo permite examinar la variación local de esos atributos entre especies, sino que puede ser crucial para esfuerzos de conservación que buscan incrementar el éxito reproductivo en especies amenazadas. La región Tumbesina del suroccidente de Ecuador y noroccidente de Perú alberga gran parte del bosque tropical costero remanente en Suramérica y es una de las bioregiones más amenazadas en el mundo debido a la presión humana. Este artículo presenta descripciones de los nidos, huevos, periodos de incubación y cría, y ubicación de nido, para 32 especies encontradas en la costa de Ecuador en el Parque Nacional Machalilla, uno de los parques más grandes en la región Tumbesina. Catorce de las especies consideradas son endémicas de esta región y se presentan las primeras descripciones de aspectos de la biología reproductiva de doce especies.

Abstract. – Little is known about the reproduction of many species of tropical birds, and especially those endemic to limited geographic regions. Gaining information such as nest architecture and site, clutch size, and incubation and nestling periods not only allows for the examination of regional and local variation in these traits within species, but can be crucial to conservation efforts which aim to increase reproductive success of threatened species. The Tumbesian region of southwestern Ecuador and northwestern Peru encompasses the great majority of remaining coastal tropical dry forest in South America, and is one of the most threatened bioregions in the world due to heavy human use. This paper presents descriptions of the nests, eggs, incubation and nestling periods and nest placement for 32 bird species found on the coast of Ecuador in Machalilla National Park, which is one of the largest parks in the Tumbesian region. Fourteen of the species discussed are endemic to the region, and first descriptions of part of the breeding biology of twelve species are given. *Accepted 2 February 2010.*

Key words: Machalilla National Park, nests, eggs, incubation period, nestling period, endemic.

INTRODUCTION

Little is known about the reproduction of many species of tropical birds, and especially those endemic to limited geographic regions. Despite several existing publications on the nesting biology of birds in southwestern Ecuador (Marchant 1958, 1959, 1960; Balchin 1996, Best *et al.* 1996), basic information, such as clutch size, egg descriptions, incubation and nestling times, and nest and site characteristics are unknown for many species. This information not only allows the examination of regional and local variation in these traits within species, but can be crucial to conservation efforts which aim to increase reproductive success of threatened species. For example, the predation risk of a nest and the normal development of the embryo and nestlings are strongly influenced by the

nest structure and location as well as the behavior of the adults (Gill 1990). Further, clutch size differences can reflect the energy available for egg formation and the lifetime reproductive success (Gill 1990). Incubation periods reflect the egg size, adult weight, and probability of predation, while nestling periods are influenced by food quantity and quality and temperature; both can vary greatly within species (Gill 1990). Nest-site selection is an integral component of habitat selection and may influence the evolution of other aspects of the morphology and behavior of a species (Stauffer & Best 1986, Gill 1990).

The Tumbesian region of southwestern Ecuador and northwestern Peru encompasses the great majority of remaining coastal tropical dry forest in South America and is one of the most threatened bioregions in the world, due to heavy human use in the form of development and livestock grazing (Best & Kessler 1995). The region, home to 32 threatened or near threatened bird species and 61 endemic bird species, has already lost over 95% of its original forest and is extremely vulnerable to continued habitat fragmentation and heavy grazing by domesticated animals (Wege & Long 1995). Machalilla National Park (01°31'37"S and 80°45'26"W) is one of the largest parks in the Tumbesian region (55,095 ha), and contains 67% of its endemic bird species (Wege & Long 1995). The park has a marked gradient of rainfall caused by differences in elevation (0–860 m) and slope position relative to the coast. As a consequence, the vegetation ranges from arid scrub to humid fog forest. A majority of the endemic bird species are found in the driest vegetation types, arid scrub, and tropical dry forest, which are often also the most affected by human use. This paper presents descriptions of the nests, eggs, incubation and nestling periods, and nest placement for 32 bird species found in Machalilla National Park. Fourteen of the species discussed are endemic to the Tumbesian region (marked with an asterisk in the text and Table 1), and first descriptions of part of the breeding biology of twelve species are given.

METHODS

All nests described in this paper were found in either arid scrub or tropical dry forest vegetation within the boundaries of Machalilla National Park. Arid scrub consists primarily of low, bushy trees and cacti and has an average canopy height of four meters. Tropical dry forest is similar to arid scrub, but differs by having trees with diameters more than twice that of the biggest trees in arid scrub, an average canopy height of eight meters, and greater canopy density. In contrast to arid scrub, tropical dry forest riverbeds retain moisture year-round and trees growing in these areas maintain their leaves for a majority of the year. The nesting season in Machalilla National Park coincides with the rainy season, which is generally from January to April. During the rainy season, the normally dry vegetation flushes green and weedy lianas often quickly spread through the understory and cover the trees.

From mid-January to late May of 2008 and 2009, my assistants and I systematically searched for nests in two 100 ha plots in each vegetation type (arid scrub and tropical dry forest). We did not search in the more humid hills where fog forest dominates. Both 2008 and 2009 appeared to have similar rainy seasons, although in 2008 there was more rainfall, especially in the hills, causing the riverbeds to fill more frequently and for longer periods. Published rainfall records for these two years from the Instituto Nacional de Meteorología e Hidrología are not yet available. Once a nest was found, we marked its location with a GPS and visited every two to three days (more frequently closer to

TABLE 1. Summary of 2008 and 2009 (combined) nesting data for each species. Mean values and ranges are given. First descriptions are indicated in bold. n AS = number of nests found in arid scrub vegetation; n TDF = number of nests found in tropical dry forest vegetation; EDF to LDF = earliest date to last date a nest was found; CS = mean clutch size; ES = mean egg size; INC = incubation period; NESL = nestling period; MOD = maximum number of days a nest was observed to be active (may include construction); NH = mean nest height; N = mean nest tree height; NTDBH = mean nest tree dbh; NDT = mean nest distance to trunk; NDFB = mean nest distance to foliage border; NED = nest external diameter; NID = nest internal diameter; NEH = nest external height; NIH = nest internal height; NI = no information; NA = not applicable; * = endemic.

