

Bird diversity and noteworthy records from the western side of the Porculla pass and the Huancabamba-Chamaya river sub-basin, northwest of Peru

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Abstract

Despite the great importance of the level of biodiversity and endemism that the Equatorial Seasonal Tropical dry Forest hosts, many of its areas remain unexplored. Here we present the results of the field evaluations carried out between 2014 and 2018 along the western side of the Porculla pass and the Huancabamba-Chamaya river sub-basin, in the northwest of Peru. This research is part of the dataset of the project Bird Assessments in Ecosystems of the Northwest of Peru – CINBIOTYC. We reported 174 bird taxa, belonging to 163 species and 32 families. Likewise, we reported two migratory bird species, one boreal and one austral, six endemics of Peru, and 31 restricted-range species, from which 25 belong to the Tumbesian Region, seven to the Marañón Valley and one was shared between them. We highlighted the record of four trans-Andean bird taxa, *Amazilia amazilia leucophoea*, *Euphonia saturata*, *Basileuterus trifasciatus*, and *Pyrocephalus rubinus piurae*, as well as, the remarkable records of *Patagioenas oenops*, *Thamnophilus shumbae*, *Pachyramphus spodiurus*, *Turdus maranonicus*, and *Incapiza ortizi*.

Resumen

A pesar de la gran importancia de los niveles de biodiversidad y endemismo que el Bosque Tropical Estacionalmente Seco Ecuatorial alberga, muchas de sus áreas permanecen aún poco exploradas. Aquí se presentan los resultados de las evaluaciones de campo realizadas entre el 2014 y 2018 a lo largo del lado occidental del Abra de Porculla y la cuenca del río Huancabamba-Chamaya, noroeste de Perú. La presente investigación forma parte del proyecto de largo aliento *Bird Assessments in Ecosystems of the Northwest of Peru* – CINBIOTYC. Se reportó 174 taxa de aves, pertenecientes a 163 especies y 32 familias. Así mismo, se registró dos especies migratorias, una boreal y una austral, seis endémicas de Perú, y 31 aves de rango restringido, de los cuales 25 pertenecen a la Región Tumbesina, siete al Valle del Marañón, y una compartida entre ellas. Resaltamos el registro trans-Andino de cuatro taxa de aves, *Amazilia amazilia leucophoea*, *Euphonia saturata*, *Basileuterus trifasciatus*, y *Pyrocephalus rubinus piurae*, así como los registros destacables de *Patagioenas oenops*, *Thamnophilus shumbae*, *Pachyramphus spodiurus*, *Turdus maranonicus*, e *Incapiza ortizi*.

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Introduction

The seasonally dry tropical forest (SDTF) of the southwest of Ecuador and northwest of Peru (Equatorial SDTF) has an outstanding level of endemism and is a critically important hotspot of biodiversity in the world (Linares-Palomino, Kvist, Aguirre-Mendoza, *et al.*, 2010; Myers, Mittermeier, Mittermeier, *et al.*, 2000; Singh & Chaturvedi, 2018) 5-6 dry months within the annual cycle, and nutrient-poor soil. Several terms have been used for this vegetation type such as seasonally dry tropical forest (SDTF. This uniqueness in

the biodiversity is the result of a variety of habitats, ranging from the arid coastal plains to the montane dry forest formations on the Andean slopes (Marcelo-Peña, Huamantupa, Särkinen, *et al.*, 2016; Singh & Chaturvedi, 2018) 5-6 dry months within the annual cycle, and nutrient-poor soil. Several terms have been used for this vegetation type such as seasonally dry tropical forest (SDTF. The partially synchronous uplift process of the northern and the central Andean chains produced the separation of the Equatorial SDTF into two well-defined biogeographic units: the Tumbes/Piura

dry forest ecoregion, on the western side of the Andes, and the Marañón valley dry forests ecoregion, on the eastern side of the Andes (Cadena, Pedraza, & Brumfield, 2016; Hoorn, Wesselingh, Steege, *et al.*, 2010; Oswald, Overcast, Mauck, *et al.*, 2017). Nowadays, Porculla pass, at 2145 m in the northwest of Peru, is the lowest point of this geographical division (Linares-Palomino, 2006; Linares-Palomino, Pennington, & Bridgewater, 2003; Weigend, 2002).

