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NEW BIRD BREEDING DATA FROM SOUTHWESTERN ECUADOR

Brinley J. Best, Matthew Checker, Richard M. Thewlis, Amanda L. Best & William Duckworth

9 Throstle Nest Close, Otley, West Yorkshire, LS21 2RR, U.K.

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Southwestern Ecuador and adjacent northwestern Peru constitute an important area of bird endemism, called the Tumbesan or Tumbesian Centre of Endemism (Cracraft 1985, Ridgely & Tudor 1989). Many of the endemic species were originally included in Chapman's "Equatorial Arid Fauna" (Chapman 1926). This paper presents new data from southwestern Ecuador collected during fieldwork in early 1991. Breeding data are published for the first time from the region on 53 species, with additional information collected on a further 5 species supplementing that already published.

Although Chapman (1926) discussed the study area in detail, only Marchant's data from the Santa Elena Peninsula in Guayas Province (1958, 1959, 1960) provide published avian breeding information from southern Ecuador's Pacific and coast. The extreme southwesternmost provinces of El Oro and Loja are especially poorly known. Breeding data exist from adjacent northwestern Peru (Schulenberg & Parker 1981, Parker *et al.* 1985), notably in the Tumbes National Forest (Wiedenfeld *et al.* 1985, Parker *et al.*, 1995). Marchant (1959) showed that the seasonal rains of January to April were an important trigger for breeding activity on the Santa Elena Peninsula.

Extreme southwestern Ecuador also witnesses a strong wet season (Munday & Munday 1992), yet prior to our 1991 fieldwork, the occurrence of a pronounced breeding season at that time, though assumed, had not been proven owing to lack of published data. Many breeding data can be found on the labels of specimens from the region, notably at the Academy of Natural Sciences of Philadelphia (ANSP), the Louisiana State University Museum of Zoology (LSUMZ) (M. Robbins *in litt.*, 1995) and the Basel Museum of Natural History, Switzerland (originating from W. Markl's studies in northwestern Peru), but this information has not yet been compiled into a single, more widely available form. Collar *et al.* (1992) gave breeding details for a few of the threatened species of the region, and further data have been noted for a handful of species from near Piñas in El Oro Province (Robbins & Ridgely 1990). The only species so far proven to coincide its breeding with the annual rains in southwestern Ecuador is *Caprimulgus anthonyi* (Robbins & Ridgely 1994).

There are pronounced vegetational differences between the Santa Elena Peninsula and the southwestern provinces of El Oro and Loja. The former is dry and only sparsely vegetated by low shrubs and herbs, whereas the latter area supports dry and humid forest, although this is now confined to small patches as a result of human disturbance.

METHODS

From late January to early March 1991 we conducted an eight week ornithological survey of El Oro and Loja Provinces (Best *et al.* 1992). Two major aims of our survey were: (a) to determine whether the rainy season coincides with

the bird breeding season; and (b) to gather new avian breeding data from the region. Survey work in August and September 1989 in the same area found only two species breeding (Best & Clarke 1991). Fieldwork in 1991 was conducted at 14 sites chosen to represent the most extensive areas of forest left in extreme southwestern Ecuador. We arrived at our first study site on 26 January. The annual rains began three days later and continued throughout much of the following eight weeks, bringing a spectacular change in the aspect of the deciduous forest sites surveyed. From dry, almost bare understorey and ground level, the forest changed to luxuriant green growth at all levels. At the wet forest sites vegetational changes were less pronounced and rainfall was high throughout the survey period.

RESULTS

At eight localities we recorded breeding data on a total of 58 bird species (see Table). This includes what we believe to be the first published nesting data for *Turdus reevei* and *T. maculirostris*, two thrushes confined to the region. Both were typical *Turdus* cup-shaped nests composed of dried grasses, fine twigs and dry leaves. A nest of *Turdus reevei* with an incubating adult was

TABLE. Bird breeding activity recorded in south-western Ecuador, January—March 1991