Species	n AS	n TDF	EDF to LDF	CS	ES (mm)	INC	NESL	MOD	NH (m)	N (m)	NTDBH (cm)	NDT (m)	NDF B (m)	NED (cm)	NID (cm)	NEH (cm)	NIH (cm)
Rufous-necked Woodrail	0	2	9-23 Feb	6 (6-6)	43.1 x 31.6	**22**	NI	28	3 (2.5-3.5)	5.5 (5-6)	5 (4-6)	2.1 (1.6-2.5)	1.5 (0.8-2.2)	23.8 (23.5-24)	17.2 (17-17.4)	7.3 (7-7.5)	4.4 (4.2-4.5)
West Peruvian Dove*	7	16	4 Feb-26 Mar	2 (2-2)	NI	**13-15**	**11-15**	29	3 (1.2-5.8)	4.6 (2.5-7)	10.4 (2-73)	2.1 (0.1-6)	1.3 (0.1-2.5)	15.7 (10-30)	11.4 (8.8-15)	7 (2-20)	2.6 (1.5-4)
Croaking Ground-dove*	59	4	6 Feb-27 Mar	2 (2-2)	22 x 16.8	12-15	10-12	21	2.5 (0.6-4.8)	4.2 (1.7-7)	6.4 (2-35)	2.1 (0.1-5.5)	0.8 (0.1-2.9)	8.7 (6-11)	7.4 (6.2-9.2)	3.5 (2-4.3)	2 (0.6-3)
White-tipped Dove	6	49	4 Feb-19 Mar	2 (2-2)	NI	12-14	10-15	33	3.7 (1-11)	6.2 (2.5-13)	10.6 (2-50)	2.9 (0.2-8)	1.5 (0.1-8.5)	16 (14-20)	11.3 (8.9-13)	5.8 (2-9)	2.6 (1.4-6)
Gray-capped Cuckoo	11	11	14 Feb-17 Mar	3.7 (2-5)	NI	**9-12**	**9-12**	29	2.5 (0.4-5)	4.7 (3-7)	7.8 (2-18)	2.3 (0.04-5.8)	1.1 (0.2-4.2)	17.9 (13-25)	14.6 (9-19) 2	7.4 (4-13)	4.3 (3-6)
Short-tailed Woodstar	1	0	24 Mar	2	**12 x 7.4**	12+	NI	13	1.5	1.9	1	0.3	0	2.5	NI	2	1.2
Necklaced Spinetail*	33	84	4 Feb-27 Mar	3.2 (3-4)	16.5 x 13.5	**~25**	**16-22**	60	5.8 (2-12)	7.8 (2.8-19)	17.1 (0.2-70)	1.9 (0.01-6)	1.3 (0.1-8)	35.8 (24-55)	6.6 (5.5-7.5)	27.2 (15-40)	NI
Collared Antshrike*	4	22	29 Jan-4 Apr	2.4 (1-3)	25 x 16.9	11-15	9-17	22	3 (1-9)	6.2 (1.4-12)	8.6 (2-30)	2.5 (0.06-5.5)	0.85 (0.2-3.5)	9.5 (9-10)	4.6 (4.3-4.8)	8.9 (6.7-12)	5.3 (4.5-6.5)

TABLE 1. Continuation.

Species	n AS	n TDF	EDF to LDF	CS	ES (mm)	INC	NESL	MOD	NH (m)	N (m)	NTDBH (cm)	NDT (m)	NDFB (m)	NED (cm)	NID (cm)	NEH (cm)	NIH (cm)
Plain Antvireo	0	3	26 Feb-12 Mar	2.3 (2-3)	NI	10+	11	21	1.1 (1-1.4)	5.8 (4.4-7)	4.2 (3-5.5)	1.6 (0.5-2.4)	0.5 (0.3-0.6)	7.5 (7.4-7.6)	4.6 (4.3-4.8)	6.5 (6.5-6.5)	4.5 (4.3-4.6)
Elegant Crescent-chest*	3	0	18-20 Mar	**3 (3-3)**	**20.9 x 16.5**	**NI**	**10-12**	12	0	NA	NA	NA	NA	**12.1 (11.7-12.5)**	**9.7 (8.8-10.5)**	**10 (9.6-10.3)**	**4.6 (4.4-4.7)**
Southern Beardless-tyrannulet	8	35	5 Feb-19 Mar	2	NI	NI	12-15	36	6.5 (2.6-11)	8.8 (4-15)	18 (4-47)	3.1 (0.4-6)	0.9 (0.2-4)	8.6	6.3	10.8	7.8
Tumbesian Tyrannulet*	1	0	18 Feb	2	NI	NI	10	17	3.5	4	6	1.2	0.6	5.5	4.5	4	3.2
Yellow-olive Flatbill	0	1	10 Mar	2	20.9 x 14.6	NI	NI	16	2.5	5	4	1	0.5	25	NI	53	NI
Tawny-crowned Pygmy-tyrant	1	2	6 Feb-27 Mar	1.8 (1-3)	16.1 x 12.7	11+	12	23	1.8 (0.4-4)	3.3 (0.6-5)	2.7 (0.2-8)	0.8 (0.04-3)	0.4 (0.04-2)	5.7 (5-6.5)	4.6 (4.5-5)	4.8 (3.5-6.5)	3.2 (2.2-4)
Bran-colored Flycatcher	2	4	17 Feb-19 Mar	2	NI	~17	~11	26	3.4 (1.5-7)	6.6 (3.2-10)	6.7 (4.5-10)	2.3 (1.1-3.4)	0.7 (0.2-2)	7.5 (6-8)	5 (5-5)	6 (5.5-6.5)	5 (5-5)
Vermilion Flycatcher	1	0	29 Feb-26 Mar	2.5 (1-3)	NI	10-15	11-15	33	3.1 (2-4)	5.2 (3-7.5)	8.9 (2.5-14)	1.9 (1-5.3)	1.3 (0.4-2.3)	6.1 (5.5-6.7)	5.3 (5-5.5)	3.7 (3-4.3)	2.3 (2-2.5)
Black-and-White Becard	1	4	9 Feb-19 Mar	NI	NI	NI	NI	40	9.3 (7-10)	12.5 (10-16)	47 (18-90)	2.4 (1.5-3.2)	1.2 (0.5-2)	35 (25-45)	NI	30 (20-40)	NI
One-colored Becard		25	4 Feb-31 Mar	3.5 (3-4)	24.1 x 17.9	NI	24-29	44	7.6 (4-14)	12.7 (9-25)	50.7 (7-110)	4.2 (0.5-7)	0.5 (0.01-1.2)	29.2 (20-38)	NI	45 (35-60)	NI
Fasciated Wren*	0	15	9 Feb-9 Mar	4	**24.1 x 17.9**	NI	NI	61	6.2 (3-12)	9.6 (4-15)	21.6 (10-50)	6.6 (0.6-60)	1 (0.3-1.6)	55	NI	35	NI

TABLE 1. Continuation.