In terms of endemism, in the same way as with the ecoregions, the western and eastern side of the Porculla pass belong to a different endemic bird area (EBA): the Tumbesian Region (EBA 045) and the Marañón Valley (EBA 048), respectively (BirdLife International, 2019b, 2019a). Globally, very few EBAs have the same amount of restricted-range bird species as the Tumbesian Region (55 species) and the Marañón Valley (22 species) (BirdLife International, 2019b, 2019a; Ugaz & Saldaña, 2014). However, the survival of these birds are worryingly supported by small fragments of dry forests and scrub remaining in the area, mainly on inaccessible slopes since most of the natural vegetation has been destroyed by human activities for farmland and livestock (Best & Kessler, 1995; Parker, Schulenberg, Graves, *et al.*, 1985).

The topographic complexity and the access difficulty are responsible for the poor attention this area has received. The last scientific report about the avian diversity of this area has been published 35 years ago by Parker, Schulenberg, Graves, & Braun (1985), who recorded 42 species in the desert scrub northeast of Huancabamba city. To date, no extensive work about the birds of the rest of the Huancabamba-Chamaya system nor the western side of the Porculla pass has been published. Our

goal was to update the checklist of bird species associated with this area, with a special emphasis on the Huancabamba-Chamaya river sub-basin. Additionally, our noteworthy records of trans-Andean bird taxa suggest that exhaustive fieldwork will continue to produce discoveries concerning the distribution and biogeography of the Tumbes-Piura and Marañón valley dry-forest avifauna, and they could give us a better understanding of the interactions between the restricted-range bird species whose populations co-occur on the east side of the Porculla pass.

Materials and methods

Study area

Porculla pass area lies on the north of Peru, between the regions of Piura, Lambayeque, and Cajamarca. This mountain pass has its lowest point at 2145 m in “Cuello de Porculla town” at 5°50′25.26″S, 79°30′21.71″W, Piura region (Figure 1). The western side has uniform open valleys and dense vegetation associated with Tumbes-Piura dry forest ecoregion (Figure 1b). It is dominated by semi-deciduous species at lower elevations, such as *Eriotheca discolor*, *Ceiba trichistandra*, *Bursera graveolens*, and *Loxopterigium huasango*, as well as a more mixed and diverse forest at higher elevations, including species such as *Ocotea cernua* and *Myrcianthes discolor* (Rasal Sánchez *et al.* 2011, Ceroni Stuva 2003, I.S.S personal observation). The upper part of the Porculla pass contains some patches of transitional habitat from cloud forest to dense montane scrub, with species such as *Oreocallis grandiflora*. The eastern side streams create the Huancabamba-Chamaya river sub-basin, which is the westernmost tributary of Marañón river in Peru. This side is eroded and arid, with sandstone and limestone sequences characteristic

of Marañón valley tributaries (Figure 1b, Marcelo-Peña *et al.* 2016). The vegetation, dominated by *Acacia macracantha*, is quite scattered, even more opened as one descends the elevational gradient.

Bird surveys

Since 2014, the Maria Koeppke Lab of Ornithology from the Peruvian NGO CINBIOTYC (Spanish initial of “Centro de Investigación en Biología Tropical y Conservación”), has been investigating the bird diversity in ecosystems of Tumbes,

