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Observations on the breeding of *Basileuterus* warblers in Ecuador

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The genus *Basileuterus* contains 24 species ranging from Mexico and the southwest USA to Bolivia, and reaches its greatest diversity in northern South America (Curson *et al*. 1994). There are eight species in Ecuador (Ridgely & Greenfield 2001), four of which are sympatric in the part of eastern Ecuador studied here. Little or nothing is known of the breeding habits of most of the genus, but described nests all appear to be on or near the ground and are domed cups with a side entrance. Here

TABLE 1
Dry weight (grams) nest component data for *Basileuterus* warblers.

		trifasciatus	*coronatus*	*tristriatus*
1° lining	Soft orange tree fern fibres	0.0	0.0	1.69
	Pale grass and plant fibres	0.29	6.73	0.0
	Soft pale tree fern chips	6.21	0.0	0.0
	Black rootlets	0.58	0.0	0.0
2° lining	Coarse orange tree fern fibres	0.0	0.0	2.16
	Moss	0.43	0.0	0.0
	Pale grass and plant fibres	0.0	2.74	0.0
	Black rootlets	0.0	0.10	0.0
3° lining	Pale grass and plant fibres	___	___	6.96
Dome and body of nest	Moss	3.69	7.40	6.87
	Sticks and leaf petioles	1.29	2.14	0.78
	Leaves	0.32	19.90	12.51
	Black rootlets	1.99	0.84	4.03
	Dark tree fern chips	0.0	0.04	0.0
	Extra fine dirt and material	2.55	0.0	0.0
Totals		17.35	39.35	35.00

we summarise current knowledge on the breeding of, and present additional observations for, four of the eight species found in Ecuador.

Observations on *Basileuterus nigrocristatus*, *B. coronatus* and *B. tristriatus* were made around Yanayacu Biological Station (00º35'S, 77º53'W) in Napo province, eastern Ecuador at elevations ranging from 1,950 to 2,250 m. Cloud forest in the area is interspersed with cattle pastures and naturally occurring *Chusquea* bamboo, but large tracts of intact forest remain.

Observations on *B. trifasciata* were made around the small town of Celica in southern Ecuador's Loja province. Most forest in this area has been cleared but small tracts of disturbed forest remain as patches within cattle pasture. For a more complete site description see Dobbs *et al*. (2001). Transcriptions and videos of this species are deposited in the Yanayacu Video and Sound Library.

Nests were measured to the nearest 0.5 cm in most cases and to the nearest 0.1 cm for *B. trifasciata*. To ascertain the relative proportions of various materials used in nest construction, nests were air dried for over three months. Following this they were separated into their various components and weighed.

Species accounts

THREE-BANDED WARBLER *Basileuterus trifasciata nitidior*

This warbler is endemic to the Tumbesian region of north-west Peru and south-west Ecuador (Fjeldså & Krabbe 1990, Curson *et al*. 1994), and in Ecuador is most com-

mon in our study area near Celica (Ridgely & Greenfield 2001). Following recent authors (e.g. Curson *et al*. 1994, Ridgley & Greenfield 2001), Three-banded Warbler is considered to be represented by two subspecies, with *nitidior* in Ecuador. Whilst Best (1992) reported singing birds and an active nest during the rainy season (January–March) in south-west Ecuador, the nest has never been formally described and nothing is known of the species' breeding biology.

The first nest was encountered on 13 February 2000 when an adult was flushed from it and found to be incubating two eggs. On flushing, the bird performed a distraction display by hopping on the ground with its wings held above its head. After moving several metres in this fashion, it joined its mate, and both adults scolded the observer from nearby underbrush. The two eggs were creamy pinkish white with maroon-brown speckling heaviest at the larger end, and measured 17.68 mm by 13.39 mm and 17.70 mm by 13.95 mm respectively. On 23 February the nest was found empty but seemingly intact.

On 2 March 2000 a second nest was found with a single egg identical to those described above. On 3 March the nest was observed while the female laid the second egg at 06.25 h. The female approached the nest chipping loudly while the male sang *c*.3 m away. Incubation of the first egg had apparently not commenced, as it was cold at the time of laying the second egg. No further observations were made at this nest.

On 29 March 2001 a third nest was found containing two nestlings. On 31 March the nest was filmed from 07.00 h to 14.00 h. These videos were later transcribed and we summarise the information here. The young had yellow gapes with red mouth linings and begged horizontally from the nest opening. They often anticipated the arrival of an adult by 1–2 seconds, particularly in late morning, and begged irregularly in the absence of adults. In begging, nestlings emitted a thin, high-pitched call. Adults did not enter the nest to feed the young, but perched just below the entrance. They were always seen foraging together, and commonly fed together in rapid succession. Thirty-seven percent of feedings were followed within one minute by a feeding by the second adult. When feeding in succession adults commonly fed different nestlings despite the fact that nestlings would rapidly swallow prey and resume begging. Adults spent only brief periods at the nest and no rapid probing of the nest lining was seen as in other species at this site (e.g. *Grallaria guatamalensis*: Dobbs *et al*. 2003).