Species	n AS	n TDF	EDF to LDF	CS	ES (mm)	INC	NESL	MOD	NH (m)	N (m)	NTDB H (cm)	NDT (m)	NDFB (m)	NED (cm)	NID (cm)	NEH (cm)	NIH (cm)
Speckle-breasted Wren	0	1	11 Apr	4	**18 x 12.5**	NI	NI	7	0	NA	NA	NA	NA	**15**	**6**	**13**	**8**
Long-tailed Mockingbird*	9	7	29 Jan-30 Mar	3.5 (2-6)	25.4 x 19.6	12-18	12-15	35	3 (1-7)	5.1 (1.4-10)	10.8 (3-28)	1.5 (0.07-6.5)	0.9 (0.1-2)	15.4 (11-23)	10.6 (8-13)	10.2 (6.5-15)	6.4 (3.3-10)
Tropical Gnat-catcher	12	4	6 Feb-27 Mar	2.4 (2-4)	NI	13-14	12-14	35	4.1 (2.7-6.8)	5.5 (3.5-7.5)	6.9 (3.5-16)	1.7 (0.2-4.6)	1.5 (0.3-10)	5 (4.5-5.5)	4.2 (3.8-4.5)	3.8 (3.5-4	2.9 (2.5-3.2)
Rufous-browed Peppershrike	0	2	25 Feb-11 Mar	2 (2-2)	24.4 x 16.4	**10+**	**12**	22	3.8 (3-4.5)	5 (5-5)	8 (8-8)	2.8 (2-3.5)	0.9 (0.4-1.4)	7.8 (7.5-8)	5.7	6 (6-6)	4.8
Red-eyed Vireo	11	6	15 Feb-31 Mar	3.2 (2-4)	22 x 13.1	10-16	10-13	26	4.2 (0.8-12)	6.2 (2.9-13)	10.1 (4-38)	3.7 (0.3-8.0)	0.7 (0.1-3.3)	7.7 (6.5-10)	5.2 (4.5-5.5)	5 (4-6)	3.1 (3-3.4)
Plumbeous-b. Thrush*	0	5	27 Feb-19 Mar	3.8 (3-4)	**27.7 x 20.9**	**9-14**	**9-14**	17	3.8 (3-5)	6.8 (6-8)	11.8 (9-16)	0.7 (0.2-1)	0.8 (0.08-1.2)	15.6	9.5	8.2	5.8
Streaked Saltator	11	11	14 Feb-23rd	2.5 (2-4)	19.7 x 17.5	11-14	12-13	27	2.8 (1.1-6)	5.2 (2.5-10)	8.1 (2-23)	1.8 (0.3-4.2)	0.7 (0.1-1.8)	14.1 (10-17.4)	9.8 (7.3-15)	7 (3-13)	5 (2-9)
Southern Yel-low-grosbeak	27	16	Mar 9 Feb-	2.8 (2-4)	27 x 19.5	10-13	8-15	32	4.3 (1.6-11)	5.8 (2.3-14)	12.3 (3-90)	2.4 (0.2-6)	1 (0.06-4)	11 (9-14)	8.2 (7.4-8.5)	4.5 (2.5-6.5)	2.5 (1.5-4.1)
Parrot-billed Seedeater*	1	0	25 Mar 21 Mar	2	NI 18.3 x	9+	11	20	2	3.5	3	1.2	0.8	6	5.5	4	3.2
Crimson-breas-ted Finch*	21	19	11 Feb-30 Mar	3 (1-4)	13.6 18.3 x	9-15	8-13	31	2.6 (0.5-5)	4 (0.8-7)	5.6 (0.5-13)	2.1 (0.03-6.5)	0.7 (0.05-4)	7.8 (6.7-9.3)	5 (4-5.5)	5.2 (3.2-7)	3.5 (2.5-4.8)
Collared War-bling-finch*	8	0	14 Feb-25 Mar	3 (1-4)	14.9	10-13	9-13	21	2 (0.5-3.5)	3.6 (1-5)	4.2 (3-7)	1 (0.08-2.5)	0.5 (0.1-1.3)	6.5 (5-8)	5.1 (5-5.2)	5.4 (4.5-6.3)	3.9 (3.5-4.3)
White-edged Oriole*	0	2	12 Feb-17 Mar	2.5 (2-3)	**24.7 x 17.8**	NI	NI	8	3.5 (3-4)	6.5 (5-8)	11.5 (3-20)	1.4 (0.5-2.2)	0.8 (0.3-1.2)	9.8 (9.5-10)	6.7 (6.3-7)	10.3 (9-11.5)	8.6 (7-10.2)
Scrub Black-bird*	0	7	4-26 Feb	**2.8 (2-3)**	NI	**~9**	**12**	23	3.7 (3-5)	5.3 (5-6)	10.7 (6-16)	1.5 (0.4-3)	0.7 0.3-1.2)	**14.3 (13.5-15.3)**	**9.3 (8.5-10)**	**8.4 (7-10.3)**	**5.1 (4.2-6)**

hatching or fledging dates) to check the status of the eggs or chicks or to note cause-specific nest failure. High nests were reached using a six meter ladder. We monitored enclosed nests by either creating a small hole in the side of the nest (which was often quickly repaired by the parents) or by making careful observations of parental behavior and nestling noises. When possible, we carefully removed the eggs from the nest, measured them with an electronic caliper, and took photographs.

Clutch sizes given are estimated only from nests where eggs were seen in active nests over consecutive nest checks. Incubation periods given were based on estimates of the time of laying of the last egg to the hatching of the last egg; while nestling periods were estimates of the time between hatching of the last egg and fledging of the last chick from the nest. In some cases, chicks may have left nests before being able to fly. Once a nest finished due to chick(s) fledging or nest failure, detailed nest placement measurements were taken following BBIRD methods (Martin *et al.* 1997). In a five meter radius circle centered on each nest we recorded: 1) the species, height, diameter at breast height (DBH), and crown size of the tree the nest was found in; 2) the height of the nest, its orientation on the trunk, distance to the foliage border, distance to the trunk, number of branches supporting the nest and their average diameter, and the percent of cover above the nest and in each cardinal direction; and 3) internal and external measurements of the nest and a description of the nest material. This information is summarized for each species in Table 1. The "first descriptions" (egg size, incubation time, etc.) given in this paper are indicated by bold font in Table 1, and are only "first" to the best of my knowledge. To determine if such information had been previously published I searched the Web of Science (http://apps.isiknowledge.com), the Searchable Ornithological Research Archive (http://elibrary.unm.edu/sora), the Zoological Record (http://ovidsp.tx.ovid.com), the Handbook of the Birds of the World series (1996–2008), and numerous bird journal indices.

RESULTS

Rufous-necked Woodrail (*Aramides axillaris*). We found two nests of this species, both within 500 m of a seasonally dry riverbed in tropical dry forest. One nest was 3.5 m high in a 6 m *Astronium graveolens*, and the other was 2.5 m high in a 5 m *Maytenus* sp. Nests were large shallow platforms made almost entirely of *Cordia lutea* sticks, with some weeds and leaves woven in. In Trinidad, nests were described as "deep twiggy bowls lined with leaves and fibers 1–7 m up in vines or bushes" (Belcher & Smooker 1934, 1937; ffrench 1991). In Mexico, nests were found most frequently over water (Howell & Webb 1995). In Trinidad, nests had three to seven eggs (Belcher & Smooker 1934, 1937; ffrench 1991). The eggs were white with a lot of various sized specks of different shades of brown; similar to eggs in Trinidad (Belcher & Smooker 1934, 1937; ffrench 1991). Both nests were found during the laying period, and the 22 day incubation period is estimated from the time the last egg was laid to the time the nest was empty (Table 1). We never saw nestlings, as rail hatchlings are subprecocial (leave the nest immediately and are fed by the parents) (Gill 1990).

*West Peruvian Dove** (*Zenaida meloda*). Seventy percent of the 23 nests found were in tropical dry forest and 30% in arid scrub. Nest were found in 11 different tree species: 36% in *C. lutea,* 16% in *Scutia* sp., 12% in *Mimosa* sp., and 4% in each of *Geoffroea spinosa*, *Pithecellobium* sp., *Xylosma* sp., *Caesalpinia corimbosa*, *Armatocereus cartwrightianus*, *Jacquinia pubescens*, *Acacia rorudiana*, and *Prosopis juliflora*. Nests were shallow platforms of sticks from *C. lutea* and other species, similar to but smaller than

those of the wood-rails. The eggs were white and clutch size was always two. Marchant (1960) found two nests in southwestern Ecuador, about 90 km south of our field site on the Santa Elena Peninsula (all subsequent references from Marchant also come from this site); both were 1.5 m high and made from *C. lutea* sticks.