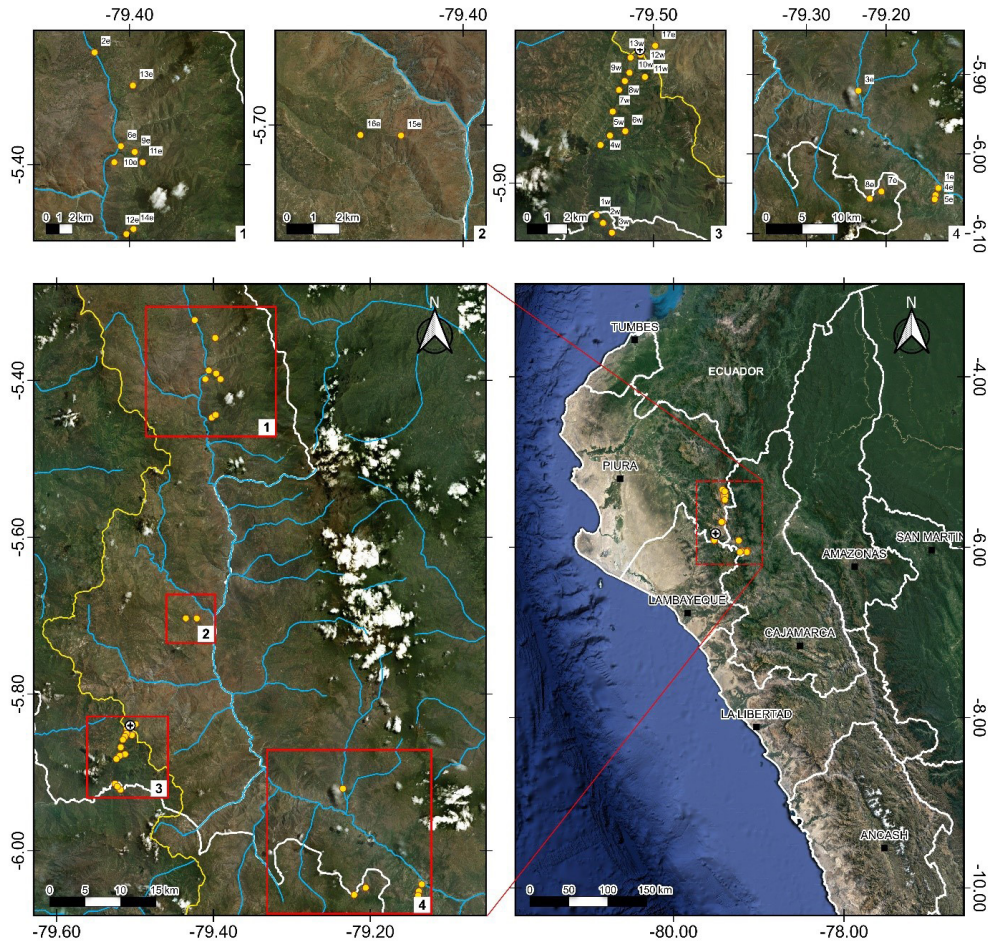


Fig. 1. Location map of the study area. Yellow circles: bird evaluation localities on both sides of Porculla pass. White circle with black cross inside: Porculla pass (5°50'25.26"S, 79°30'21.71"W). Yellow line: watershed separating the Pacific basin (west) from the Amazon basin (east). Light-blue lines: hydrography. Imagery source: Bing Aerial BaseMaps (<https://www.bing.com/maps/aerial>).

Piura, Lambayeque, Cajamarca and La Libertad regions with the self-financed project *Bird Assessments in Ecosystems of the Northwest of Peru* (unpublished data, <https://www.birdsmklo.com/nwperu.html>). The project's goal is to compile and update the information about the distribution of the bird species of northwestern Peru, involving thesis projects, short communications and scientific articles highlighting their field observations. Here we present the presence-only data of 30 georeferenced localities between 1000 to 2200 m on both sides of Porculla pass (Figure 1), obtained between August 2014 to October 2018.

The data collection followed the same methodology in all the localities surveyed: two line-transects of 500 m long per locality with two visits on most of them (n=20),

with a total effort of 50 line-transects, which represent 25 km walked. The evaluations were mainly performed early in the morning or before sunset (5:00–10:00 and 15:00–18:00 hrs). The bird species were identified to subspecies level when it was possible, following the nomenclature of del Hoyo, Elliott, Sargatal, Christie, & de Juana (2018) and the descriptions published in the literature (del Hoyo *et al.*, 2018; Schulenberg, Stotz, Lane, *et al.*, 2010; Ugaz & Saldaña, 2014).

Species accounts

We recorded 174 bird taxa (including species and subspecies reported), belonging to 163 species and 32 families (Table 2). All the species were residents, except for two migratory species, one boreal migratory Black-billed Cuckoo (*Coccyzus*

Table 1. Localities of bird evaluation on both sides of the Porculla pass.