Species	Breeding activity recorded	Locality where data were gathered
*Leucopternis occidentalis**	d, m	2
	d	3, 5
Buteogallus urubitinga	m	1
	d, m	8
Buteogallus meridionalis	d	8
Geranoaetus melanoleucus	m	1
Buteo magnirostris	d	1
*Ortalis erythroptera**	d	3
Chamaepetes goudotii	y	1
Columba fasciata	d	7
Columbina cruziana[1]	c, y	8
*Aratinga erythrogenys**		8
*Pyrrhura orcesi**[2]	y	1
Brotogeris pyrrhopterus	i, c	8
Glaucidium peruanum	na	8
Heliodoxa jacula	m	1
Aglaiocercus coelestis	nb	1
Aulacorhynchus haematopygius	y	1
	f, nf	3
Xiphocolaptes promeropirhynchus	d	8
Furnarius leucopus	f, nf	4
Synallaxis azarae	nf	3
Pseudocolaptes johnsoni[3]	y	1
*Hylocryptus erythrocephalus**[4]	i, m	7
*Sakesphorus bernardi**[1]	nb	8
Zimmerius chrysops	nf	3
Serpophaga cinerea	m, y	1
Lophotriccus pileatus	y	1
Tolmomyias sulphurescens	nb	8
Myiophobus flavicans	m	3
Myiophobus fasciatus	m	1
	fy, nb	3
Contopus fumigatus	nf	3
Myiarchus phaeocephalus	c	8
Legatus leucophaius	d, nb	7
Pachyramphus homochrous	nb	8
Machaeropterus deliciosus	d	1
Hirundo rufocollaris	nb	5, 7
*Cyanocorax mystacalis**	m	7
Campylorhynchus fasciatus	nb	7, 8

Species	Breeding activity recorded	Locality where data were gathered
Troglodytes aedon	m	8
Turdus chiguanco	y	4
*Turdus reevei**	m	4
	na	8
*Turdus maculirostris**	fy, ny	
Cyclarhis gujanensis	m	
Vireo leucophrys	d	
Parula pitiayumi	fy, y	
Myioborus miniatus	nb	
*Basileuterus trifasciatus**	nf	
Euphonia xanthogaster	y	1, 2
Euphonia laniirostris	nb	8
Pipraeida melanonota	m	
Tangara rufivertex	y	
Tangara nigroviridis	m, nb	
Anisognathus flavinucha	m	
Ramphocephalus flammigerus	y	
Piranga flava	nf	
Saltator maximus	f	
Oryzoborus angolensis	fy	
Atlapetes rufinucha	m	
Zonotrichia capensis	nf	3
Cacicus microrhynchus	nf	1

Numbers in superscript after the species name indicate breeding data from southwestern Ecuador have been published for that species previously as follows: 1 = Marchant (1958, 1959, 1960), 2 = Ridgely & Robbins (1988), 3 = Robbins & Ridgely (1990), 4 = Collar *et al.* (1992).

Species with asterisks are restricted to the Tumbesian Centre of Endemism.

Breeding codes: c = copulation, d = display, f = adult carrying food, fy = adult feeding young, i = adult investigating nest hole, m = adult carrying nest material, nf = nest found — contents not established, na = nest with adult, nb = nest building, ny = nest with young, y = fledged young.

Site details listed north to south (location, altitudinal range above sea level and dates of surveys of each site are given in parenthesis): 1. Buenaventura, El Oro Province; humid forest (3 °40' S, 79 °44' W; 900—1.000 m; 24 Feb—4 Mar). 2. Vicentino, Loja Province; humid forest (3 °57' S, 79 °57' W; 900—1.450 m; 14—18 Feb). 3. Tierra Colorada, Loja Province; humid forest (4 °02' S, 79 °57' W; 1.400—1.850 m; 9—19 Feb). 4. Catacocha, Loja Province; semi-humid forest (4 °03' S, 79 °40' W; 1.400—1.750 m; 4—5 & 7—8 Mar). 5. Celica, Loja Province; humid forest (4 °07' S, 79 °58' W; 1.800—2.100 m; 6—8, 14 & 20 Mar). 6. El Empalme, Loja Province; dry forest (4 °07' S, 79 °51' W; 800—900 m; 7 & 17 Feb). 7. Sozoranga, Loja Province; semi-humid forest (4 °21' S, 79 °47' W; 1.300—2.615 m; 30 Jan—1 Feb, 6 Feb, 5—6 & 9—12 Mar). 8. Tambo Negro, Loja Province; dry forest (4 °24' S, 79 °51' W; 600—1.000 m; 26 Jan—7 Feb; 6—9 Mar).