*Croaking Ground-dove** (*Columbina cruziana*). Ninety four percent of the 63 nests found were in arid scrub and 6% in tropical dry forest. The doves nested in a total of 13 different plant species. They used *C. lutea* as their nesting tree 71% of the time, *Mimosa* sp. 9% of the time, *P. juliflora* 6% of the time, *Capparis heterophylla* 4% of the time, *C. corimbosa*, *A. cartwrightianus*, and *Bursera graveolens* 3% of the time each, and *J. pubescens* only once. Marchant (1960) also found that over a 4 year period the ground-doves chose *C. lutea* as their nesting tree more frequently than any other species, but found that nest height averaged 1.7 m for 297 nests. Nests were shallow, flattened cups made from small sticks, dry vines and weeds, leaves, leaf veins, feathers, grass, and cactus spines. The doves sometimes glued the nest to the branch with their feces and the rims of the nests often became covered in feces as the chicks grew. Green weeds and leaves were woven into the outside of the nests to help camouflage them. The eggs were plain white and clutch size was always two, although clutches of one and three eggs have been described (Marchant 1960). Marchant (1960) described an incubation period of 14 days and a nestling period of 10 days.

White-tipped Dove (*Leptotila verreauxi decolor*). Eighty nine percent of the 55 nests were found in tropical dry forest and 11% in arid scrub. The doves nested in 14 different plant species, using *C. lutea* 44% of the time, *P. juliflora* 19% of the time, *Scutia* sp. 8% of the time, *Malpighia punicifolia* and *Pithecellobium* sp. 6% of the time each, unknown species 3% of the time, and *G. spinosa*, *Guapira* sp., *Xylosma* sp., *Coccoloba* sp., *Mutingia calabura*, *Ipomea carnea*, and *C. corimbosa* 2% of the time each. The majority of the nests Skutch (1981) found in Costa Rica were 1–2 m high (although rarely up to 6 m), and in Trinidad nests were usually placed 6 m high in a palm or other tree (ffrench 1991). Wetmore (1968) occasionally found nests on the ground in Panama. Nests were very similar to those of the West Peruvian Doves, and were constructed almost entirely of small sticks from various tree species. Lichen was sometimes affixed to the outside of the nest. In Costa Rica, nests were made from twigs, straws, dry grasses, weed stems, dry vine pieces, fern fragments, and rootlets (Skutch 1964, 1981) while in Trinidad nests were made from small twigs and lined with fine grass (ffrench 1991). The eggs were white and the clutch size was always two. In Costa Rica, the incubation period was 14 days and the nestling period 15–18 days (Skutch 1981) while in Trinidad the incubation period was 14–15 days and the nestling period 13–14 days (ffrench 1991).

Gray-capped Cuckoo (*Coccyzus lansbergi*). Fifty percent of the 22 nests were found in tropical dry forest and 50% in arid scrub. The cuckoos nested in nine different tree species, choosing *C. lutea* 38% of the time, *Mimosa* sp. 17% of the time, *J. pubescens* and *Scutia* sp.10% of the time each, and *A. cartwrightianus*, *Coccoloba* sp., *B. graveolens*, and *Pithecellobium* sp. 5% of the time each. The nests were usually very well hidden by foliage in all directions and resembled those of the White-tipped and West Peruvian doves. Marchant (1960) found three nests, ranging in height from 1.2–2 m. Nest material consisted almost entirely of sticks of *C. lutea*, although sometimes sticks from spiny plants such as *Pithecellobium* sp. were included. The eggs were large and white and appeared

very similar to those of the White-tipped and West-Peruvian doves, although the clutch size ranged from two to five with an average of 3.7 eggs. This differs from Marchant's (1960) description of a clutch size of two to three, and his description of the eggs as greenish-white with rough chalky shells. We observed an incubation period ranging from 9–12 days and a nestling period of 9–12 days. Marchant (1960) speculated that the nestling period was 8–13 days.

Short-tailed Woodstar (*Myrmia micrura*). We found one nest in arid scrub, woven precariously to attach in one place 1.5 m up the stem of an unknown species of weed. The stem with the nest swung up and down in the wind, nearly tipping the tiny eggs out. The nest was a tiny cup made almost entirely of the very soft, cotton-like seed down of *I. carnea* or *Eriotheca ruizii* with small brown seeds and lichen affixed to the outside. The nest had two tiny white eggs shaped in elongated ovals, similar to jelly beans. After observing the nest for 12 days the eggs disappeared, making it impossible to determine the exact incubation or nestling periods. Marchant (1960) provided similar descriptions of the nest and eggs of this species, and an incubation period of 15–16 days and nestling period of 20–23 days.

*Necklaced Spinetail** (*Synallaxis stictothorax stictothorax*). Seventy two percent of the 117 nests found were in tropical dry forest, and 28% were in arid scrub. All but four nests were in spiny trees or cactus. The spinetails chose *J. pubescens* 26% of the time, *P. juliflora* 20% of the time, *Scutia* sp. and *A. carturightianus* 15% of the time each, *Mimosa* sp., *Zizyphus thyrsiflora* and *Pithecellobium* sp. 5% of the time each, *M. punicifolia* and *C. lutea* 4% of the time each, and *Morisonia americana* once. Nests were enclosed with a side tunnel entrance and woven very tightly from the spiny sticks of nine different plants. The inside cup was lined with feathers and the soft seed down of *I. carnea* or *E. ruizii*. These descriptions are similar to Marchant's (1960). In the nest measurements given (Table 1), external diameter refers to the longest (horizontal or vertical) part of the nest, while external height refers to the perpendicular measurement. We made small holes in the sides of 18 nests to view the contents (with some difficulty due to the tightly woven, thick nest walls) (Fig. 1). We did not open more nests because we did not want to cause nest abandonment or predation, and nests were often too high or in very spiny plants. In all cases, the parents quickly repaired nests we had opened. Marchant (1960) opened one nest that had three eggs, "lying on a lining of yellowish mossy material." We found the eggs to be small and white with a few brown spots (Fig. 1), while Marchant (1960) describes them as pure white. For all other nests we made frequent careful observations of parental activity, but it was difficult to determine the stage of the nests. Parents often entered the nests with food, but they may have been feeding the incubating parent. Incubation and nestling periods were based on nests that we opened every 2–3 days or nests where we heard chicks crying.