Code	Locality Name	Region	Latitude	Longitude	Elevation
West of Porculla pass					
1w	Paipay	Lambayeque	5°54'51.93"S	79°31'31.64"W	1038 m
2w	Paipay	Lambayeque	5°55'4.65"S	79°31'21.09"W	1132 m
3w	Paipay	Lambayeque	5°55'20.20"S	79°31'6.86"W	1270 m
4w	Chinche	Piura	5°52'58.90"S	79°31'25.29"W	1360 m
5w	Chinche	Piura	5°52'43.64"S	79°31'9.94"W	1470 m
6w	above Chinche	Piura	5°52'36.54"S	79°30'45.31"W	1535 m
7w	west of Cuello de Porculla 1	Piura	5°52'4.97"S	79°31'5.52"W	1637 m
8w	west of Cuello de Porculla 2	Piura	5°51'30.16"S	79°30'55.44"W	1706 m
9w	west of Cuello de Porculla 3	Piura	5°51'15.63"S	79°30'46.01"W	1891 m
10w	west of Cuello de Porculla 4	Piura	5°51'2.31"S	79°30'38.49"W	1979 m
11w	west of Cuello de Porculla 5	Piura	5°51'9.04"S	79°30'13.72"W	2132 m
12w	west of Cuello de Porculla 6	Piura	5°50'33.52"S	79°30'20.46"W	2125 m
13w	west of Cuello de Porculla 7	Piura	5°50'37.98"S	79°30'36.75"W	2160 m
East of Porculla pass					
1e	above Pucara 1	Cajamarca	6° 2'34.29"S	79° 8'3.63"W	1036 m
2e	bridge to Sóndorillo	Piura	5°19'22.93"S	79°25'26.03"W	1740 m
3e	Pomahuaca	Cajamarca	5°55'14.69"S	79°14'5.43"W	1120 m
4e	above Pucara 2	Cajamarca	6° 3'6.38"S	79° 8'16.77"W	1230 m

5e	above Pucara 3	Cajamarca	6° 3'24.94"S	79° 8'20.49"W	1470 m
6e	below Tacarpo	Piura	5°23'14.40"S	79°24'21.38"W	1664 m
7e	route to Atumpampa 1	Lambayeque	6° 2'50.06"S	79°12'20.94"W	1770 m
8e	route to Atumpampa 2	Lambayeque	6° 3'22.51"S	79°13'13.77"W	1912 m
9e	above Tacarpo	Piura	5°23'28.37"S	79°23'47.10"W	1768 m
10e	route to Tuluce	Piura	5°23'54.11"S	79°24'37.41"W	1909 m
11e	route to Mancucur	Piura	5°23'54.24"S	79°23'27.65"W	1758 m
12e	Chirimoyo 1	Piura	5°26'51.04"S	79°24'7.49"W	1861 m
13e	above Sónдор	Piura	5°20'44.79"S	79°23'51.55"W	2128 m
14e	Chirimoyo 2	Piura	5°26'38.55"S	79°23'50.11"W	2024 m
15e	east of San Isidro 1	Piura	5°42'12.98"S	79°25'16.42"W	2080 m
16e	east of San Isidro 2	Piura	5°42'12.49"S	79°26'6.50"W	2170 m
17e	east of Cuello de Porculla	Piura	5°50'18.83"S	79°29'57.04"W	2074 m

erythroptalmus), and one austral migratory Slaty Thrush (*Turdus nigriceps*). Likewise, we reported one vagrant species Orange-crowned Euphonia (*Euphonia saturata*, Figure 11A,B) on the east side of the Porculla pass.

The bird species richness was greater on the western side (144 species) than on the eastern side (121 species) of Porculla pass. We reported six endemic species of Peru and 31 restricted-range species, from which seven are restricted to Marañón Valley EBA, 25 to Tumbesian Region EBA, and one is shared between them (Grey-breasted Flycatcher *Lathrotriccus griseipectus*; Figure 5E). Ten species belonging to the IUCN's red list of threatened species, six Vulnerable (VU), three Near Threatened (NT), and one Data Deficient species (DD; Table 2). We obtained four previously undocumented new records of trans-Andean birds, all of them on the eastern side of the Andes in Huancabamba-Chamaya river sub-basin: Amazilia Hummingbird *Amazilia amazilia leucophoea* (Figure 2D), Orange-crowned Euphonia *Euphonia saturata* (Figure 11A,B), Three-banded Warbler *Basileuterus trifasciatus* and Common Vermilion Flycatcher *Pyrocephalus rubinus*

piurae (Figure 6 A,B; Table 2). Besides, two records were removed from the original checklists due to the lack of evidence to prove them, remaining as hypothetical (not confirmed nor documented) observations to the eastern side of the Porculla pass in the Huancabamba-Chamaya river sub-basin (Maranon Sparrow *Arremon nigriceps* and Maranon Crescentchest *Melanopareia maranonica*). We will discuss our remarkable observations in the following paragraphs.