During the seven hours of video observation, nestlings were fed 105 times (range 8–20 feeds/h; mean 15 feeds/h). Adults most frequently arrived carrying a single arthropod, the size of the bill or smaller. They fed only one nestling on 56 of 66 feeds where this behaviour was visible. Less frequently they arrived carrying several prey items, which appeared to coincide with disturbances around the nest during which adults continued to forage. While most food items could be identified no more specifically than arthropods, twice adults were seen to feed a single katydid (Orthoptera, Tettigoniidae), once a walking stick (*Phasmida*), and once each a lepidopteran larvae and an adult. If a nestling had difficulty in swallowing an item,

adults would remove the prey and manipulate it before returning it to the same nestling.

In seven hours, the adults removed eight faecal sacs. Before producing a faecal sac, nestlings turned 180º and held their cloacas to the edge of the nest, where adults took the faecal sac directly from the nestling. Occasionally the faecal sac would fall, and the adult would retrieve it as it rolled down the front of the nest.

Of the three observed nests, two were on the ground nestled in low dirt banks within disturbed habitats. The third, that videotaped, was beside a small boulder roughly 2 m by 4.5 m by 1.5 m tall. This nest was *c*.65 cm above ground and constructed into the moss and ferns growing on the boulder. All nests were bulky domed cups. The first two had no perceivable lip in front of the cup, whereas the third had a 10 cm-wide lip extending 12.5 cm in front of the opening. The dimensions of two nests were recorded. Respectively, the entire domed structures measured 12.5 cm and 11.2 cm tall, by 14.5 cm and 15.6 cm wide by 11.0 cm and 13.0 cm deep. The openings measured 3.3 cm and 3.2 cm deep, by 3.2 cm and 3.2 cm tall by 5.6 cm and 6.4 cm wide. The chambers inside measured 8.0 cm and 7.5 cm tall. The cup of one measured 5 cm by 5 cm and *c*.4 cm deep. That of the second measured 5.8 cm by 6.2 cm and was 3.8 cm deep. In both nests the dome was of small twigs, rootlets and moss woven together. The cup of one was lined solely with very fine, pale dead grasses and the cup of the second was lined with these dead grasses plus soft, pale tree fern chips and a few black rootlets. Closer inspection of the second nest revealed a secondary lining of pure moss, but it was not well differentiated from the components of the dome. This second nest, that beside the small boulder, was collected after the young has fledged, and its components dried and weighed. The entire nest weighed 17.35 g and the various component weights are given in Table 1.

Additional observations for this species include adults with dependent fledglings on 28 April 2000 and on 3 May 2001.

BLACK-CRESTED WARBLER *Basileuterus nigrocristatus*

This species is closely related to Citrine Warbler *B. luteoviridis* and Pale-legged Warbler *B. signatus*, but the taxonomic status of this group is unresolved (Curson *et al*. 1994). Despite being distributed at 1,300–3,400 m, on both slopes of the Andes, from northern Venezuela to central Peru (Hilty & Brown 1986), there is surprisingly little morphological variation throughout Black-crested Warbler's range, and no subspecies or races have been described. Most published breeding data are from Colombia: Sclater & Salvin (1879) provided a brief description of the nest and egg; Hilty & Brown (1986) recorded birds in breeding condition in May–July and three feathered nestlings in October; juveniles were reported in March, June, July, October and January (Olivares 1969, Hilty & Brown 1986). Additionally, in Ecuador, juveniles have been reported in February and May (Fjeldså & Krabbe 1990, Curson *et al*. 1994) and breeding-condition birds and a nest with eggs in October (Guerrero 1996). Guerrero (1996) described the nest as spherical with a

side entrance, suspended in vegetation 80 cm above ground, and constructed of thick plant fibres.

Our first nest found was found in mid-November 1996. It was spherical, *c*.15 cm in diameter, with a side entrance and constructed predominantly of dried grasses. It was located beside the trail in the Cordillera de Guacamayos, 5 km south-east of Yanayacu Biological Station, at 2,250 m. Supported by living plants, it was *c*.50 cm above ground. The nest contained a single egg with red-brown spotting. Approximately one month earlier the same nest contained two nestlings (J. Nilsson pers. comm.). It appears, therefore, that the same pair was attempting a second brood. No further data were obtained from this nest.

Subsequently, on 20 May 2001, a second nest was encountered adjacent to a trail on the privately owned preserve of Cabañas San Isidro at 2,200 m. It was suspended within *Chusquea* sp. bamboo (Poaceae), *c*.1 m above ground. At 11.15 h on 20 May an adult was flushed from the nest and two white eggs with heavy dark red spotting were discovered. The markings were heaviest at the larger end and formed a distinct ring. They measured 20.8 mm by 14.3 mm and 20.5 mm by 14.3 mm respectively. The nest appeared to be constructed entirely of interwoven, dead bamboo leaves and was domed, with a side entrance facing the trail (roughly north-east). The cup measured 5 cm in diameter by 3 cm deep. Outside, the nest measured 15 cm tall by 15 cm wide with a 5–10-cm lip of bamboo leaves leading to the entrance. The nest was visited again on 2 June and was found torn apart. While we could not collect the nest, our initial observations appeared correct in that the nest was almost entirely of bamboo leaves with perhaps a few black rootlets for structural support.