Collared Antshrike (Sakesphorus bernardi bernardi)*. Eighty five percent of 26 nests were found in tropical dry forest and 15% in arid scrub. Nests were found in a total of 13 different plant species; 28% in *C. lutea*, 16% in *P. juliflora*, 8% each in *J. pubescens*, *Scutia* sp., *Xylosma* sp. and *Pithecellobium* sp., and 4% each in *Croton riviniaefolius*, *Acnistus arborescens*, *B. graveolens*, *Musa paradisiaca*, *Maytenus octogona*, and *A. graveolens*. Nests were deep cups woven to hang from bifurcating twigs or branches. Marchant (1960) found the average height for 11 nests was 1.4 m. The antshrikes occasionally wove the nests so thinly that the contents were visible from the outside, though this was

FIG. 1. Inside the nest of the Necklaced Spinetail (*Synallaxis stictothorax stictothorax*), with three eggs.

the minority of cases. Nest material included small twigs, dry vines and weeds, and roots on the outside of the cup, and mostly black lichen on the inside. Marchant (1960) described nests as neatly woven from dead grasses and plant stems without lining so contents were visible from the outside. The eggs were white with dark purple splotches, concentrated around the thicker end, and tiny dark purple dots all over, which is similar to Marchant's (1960) description. Marchant (1960) found the incubation period to be 15 days and the nestling period to be 11 days. Although he found only females incubating, I frequently observed males incubating.

Plain Antvireo (*Dysithamnus mentalis aequatorialis*). All three nests were found in tropical dry forest. Two nests were in *C. polyantha*, and the third in *M. americana*. The cup nests were very similar to those of the antshrikes, though smaller. The nests were woven to hang in the fork of two small branches, and were made from flexible dry vines, plant fibers and small twigs, and were often transparent; especially the top part where the head of the incubating parent was visible. The eggs were cream-colored with many large maroon splotches. These descriptions are similar to descriptions of nests in Mexico, Costa Rica, and Trinidad (Skutch 1969, ffrench 1991, Howell & Webb 1995). In Costa Rica, the incubation and fledging periods were 15 and 9 days, respectively (Skutch 1969).

*Elegant Crescentchest** (*Melanopareia elegans*). We found three nests which were located on the ground in arid scrub and extremely well-camouflaged. The nests were enclosed except for a small side entrance and made almost entirely from dry strips of cactus and dry weeds (Fig. 2). The eggs were light blue with large brown spots at the wider end (Fig. 2). All nests were found close to or during the nestling stage, making determining the incubation period impossible. To my knowledge, this is the first description of nest and eggs for this species.

FIG. 2. Nest from above (top left) and side (top right), view of recently hatched chick and egg through nest hole (bottom left) and egg (bottom right) of the Elegant Crescentchest (*Melanopareia elegans*).

Southern Beardless-Tyrannulet (*Camptostoma obsoletum sclateri*). Eighty one percent of 43 nests were found in tropical dry forest and 19% in arid scrub. Forty nine percent of the nests were found in *P. juliflora*, 11% in *C. lutea*, 9% each in *Scutia* sp. and *J. pubescens*, 6% each in *C. heterophylla*, *Pithecellobium* sp., and unknown species, and 1% each in *Sapindus saponaria*, *M. calabura*, *Z. thyrsiflora*, and *Mimosa sp.* In southwestern Ecuador and Trinidad, nests heights ranged from 1–4 m (Marchant 1960, ffrench 1991) while in Costa Rica heights ranged from 1.5–9 m (Skutch 1981). The nests were globular with a small entrance hole at the top or side. We were able to knock down a few nests after the chicks had fledged to examine the material used; they consisted mostly of small sticks, feathers, and dry algae from the riverbed, as well as lichen, leaves, small strips of a plastic rice bag, and spider web. The inside cup was lined with the soft cotton-like seed down of *E. ruizii*. This is similar to the description given of nests in Suriname by Haverschmidt (1968). The nests were usually very high and were always within 1 m of active wasp nests (*cf.* Marchant 1960 and ffrench 1991), making them difficult to check. We made careful observations of parental behavior and noted nestling noises, but could not report exact incubation or nestling periods. Parents were very shy. Marchant (1960) describes incubation periods ranging from 14–15 days and nestling periods from 15–19 days.

*Tumbesian Tyrannulet** (*Phaeomyias tumbezana*). We found one nest in an *A. rorudiana* tree in arid scrub vegetation. Marchant (1960) found 11 nests with an average height of 2.4 m. The small cup nest was suspended from the fork of small twigs, and made of leaf veins, the soft cotton-like seed down of *I. carnea* or *E. ruizii*, feathers and tiny sticks. The nest was too high and delicate to try to remove the eggs for description and measurement. The nest was found with two eggs and after seven days the chicks hatched. Thus, we were unable to determine the total incubation period. The parents were not shy during the nestling period and brought food to the chicks every few minutes. We estimated the nestling period to be 10 days, although Marchant (1960) found it to be 14–15 days and the incubation period to be 16–17 days.

Yellow-olive Flatbill (*Tolmomyias sulphurescens*). We found one nest of this species in tropical dry forest, hanging from the limb of a *Xylosma* sp. tree. Nests in Trinidad were found to range from 2–12 m high and in Costa Rica from 2–7 m high (Skutch 1960, ffrench 1991). The nest was made of dry, course, straw-like grasses, weeds, and bark, and was lined with the soft seed down of *E. ruizii*. Unlike descriptions given for the species in Costa Rica, Trinidad, and Mexico, the nest was not made primarily of dark, hair-like fibers (Skutch 1960, ffrench 1991, Howell & Webb 1995). The nest was elongated vertically and enclosed, with a tube entrance coming up from the bottom of the nest, and was much larger than the 25 x 13 cm nests described in Trinidad (ffrench 1991, Table 1). We had to make a small hole in the side to view the contents, but unfortunately the parents abandoned it afterwards and we were unable to determine incubation or nestling periods. There were two light tan-colored eggs in the nest, with small brown spots clustered mostly at the thicker end, similar to what other authors observed (Skutch 1960, ffrench 1991, Howell & Webb 1995).

Tawny-crowned Pygmy-tyrant (*Euscarthmus meloryphus*). Eighty six percent of the 14 nests we found were in arid scrub and 14% in tropical dry forest. The nests were found in a total of five different plant species, with *C. lutea* 54% of the time, *Guapira* sp. 13% of the time, and *C. corimbosa*, *P. juliflora*, and an unknown species 8% of the time each. Marchant (1960) found 20 nests ranging from 0.5–1.7 m high. The small and fragile cup nests were made of tiny sticks, dry weed stems, vines, bark, grass, lichen, and the soft cotton-like seed down of *I. carnea* or *E. ruizii*. Nests were well hidden in the scrub, and were often nearly transparent. Marchant (1960) provided a similar nest description. Clutch size ranged from one to three eggs, though Marchant (1960) only found nests with two eggs. The eggs were white with tiny brown spots around the middle; I did not observe any lavender spots as mentioned by Marchant (1960). Marchant (1960) listed the incubation period as 14–15 days and the nestling period 11–12 days.

Bran-colored Flycatcher (Myiophobus fasciatus). Seventy five percent of the five nests were found in tropical dry forest and 25% in arid scrub. Two nests were in the tree *Pithecellobium* sp., and the others were in *J. pubescens*, *Scutia* sp., and *A. graveolens*. Nests were small cups consisting of strands of dark lichen woven with dry, flexible twigs or vines, and sometimes strips of bark. In Trinidad, nests were made from bark, bamboo sheaths, and cobweb and lined with fine fibers or plant down (ffrench 1991). The eggs were cream-colored, with dark orange spots clustered around the thicker end, and clutch size was always two, which is very similar to the description of Colombian eggs and clutch size observed by Sclater & Salvin (1879). ffrench (1991) gave the clutch size in Trinidad as one or two, and

described the eggs as cream colored with red-brown spots forming a wreath. In Costa Rica, Skutch (1960) found the incubation period to be 17 days, but listed the nestling period as 15–17 days.