Ochre-bellied Dove *Leptotila ochraceiventris*

ISS and AB observed an individual walking through the undergrowth, and heard another 30 min later in understory at 1500 m, route to Cuello de Porculla town - Piura region, on 13 June 2016. AU and ABC heard another individual in the same locality, on 28 March 2018. This species has been largely confined to the zone at 500-1800 m due to habitat deforestation. Records of this species are uncommon due to their low abundance in most of their distribution range (Schulenberg *et al.*, 2010). However, its vocalizations are quite distinctive, it is difficult to mistake for *L. verreauxi* (del Hoyo, Elliott, Sargatal, *et al.*, 2019).

Peruvian Pigeon *Patagioenas oenops*

This Marañón valley endemic has been overlooked in the Huancabamba-Chamaya river sub-basin. ISS made an opportunistic record of an individual perching in a *Eucalyptus* sp. tree out of the study area, at 2450 m on the Huancabamba-Canchaque route - Piura region (-5.271753°S -79.472275°W), on 20 July 2017. This record was confirmed later when ISS, DAB, and AB observed and photographed two individuals at 1750 m near Chirimoyo town - Piura region, on 17 May 2018 (Figure 2B). Our records represent the westernmost ones and determine that the species has not been extirped from the area as BirdLife International (2018) states.

Black-billed Cuckoo *Coccyzus erythrophthalmus*

ISS observed on 18 March 2017 an individual flying over an relict forest of *Acacia macracantha*, at 1750 m on the route Sónдор-Sónдорillo - Piura region. Although this common species is widely distributed in Peru during its migration (del Hoyo, Elliott, *et al.*, 2019; Schulenberg *et al.*, 2010), this is the first confirmed record in dry habitats of Marañón valley.

Porculla Hermit *Phaethornis porcellae*

Several observations by ISS, RBG, ABC, and AU between 1250 and 1948 m, mainly in the dense understory. Frequently subordinated by other hummingbirds. It was more common in lower areas. This species is distributed between Loja province -Ecuador and Lambayeque region - Peru. The plumage of *P. porcellae* (Figure 3D) is recognizable paler than that of *P. griseogularis zonura* (Figure 3C), which has been recorded in the Huancabamba-Chamaya river sub-basin (del Hoyo, Elliott, *et al.*, 2019).

Grey-chinned Hermit *Phaethornis griseogularis zonura*

ISS photographed an adult in understory next to a trail above Pucará - Cajamarca region, on 22 March 2017 (Figure 3C). It appears to be rare in this region, no other records were obtained from nearby localities, even in different visits. Maybe nomadic.

Amazilia Hummingbird *Amazilia amazilia leucophoea*

Fairly common in most of the surveyed areas. Frequently observed on the east side of the Porculla pass, e.g., Chirimoyo - Piura region at 1750m (Figure 2D) or Pomahuaca - Cajamarca region at 1100 m. This is the first documented trans-Andean record the Amazilia Hummingbird (Schulenberg *et al.*, 2010; Weller, 2000), despite it has already been observed in other areas of the Marañón valley in numerous occasions between 800-2650 m (ISS and LMV, personal communication).

Plumbeous Rail *Pardirallus sanguinolentus tschudii*

Common in small in anthropogenic flooded grasslands and riparian vegetation near Sónдор. Several observed and heard by ISS, AU, DAB, and AB at 1760-1900 m. The species tends to occur in a wide elevational range, including highlands up to 4000 m. Therefore, there was a possibility that the coastal subspecies *simonsi* would be reported as trans-Andean taxa. However, the subspecies *tschudii* was confirmed thanks to a juvenile photographed near Sónдор (Figure 4A), on February 19, 2014. We followed the descriptions of (Schulenberg *et al.*, 2010).