found at Tambo Negro c. 2 m up in a small tree leaning over a ravine. It had thick walls with an outer diameter of c. 15 cm. Two nests of *Turdus maculirostris* were found at Tierra Colorada. The first was situated about 60 cm above the ground in low vegetation by a trail edge (photographs were obtained), and was occupied by three young; the second was placed in a cut tree stump bearing thickly regenerating tree shoots, 1.5 m above the ground.

DISCUSSION

Our data clearly indicate that the months of January to March constitute an important breeding season in extreme southwestern Ecuador, coinciding with the irregular, heavy rainfall which occurs at this time. These results mirror those of Marchant (1959) from the Santa Elena Peninsula, situated approximately 180 km north of our northernmost study site (Uzhcurrumi), and unpublished LSUMZ data of Williams and Cardiff (M. Robbins *in litt.*, 1995). In late March 1991, fieldwork by the Western Foundation of Vertebrate Zoology south-west of Celica in Loja Province, also found many species breeding (L. Kiff, *in litt.* 1991).

Our data also suggest that at the more northerly of our study sites breeding activity was earlier than further south. However, there were not enough observers to survey each site simultaneously, and as we intended to cover a large number of sites in a short period of time, surveys lasted at most two weeks at each site. As a result

we felt that statistical analyses of these apparent fluctuations in breeding stage across the study area would be inappropriate. We confine ourselves here to more general comments.

The best surveyed sites (at least ten days of surveys each) were Buenaventura (9.5 km west of Piñas), Tierra Colorada and Tambo Negro. At Tierra Colorada (4°02'S) in mid-February most breeding activity was indicative of the pre-hatching period (69% of records attributable to pre- or post-hatching activity), whereas a week later at the more northerly site of Buenaventura (3°40'S), 61% of species found breeding had young clearly over a week old, and in some cases (e.g., *Tangara rufivertex*), the condition of fledglings indicated egg laying probably started in late December. Our early March visit to Tambo Negro (4°21'S), the southernmost site, however, showed that breeding activity there was less advanced than at the above two sites with 66% of breeding activity involving nest building.

Although these results suggest that in Ecuador's El Oro and Loja Provinces there may be a latitudinal gradient in breeding periodicity, on the Santa Elena Peninsula at 2°20'S (200 km north of Buenaventura) Marchant (1959) found the breeding season concentrated during the period from mid-February to late March, no earlier than at our more southerly study sites. This situation indicates that increasing latitude may not be directly correlated with a later breeding season across southwestern Ecuador as a whole. The differences in breeding stage discovered during our fieldwork probably result from the highly variable local climatic conditions which affect southwestern Ecuador. These conditions are described in Munday & Munday (1992). The broad variations in habitat type across the region (from desert scrub to very humid forest) also probably play an important role in the variability of nesting seasonality.

Marchant (1959) showed that, over a four year period, the breeding season on the Santa Elena Peninsula varied from year to year by as much as seven weeks, and that the length of the season itself ranged from six to 14 weeks. Such temporal variations in bird breeding activity probably operate throughout southwestern Ecuador, being closely linked to yearly fluctuations in local climatic conditions. Thus, detailed comparisons of the timing of breeding between sites in this region cannot be made until data are gathered in several seasons. It would also be interesting to gather further data from southwestern Ecuador and northwestern Peru during El Niño years when rainfall is early and unusually high, as this also probably has profound effects on bird breeding activity. Robbins & Ridgely (1994) postulated that the breeding period in *Caprimulgus anthonyi* could be more prolonged in El Niño years, with perhaps more than one clutch being produced. During exceptionally dry years, on the other hand, this nightjar may not breed at all. Clearly a standardised, year-round database of bird breeding activity in the region is required, and we encourage other workers to publish existing data and record carefully any breeding activity encountered in the Tumbesian region so that the patterns may be better understood.

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