Vermillion Flycatcher (*Pyrocephalus rubinus*). All 13 nests were found in arid scrub. Ninety three percent of the nests were in *P. juliflora* and 7% in *C. lutea*. Marchant (1960) found 200 nests over a four year period, the majority of which were in dead bushes, *C. lutea* and *Pithecellobium sp.* The nests we found were almost always in trees along dirt roads, rather than in the forest; and placed on top of branches (glued with domestic animal feces) or in a fork. The shallow cup nests were made of fine dry weeds and vines, feathers, lichen, and the seed down of *I. carnea* or *E. ruizii*. These descriptions are similar to Marchant's (1960). Nests in Colombia were made from lichen and grass and in Mexico from fine twigs, grasses and fibers (Hilty & Brown 1986, Howell & Webb 1995). Marchant (1960) found nests that ranged in height from 0.8–5.6 m. The eggs were white with a belt of brown spots around the middle. In Colombia and Mexico the clutch was two or three and the eggs were white with large red-brown or dark brown and gray spots (Hilty & Brown 1986, Howell & Webb 1995). Marchant (1960) found the incubation period to be 13–14 days and the nestling period to be 13–15 days.

Black-and-White Becard (Pachyramphus albogriseus). All four nests were found in tropical dry forest and all in large trees at least 10 m tall with a DBH of at least 18 cm. Nests were found in *Ceiba trichistandra*, *P. juliflora*, *Albizia guachapele*, and *C. heterophylla* trees. In Costa Rica, nest height ranged from 7–20 m (Stiles & Skutch 1989). Nests were enclosed spheres wedged in the fork of branches or the trunk, with an entrance hole on one side. They consisted of soft, flexible strips of bark and small sticks. Costa Rican nests were made of dead leaves, moss and vine bits (Stiles & Skutch 1989). The nests were too high to reach with the 6 m ladder, and thus measurements given are based on visual estimates using a tape measure (Table 1). Further, we could not obtain reliable information for incubation and nestling periods based solely on parental cues. Parents were seen adding material to the nests through the entire activity period, the longest being 40 days.

One-colored Becard (*Platypsaris homochrous*). All 25 nests were found in tropical dry forest and all were located in large trees, with 63% in *P. juliflora*, 31% in *C. trichistandra*, and 6% in *Z. thyrsiflora*. Nests were enclosed and hung from a branch in a triangle or pear shape with a small entrance hole in the side. Nests in *P. juliflora* were almost always hanging over a seasonal riverbed while nests in *C. trichistandra* never were. Nests were primarily made of dry, straw-like grass and weeds; but vines, lichen, and small sticks were also used. The inside cup of the nest was lined with feathers, dry leaves, and the soft cotton-like seeds of *E. ruizii*. Nest foliage cover was much lower in all directions than the nests of most other species in this paper, likely because the nests were hanging. We made small holes in the sides of several nests to view the contents. One of the nests we opened became abandoned by the parents, and the other was repaired. The eggs were cream-colored with many tan spots at the wider ends, which is similar to a description of Colombian eggs (Sclater & Salvin 1879). Because the nests were high and enclosed we could not determine the incubation period. The estimated nestling period was 24–29 days, based on observations of parents bringing food. The actual period may be shorter. To my knowledge, incubation and nestling periods are not yet described for this species.

FIG. 3. Egg of the Fasciated Wren (*Campylorhynchus fasciatus*).

*Fasciated Wren** (*Campylorhynchus fasciatus*). All 15 nests were found in tropical dry forest. Thirty percent of nests were found in *P. juliflora*, 21% each in *J. pubescens* and *Z. thyrsiflora*, and 7% each in *Guazuma ulmifolia*, *A. cartwrightianus*, *Citrus reticulate*, and *C. heterophylla*. Nests were enclosed and irregularly-shaped, and were often clumped with non-active or sleeping nests. The nests were principally made of straw-like dry weeds and soft strips of bark, with dry leaves and sometimes bits of human trash, such as string or plastic bags. In the nest measurements given, external diameter refers to the longest (horizontal or vertical) part of the nest while external height refers to the perpendicular measurement (Table 1). We were only able to open one nest as most nests were too high or past the egg stage. The nest had four cream-colored eggs with tiny tan spots (Fig. 3). Although we made behavioral observations at each nest, it was nearly impossible to determine if parents were bringing food to the nest to feed nestlings or to feed the other incubating parent. In northern Peru, nests were made of grass and lined with feathers and cotton and incubation was estimated to be 17 days (Brewer 2001). To my knowledge, the eggs of this species have not been previously described.

Speckle-breasted Wren (*Thryothorus sclateri*). We found one nest on the ground in tropical dry forest very well camouflaged in a clump of weeds. The nest was enclosed with a side entrance and made from small sticks and vines, leaves, and lichen (Fig. 4). The nest had four white eggs, evenly covered with small brown spots (Fig. 4). After 7 days of observing the nest we found broken eggs inside and no sign of the parents, therefore we could not determine incubation or nestling periods. To my knowledge, this is the first description of the nest and eggs of this species.

*Long-tailed Mockingbird** (*Mimus longicaudatus*). Fifty six percent of the 16 nests found were in arid scrub and 44% in tropical dry forest. The mockingbirds used seven different plant species for nesting, with 36% in *C. lutea*, 29% in *A. cartwrightianus*, and 7% each in *P. juliflora*, *J. pubescens*, cardon, *A. rorudiana*, and *Mimosa* sp. Marchant (1960) found 239 nests over a 4 year period with an average height of 1.7 m, the majority of which were in *Capparis* sp., *J.*

FIG. 4. Nest (left) and egg (right) of the Speckle-breasted Wren (*Thryothorus sclateri*).

pubescens, and *A. cartwightianus*, all of which are spiny. Nests were shallow cups or platforms composed of medium-sized, often spiny sticks. The cups of the nests were lined with grasses, weeds, dry leaves, or lichen. Marchant (1960) describes the lining as composed of brown rootlets, plant stems, and hair. It was impossible to tell if the eggs were laid by just one female, since several females often lay in one nest. Marchant (1960) found clutches ranging from two to five eggs. The eggs were blue with lots of brown, streaky spots, differing greatly from Marchant's (1960) description of greenish eggs spotted and smeared with reddish-brown. However, the eggs of this genus may vary in color (Taczanowski 1877, Marchant 1960). Marchant (1960) found the incubation period to be 12–13 days and the nestling period to be 11–14 days.