Maranon Antshrike *Thamnophilus shumbae*

This taxon was previously placed within *T. bernardi* as a subspecies. Now, it has been elevated as a species category, restricted to the Marañón valley (del Hoyo, Elliott, *et al.*, 2019; Schulenberg *et al.*, 2010). It is considered as Data Deficient according to the last version of the IUCN on 26 July 2019 (BirdLife International, 2019c). ISS photographed a female (Figure 4E) moving between *Acacia macracantha* relicts at 1733 m, Tacarpo - Piura region, on 9 August 2014. This record extends the distribution of the species 80 km to the northwest and 733 m above previous records in Jaén vicinity - Cajamarca region (del Hoyo, Collar, & Kirwan, 2019; Schulenberg *et al.*, 2010; Sullivan, Wood, Iliff, *et al.*, 2009).

Short-tailed Field-tyrant *Muscigralla brevicauda*

Common in open habitats in lowland and arid inter-Andean valleys (del Hoyo, Elliott, *et al.*, 2019; Schulenberg *et al.*, 2010; Ugaz & Saldaña, 2014). The trans-Andean status of the Short-tailed Field-tyrant has been previously documented in the literature, with several records in the Marañón Valley in Jaén vicinity - Cajamarca region, up to 1200 - 1500 m (del Hoyo, Elliott, *et al.*, 2019; Schulenberg *et al.*, 2010; Sullivan *et al.*, 2009). ISS photographed this species at 1670 m at Tacarpo - Piura region (Figure 5B) and observed many others inhabiting the dry scrubland and open areas of Huancabamba-Chamaya river sub-basin up to 1750 m.

Piura Chat-Tyrant *Ochthoeca piurae*

One individual observed perching and flying over the bushes at 2125 m on the west side of the Cuello de Porculla town - Piura region, on 12 June 2016 (Figure 6C). This locality is one of the northernmost areas where the species has been regularly recorded (Farnsworth & Langham, 2019).

Vermilion Flycatcher *Pyrocephalus rubinus piurae*

This subspecies is supposed to be replaced by *P. rubinus ardens* in areas of the Marañón river basin (Farnsworth, Lebbin, & Kirwan, 2019). The observations made by ISS, AU, AB, and DAB throughout the entire evaluated elevational range. Nevertheless, our records show that the subspecies *piurae* occurs on the eastern side of the Porculla pass. All the females that we have observed on the Huancabamba-Chamaya river sub-basin have the pale plumage of *piurae* (Figure 6B) instead of the brighter orange tones on belly and crown that *ardens* has.

Slaty Becard *Pachyramphus spodiurus*

This Tumbesian Region endemic is rather uncommon, very local, and probably often overlooked. Its forest habitat has been nearly destroyed, and severely fragmented as a result of timber extraction and livestock grazing (del Hoyo, Elliott, *et al.*, 2019). AU photographed an adult male at 1026 m (Figure 2) above Paipay - Lambayeque region, on 21 March 2017 (Figure 6E). This represents a new locality, in addition to the other approximately 29 to 31 previously known in its fragmented distributional range (Best & Kessler, 1995; del Hoyo, Elliott, *et al.*, 2019; IUCN, 2019; Parker *et al.*, 1985).

Maranon Thrush *Turdus maranonicus*

ISS and AU observed and photographed an individual on two occasions at 1036 m near Pucará - Cajamarca region, on 11 April 2015 (Figure 8D), where it appears to be uncommon. ISS observed one in flight at the same locality the next day. This species is fairly common in forested lower areas of Marañón valley (del Hoyo, Elliott, *et al.*, 2019).

Grey-winged Inca-finch *Incaspiza ortizi*

Two individuals observed and photographed by ISS at 2170 m on the Sóndor-Tabaconas highway - Piura region, on 19 May 2016 (Figure 8F), and an individual photographed on 18 April 2018 in the same locality. These records confirm the documented record of Parker *et al.* (1985) and the unpublished record of F. Angulo from June of 2014 (Sullivan *et al.*, 2009). The scrub and natural dry bushes of the area have been severely degraded and burned, however, the species persists. Unfortunately, we did not find other locations for this species in the Huancamaba-Chamaya river sub-basin.