RUSSET-CROWNED WARBLER *Basileuterus coronatus*

Eight subspecies of this species are currently recognised, grouped into white-bellied and yellow-bellied forms (Curson *et al*. 1994). *B. c. orientalis* is an intermediate form and is found in our study area (Ridgely & Greenfield 2001). Curson *et al*. (1994) described the nest as 'on a bank on the ground and…probably domed' but no published description appears to be available. Breeding-condition birds have been reported in February–October in Colombia, and dependent young or juveniles in Colombia in May–October and in Peru in February–August (Hilty & Brown 1986).

A nest of the species was found on 21 September 2001, near a stream adjacent to the Yanayacu Biological Station, 5 km west of Cosanga, at 2,150 m. At 08.15 h on the date of discovery, an adult was flushed from the nest and found to have been incubating two eggs, which were pale pinkish buff with red-brown speckling concentrated at the larger end. They measured 21.3 mm by 15.0 mm and 21.4 mm by 15.2 mm respectively. On 30 September the nest was found empty but intact.

The nest was 8 m from a small stream in partially disturbed forest with an intact canopy dominated by *Vismia* sp. (Clusiaceae), *Bunchosia* sp. (Malphigiaceae), *Nectandra* spp. (Lauraceae) and *Solanum* sp. (Solanaceae). The understorey was

fairly dense and dominated by *Chusquea* sp. (Poaceae) and various Piperaceae, Solanaceae, Gesneriaceae and Urticaceae. The nest was a moss, stick and leaf ball bound with fine black rootlets and nestled 5 cm above ground into the base of a tree root mass. This root mass formed a bank rising *c*.50 cm to the main trunk. The ball measured 14.5 cm wide by 20 cm tall with a 7-cm lip of leaves (predominantly *Chusquea* sp.), twigs and moss, extending out from a small side entrance, 7 cm wide by 4.5 cm tall, and opened into a chamber measuring 6 cm wide by 7.5 cm tall. The cup was lined with pale grass, pale plant fibres and *c*.40 pale tree fern scales. It measured 5 cm wide by 4 cm deep. On closer inspection, the cup was noted as being formed of two distinct layers: the first (described above) was held within a thinner cup of pale fibres interlaced with black rootlets. The entire dry weight of the nest was 39.35 g and nest composition is given in Table 1.

THREE-STRIPED WARBLER *Basileuterus tristriatus*

This warbler occurs from Costa Rica to central Bolivia and was considered to comprise 13 subspecies by Curson *et al*. (1994). Three subspecies occur in Ecuador and that in our region, *baezae*, is restricted to eastern Ecuador (Ridgely & Greenfield 2001). Nests are reportedly on the ground but have not been well described (Curson *et al*. 1994). From Colombia, Hilty & Brown (1986) reported nests with eggs in April–June, fledglings or juveniles in January–July and September–November, and breeding-condition adults in May–July.

The only nest of this species was located at the edge of a cattle pasture along the Baeza–Cosanga road at 1,950 m. It was on the ground against a 60-cm-high bank and nestled within ferns growing from the bank. The dome was constructed of moss, leaves and a few sticks bound together with a large number of fine black rootlets. The cup comprised three distinct layers: the inner was entirely soft orange-brown tree fern fibres, the middle was constructed of coarse fibres similar to those of the primary lining, and the outer was of pale fibres and a few pieces of skeletonised leaves. The entire dry weight of the nest was 35 g and the various component weights are given in Table 1. The nest was found during construction on 12 May 2001, was noted to contain two white eggs with dark reddish splotching on 27 May 2001, and was found empty and collected in late June.

Each of the four species studied here belongs to a different 'group' of warblers within the genus *Basileuterus*, following Curson *et al*. (1994). The details of nest architecture and nest component data presented here follow the established trend for *Basileuterus* to construct bulky domed nests (Curson *et al*. 1994). It is interesting to note, however, that between these species, detailed architecture ranges considerably. From the relatively simple nest, constructed of mostly or entirely a single material and with no apparent differentiated lining, constructed by Black-crested Warbler, we see a trend of increasing complexity to the nest of Three-striped Warbler which had three distinct cup linings and at least seven types of materials.

Further natural history observations and detailed taxonomic work are needed to further explore these findings.

As mentioned by Curson *et al*. (1994), habitat conservation is a priority for overall preservation of most species. The detailed nest component data presented here reveal that, whilst like many *Basileuterus*, these species breed in relatively disturbed habitat, all except Black-crested Warbler included materials gathered from plant species occurring within mature cloud forest (eg. tree fern scales). This observation points to a need for further detailed natural history studies of these and other taxa to fully elucidate species' habitat requirements, which may be critical for development of appropriate conservation tactics.

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