Tropical Gnatcatcher (*Polioptila plumbea*). Seventy five percent of the 16 nests found were in arid scrub and 25% in tropical dry forest. Seventy nine percent of nests were found in *C. lutea*, and 7% each in *A. rorudiana*, *Mimosa* sp., and *C. heterophylla*. Marchant (1960) found 31 nests that ranged in height from 0.6–3.2 m, mostly in *C. lutea* and dead bushes; while in Costa Rica nest height ranged from 2–8 m (Stiles & Skutch 1989). Marchant (1960) stated that the cup nests "are often entirely conspicuous and unprotected," but all the nests we found were very well hidden as they were very small, made in the "V" of two branches, were the same color as the branches, and were often even slanted in the direction of the branch. Nest material consisted mostly of dry grass and the soft, cotton-like seed down of *I. carnea* or *E. ruizii* with some weeds, lichen, feathers, spider web, and small sticks woven in. Costa Rican nests were described as "dainty moss and lichen cups saddled on limbs" (Stiles & Skutch 1989). The eggs were white with brown specks and clutch size, incubation, and nestling periods agreed with descriptions by Marchant (1960) and Stiles & Skutch (1989).

Rufous-browed Peppershrike (*Cyclarhis gujanensis*). We found two nests of this species in tropical dry forest, both in *C. lutea*. The deep cup nests were made almost entirely from dry grass or vine, with a bit of seed down from *E. ruizii* in the cup. In Trinidad nests were made of fine roots and moss (ffrench 1991), in Panama one was found that was made almost entirely of moss (Worth, 1938), and in Costa Rica nests were made from lichen, green moss, and spider's egg cases and lined with coarse vegetable material (Skutch 1967). In Trinidad and Costa Rica, nests were usually

very high with two to three eggs (ffrench 1973, 1991; Skutch 1967). The eggs were very pointy and colored white with tiny light brown spots, similar to what Skutch (1967) found but differing from eggs described from Trinidad and Venezuela which were white and did not show any larger blotches of brown (Cherrie 1916, ffrench 1973).

Red-eyed Vireo (*Vireo olivaceus*). Sixty five percent of 17 nests were found in arid scrub and 45% in tropical dry forest. Eighty two percent of the nests were in *C. lutea*, 12% in *B. graveolens*, and 6% in *P. juliflora*. Marchant (1960) found 15 nests with an average height of 3.6 m. The small cup nests were suspended from small twigs and were usually very well hidden in the foliage, agreeing with Marchant's (1960) observations. The nests were made from dry weeds, vines, and bark and lined with black lichen, feathers, and seed downs of *E. ruizii* or *I. carnea*. The eggs were creamy-white with very few tiny spots as reported by Marchant (1960). In Panama, nests usually had two white eggs spotted blackish mostly at the larger end (Hilty & Brown 1986). In Costa Rica, both the incubation and nestling periods were 12–14 days (Skutch 1945) while Marchant (1960) found an incubation period of 12–13 days and a nestling period of 10–11 days.

*Plumbeous-backed Thrush** (*Turdus reevei*). All five nests were found in tropical dry forest in spiny trees, often close to the trunk and very well hidden. The trees were *G. spinosa*, *Scutia* sp., *C. lutea*, *Xylosma* sp., and *Tabebuia billbergii*. The shallow cup nests had thick walls made of sticks and vines, with bits of lichen and dry leaves and were held together with domestic animal feces (cows or horses). The eggs were blue with lots of brown spots (Fig. 5). Best *et al.* (1996) found one nest of this species in the Loja province of southwestern Ecuador, composed of dry grass, fine twigs, and dry leaves 2 m up in a small tree leaning over a ravine.

Streaked Saltator (*Saltator striatipectus*). Eleven of the 22 nests found were in tropical dry forest and the remaining in arid scrub. The saltators used seven different tree species for nesting; 41% in *C. lutea*, 18% in *Scutia* sp., 12% in *Mimosa* sp., and 6% each in *A. graveolens*, *C. heterophylla*, *Guapira sp.*, and an unknown species. Nest height ranged from 1.1–6 m, very similar to nests found in Colombia (Sclater & Salvin 1879). The cup nests were messily constructed of sticks and bark on the outside with some dry weeds and vines, lichen, and leaves. The eggs were blue with dark squiggles around the thicker ends, similar to eggs in Colombia (Sclater & Salvin 1879). In Colombia, usually only two eggs were observed (Sclater & Salvin 1879). In Costa Rica, chicks fledged after 13 days (Skutch 1954).

Southern Yellow-grosbeak (*Pheucticus chrysogaster*). Sixty three percent of 43 nests were found in arid scrub and 37% in tropical dry forest. Thirty eight percent of the nests were found in *C. lutea*, 9% in *P. juliflora*, 7% in *J. pubescens*, 5% each in *C. heterophylla*, and unknown species, and 2% each in *M. americana*, *Xylosma* sp., *C. trichistandra*, and *Mimosa* sp. Marchant (1960) found six nests ranging in height from 2.9–4.3 m. Nests were loosely constructed shallow cups placed precariously on the tops of branches and made primarily of small sticks or weed stems with some grass and vines woven in, similar to what Marchant (1960) observed. The eggs were blue with brown streaks, and clutch size ranged from two to four, corresponding to Marchant (1960). Marchant (1960) found the incubation period to be 14–16 days and the nestling period to be 10–12 days.

*Parrot-billed Seedeater** (*Sporophila peruviana*). We found one nest of this species in arid scrub in a *C. lutea*. Marchant (1960) found 321 nests over a 4 year period in southwestern Ecuador, the majority of which were in *C. lutea* and

FIG. 5. Nest (left) and egg (right) of the Plumbeous-backed Thrush (*Turdus reevei*).

Pithecellobium sp. at an average height of 1.8 m. The small and fragile transparent cup nest was made of dry vines and lichen, differing from Marchant's (1960) nests which were "nearly always of the bright brown or greenish brown, hirsute tendrils of a certain unidentified creeping or trailing plant." The nest had two white eggs with beige spots, but the eggs can be very variable in coloration and the clutch size can range from one to four (Marchant 1960). Both chicks successfully fledged after we had been watching the nest for 20 days. The incubation period was at least 9 days; Marchant (1960) determined a period of 11 days. The nestling period was 11 days, agreeing with Marchant's (1960) results.

*Crimson-breasted Finch** (*Rhodospingus cruentus*). Ninety one percent of the 220 nests we found were in arid scrub and the other 9% in tropical dry forest. The finches used nine different species for nesting; *C. lutea* 90% of the time, *M. americana* and an unknown species 2% of the time each, and *Pithecellobium* sp., *A. arborescens*, *Scutia* sp., *C. riviniaefolius*, *J. pubescens*, and *Mimosa* sp. 1% of the time each. Marchant (1960) found that the majority of the 113 nests he studied were also in *C. lutea*, with an average height of 1.4 m. The small cup nests were often well covered by foliage and the outside consisted of very fine dry vines and weeds, small sticks, leaves, tree bark, green lichen, spider web, and soft seed downs of *I. carnea* or *E. ruizii*. The inside of the cup was mostly woven with black lichen. Marchant (1960) provided a similar nest description. The eggs were white with a few large dark brown splotches and lots of tiny dark brown spots, similar to those observed by Marchant (1960). Marchant (1960) found an incubation period of 10–11 days and a nestling period of 7–9 days.