Three-banded Warbler *Basileuterus trifasciatus*

ISS photographed an adult at 1700 m near Tacarpo - Piura region, on 18 May 2016. Likewise, a flock of four Three-banded Warbler, one photographed by ISS, observed among the bushes at 1750m below Chirimoyo - Piura region, on 14 April 2018 (Figure 10E). These are the first documented records of this species on the eastern slope of the Andes, where is widely replaced by *B. tristriatus*, but only in more humid habitats. The Three-banded Warbler inhabits dense vegetation in dry forests, riparian thickets, shrubby forest clearings, and well-developed second growth with dense undergrowth, mainly at 500-2000 m (Curson, 2019).

Orange-crowned Euphonia *Euphonia saturata*

ISS observed two males foraging on an inflorescence of *Agave americana* at 1742 m near to Tacarpo - Piura region, on 18 May 2016 (Figure 11A,B). Our observation is the first documented trans-Andean record, as well as, the highest in Peru (Schulenberg

et al., 2010), extending its distribution 170 km to the southeast and 1000 m above from its previously known range, in the limit between Ecuador and Peru (Hilty, 2018; Schulenberg *et al.*, 2010).

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Authors' contribution

ISS conceived the initial idea. All the authors performed field observations. ISS made the maps. ISS, AB and AU took the photographs here presented. All the authors wrote and gave final corrections to the manuscript.

Conflict of interest disclosure

The authors declare that they have no conflict of interest.

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Appendix

Table 2. Species checklist of the birds recorded on both sides of the Porculla pass. Abbreviations: P, endemic of Peru; Va, vagrant species; †, reported only by Parker *et al.* (1985); *, subspecies not identified; 045, restricted to EBA Tumbesian Region; 048, restricted to EBA Marañón Valley; Ma, austral migrant; Mb, boreal migrant.

Species	Status	West side of Porculla pass (w)											East side of Porculla pass (e)																				
		1	2	3	4	5	6	7	8	9	10	11	12	13	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
<i>Nothoprocta penlandii ambigua</i>		x						x																									
<i>Columba livia</i>						x							x																				
<i>Columbina cruziana</i>		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x								
<i>Columbina buckleyi buckleyi</i>																																	
<i>Columbina buckleyi dorsti</i>																																	
<i>Leptotila verreauxi decolor</i>		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
<i>Leptotila ochraceiventris</i>	VU, 045																																
<i>Merriopelta ceciliae*</i>																																	
<i>Patagioenas albilinea albilinea</i>																																	
<i>Patagioenas oenops</i>	VU, 048																																
<i>Zenaidura auriculata hypoleuca</i>		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
<i>Zenaida meloda</i>		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
<i>Coccyzus erythrophthalmus</i>	Mb																																
<i>Coccyzus melacoryphus†</i>	Ma																																
<i>Crotophaga sulcirostris</i>		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
<i>Piaya cayana nigricrissa</i>																																	
<i>Piaya cayana mesura</i>																																	

<i>Knipolegus poecilurus peruanus</i>									X															X	
<i>Lathrotriccus griseipectus</i>	VU, 045, 048															X									
<i>Mecocerculus calopterus</i>																									X
<i>Mionectes striaticollis</i>																									
<i>Muscivalla brevicauda</i>																									
<i>Myiarchus tuberculifer atriceps</i>																									X
<i>Myiarchus phaeocephalus phaeocephalus</i>																									X
<i>Myiodynastes bairdii</i>																									
<i>Myiopagis subplacens</i>	45																								
<i>Myiophobus crypterythrus</i>																									X
<i>Myioheretes striaticollis</i>																									X
<i>Ochthoeca piurae</i>	NT, 045, P																								
<i>Phaeomyias tumbezana*</i>	45																								X
<i>Pyrocephalus rubinus piurae</i>																									X
<i>Sayornis nigricans angustirostris</i>																									X
<i>Tolmomyias sulphureus aequatorialis</i>																									X
<i>Tyrannus melancholicus melancholicus</i>																									X
<i>Pachyramphus spodiurus</i>	EN, 045																								X
<i>Pachyramphus homochrous homochrous</i>																									X