*Collared Warbling-finch** (*Poospiza hispaniolensis*). All eight nests were found in arid scrub. Seven of the eight nests were in *C. lutea* and

FIG. 6. Egg of the White–edged Oriole (*Icterus graceannae*).

the other was in *C. heterophylla.* Marchant (1960) found 83 nests over a 4 year period in southwestern Ecuador, the majority of which were also in *C. lutea* at an average height of 1 m. The thick outside walls of the cup nests were made from small sticks, dry stems, and bark while the insides were lined with dried weeds, vines, and lichen, differing slightly from Marchant's (1960) description of nests as formed of "dead gray grasses without special lining." The eggs were light blue with a few dark splotches at the larger ends. Marchant (1960) found nests with two to five eggs, an incubation period of 11–12 days, and a nestling period of 8–9 days.

*White-edged Oriole** (*Icterus graceannae*). We found two nests of this species in tropical dry forest, one 4 m up in a *P. juliflora* tree and one 3 m up in a *Scutia sp.* Marchant (1960) found a single nest 1.8 m high. The deep cup nests were constructed from flexible dry grass or vine and weeds, similar to what Marchant (1960) observed. The nests were so thinly woven that they were transparent and the eggs could be seen through the nest wall. The eggs were cream-colored with large, messy dark brown splotches mostly at the thicker end (Fig. 6). One nest was found with three eggs but was empty after seven days of observation. The other nest was found with two half-grown nestlings that fledged after six days. To my knowledge, the eggs, incubation, or nestling periods have not been previously described.

*Scrub Blackbird** (*Dives warszewiczi*). All seven nests were found in tropical dry forest, with five of them located in a seasonally dry riverbed and the other two in an orchard. Three nests were in *P. juliflora*, one in *C. lutea*, and one in *Citrus limon.* Nests were messy shallow cups made of fine sticks, grass, mud, weeds, and bits of banana leaves. The eggs were blue with black spots. To my knowledge, there are no other descriptions of the nest, eggs, or incubation and nestling periods of this species.

DISCUSSION

This paper provides descriptions of the nests, eggs, incubation and nestling periods, and nest placement of 32 species (14 of which are

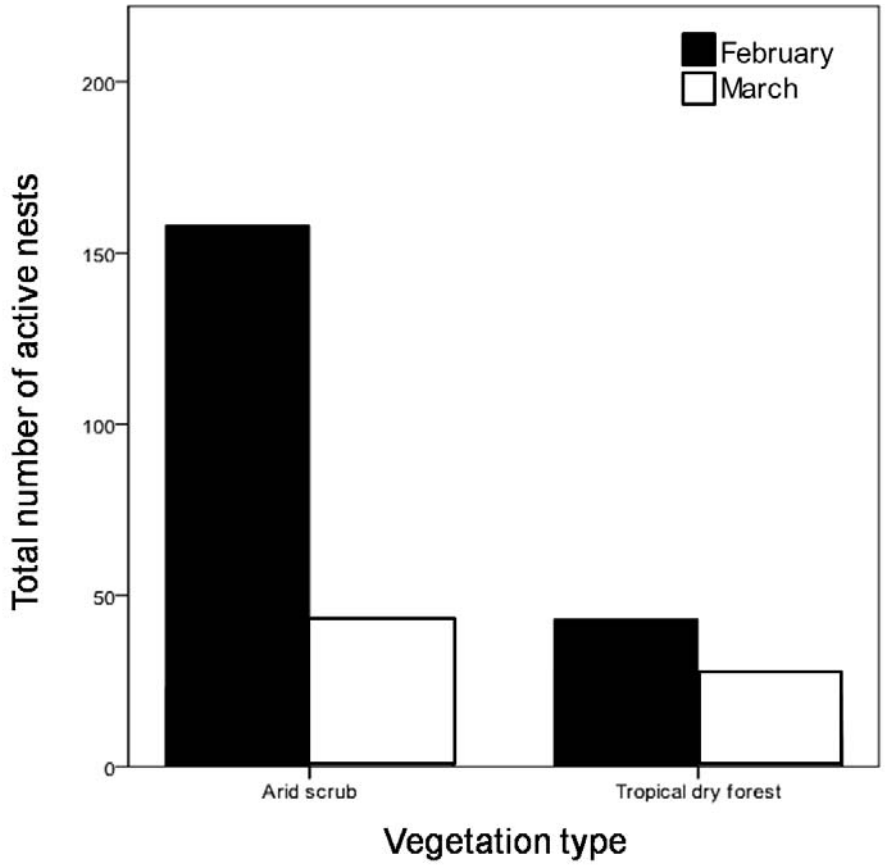

FIG. 7. Total numbers of active nests found during each month of the field season (January–May) for 2008 and 2009 combined.

endemic) in the highly vulnerable Tumbes region of coastal Ecuador. First observations of some or all of this information are given for 12 species (highlighted with bold font in Table 1). The Tumbesian region is among the five most species-rich regions of the world in terms of endemic species and is therefore considered a critical priority area for conservation action (BirdLife International 2003). Like much of the region, Machalilla National Park suffers from continual degradation from human use and most of the vegetation is in some stage of recovery from excessive grazing and removal of trees for charcoal production (Zambrano & Vargas 1998). Several small communities still exist within the park and residents make a living by farming goats, cattle, horses, and pigs, all of which roam freely and cause considerable damage to the vegetation (pers. observ.). The majority of the plant species used for nesting and nest building were endemic to the Tumbesian region; including *C. lutea*, *C. trichistandra*, *P. juliflora*, *E. ruizii*, *Pithecellobium* sp., *B. graveolens*, *Capparis* sp., and *C. riviniaefolius.* Several other plant species used are endangered, such as *Z. thyrsiflora* and *T. billbergii.* Continued destruction of these endemic plants for charcoal production,

livestock grazing, and timber will surely have negative consequences for the long-term persistence of the birds in this region.

Many species (n = 14) nested most frequently in *C. lutea*. This is most likely due to a combination of factors; *C. lutea* is the most common tree in arid scrub vegetation, it exhibits extensive horizontally growth and thus provides a lot of cover for nests, and because it does not usually grow more than 6 m tall nests in this species were likely easier to find than those in the crowns of taller trees. Similarly, although we found that most species have an average nest height close to 3 m, this may be due to the fact that nests at this height are the easiest to find. Incubation and nestling periods varied, sometimes greatly, between nests of the same species both within the study area and between the study area and the Santa Elena Peninsula where Marchant (1960) collected his data, highlighting the fact that these periods are influenced by many factors, such as food availability and temperature (Gill 1990). Although we searched for nests from January to May of 2008 and 2009, all active nests were found in February and March of these years (Fig. 7), perhaps because vegetation was most dense and green during this time. Further, many species showed very short nesting cycles in the range of 20–30 days. As was pointed out by Marchant (1960), this is likely an adaptation to the short and uncertain rainy season in the region. While much of the information given in this paper was previously published by Marchant (1960) and others, none of the previously published data came from Machalilla National Park. Further, few existing publications include information on egg and nest sizes or nest placement (but see Marchant 1960). Obtaining natural history information on the birds in the region is especially important given the high number of endemic species and the imminent threats of climate change and further habitat destruction and will be crucial not only for evolutionary studies but for conservation efforts as well.

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