<i>Tangara episcopus caerulea</i>						X	X	X									X
<i>Tangara viridicollis</i>							X	X									X
<i>Thlypopsis ornata media</i>						X	X	X									X
<i>Volatinia jacarina*</i>					X		X	X	X	X	X	X	X	X			
<i>Arremon assimilis*</i>					X										X	X	
<i>Arremon abeillei</i>	X	X															
<i>Atlappetes latinuchus latinuchus</i>					X	X	X									X	X
<i>Atlappetes leucopterus dresseri</i>					X	X	X										
<i>Atlappetes seebohmi*</i>	45				X					X							
<i>Zonotrichia capensis huancabambae</i>					X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Amaurospiza moesta aequatorialis</i>											X						X
<i>Piranga hepatica lutea</i>					X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Piranga rubra rubra</i>					X	X	X			X							
<i>Phenicicus chrysogaster chrysogaster</i>					X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Basileuterus trifasciatus*</i>					X						X				X	X	
<i>Geothlypis auricularis*</i>										X	X	X	X	X	X	X	X
<i>Myioborus miniatatus*</i>											X						X
<i>Myiothlypis fraseri</i>					X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Myiothlypis nigrocristata</i>											X						
<i>Setophaga pitiayumi pacifica/alarum*</i>					X	X	X	X	X	X	X	X	X	X	X	X	X
<i>Leistes bellicosus bellicosus</i>											X	X	X	X	X	X	X
<i>Icterus graceanae</i>					X												X



Fig. 2. A. *Metriopelia ceciliae* (east); B. *Patagioenas oenops*; C. *Amazilia franciae cyanocollis* (male); D. *Amazilia amazilia leucophaea* (east); E. *Chaetocercus mulsant* (female, east); F. *Heliomaster longirostris albicrissa*.



Fig. 3. A. *Leucippus taczanowskii* (endemic); B. *Leucippus baeri*; C. *Phaethornis griseogularis zonura*; D. *Phaethornis porcullae*; E. *Colaptes atricollis peruvianus* (endemic); F. *Picumnus sclateri porcullae* (male).



Fig. 4. A. *Pardirallus sanguinolentus simonsi* (juvenile); B. *Falco femoralis pichincha*; C. *Forpus coelestis* (female); D. *Thamnophilus zarumae palamblae*; E. *Thamnophilus shumbae* (endemic, female); F. *Thamnophilus bernardi* (male).



Fig. 5. A. *Melanopareia elegans paucalensis* (male); B. *Muscigralla brevicauda* (east); C. *Agriornis montana*; D. *Myiopagis subplacens*; E. *Lathrotriccus griseipectus*; F. *Anairetes flavirostris huancabambae*.



Fig. 6. A. *Pyrocephalus rubinus piurae* (east, male); B. *Pyrocephalus rubinus piurae* (east, female); C. *Ochthoeca piurae* (endemic); D. *Contopus punensis*; E. *Pachyramphus spodiurus* (male); F. *Pachyramphus homochrous homochrous* (male).



Fig. 7. **A.** *Cyanocorax mystacalis*; **B.** *Pheugopedius paucimaculatus*; **C.** *Polioptila maior* (endemic, male); **D.** *Polioptila maior* (endemic, female); **E.** *Polioptila plumbea bilineata* (male); **F.** *Polioptila plumbea bilineata* (female).



Fig. 8. A. *Cyclarhis gujanensis saturata/contrerasi*; B. *Cyclarhis gujanensis virenticeps*; C. *Turdus reevei*; D. *Turdus maranonicus*; E. *Coereba flaveola magnirostris*; F. *Incaspiza ortizi* (endemic).



Fig. 9. A. *Saltator striatipectus peruvianus*; B. *Saltator striatipectus immaculatus*; C. *Sicalis luteola bogotensis*; D. *Sporophila nigricollis inconspicua* (male); E. *Asemospiza obscura pauper*; F. *Mimus longicaudatus* (east).



Fig. 10. A. *Spinus magellanicus*; B. *Tangara episcopus caerulea*; C. *Arremon abeillei*; D. *Atlapetes leucopterus dresseri*; E. *Basileuterus trifasciatus* (east); F. *Geothlypis auricularis* (east).

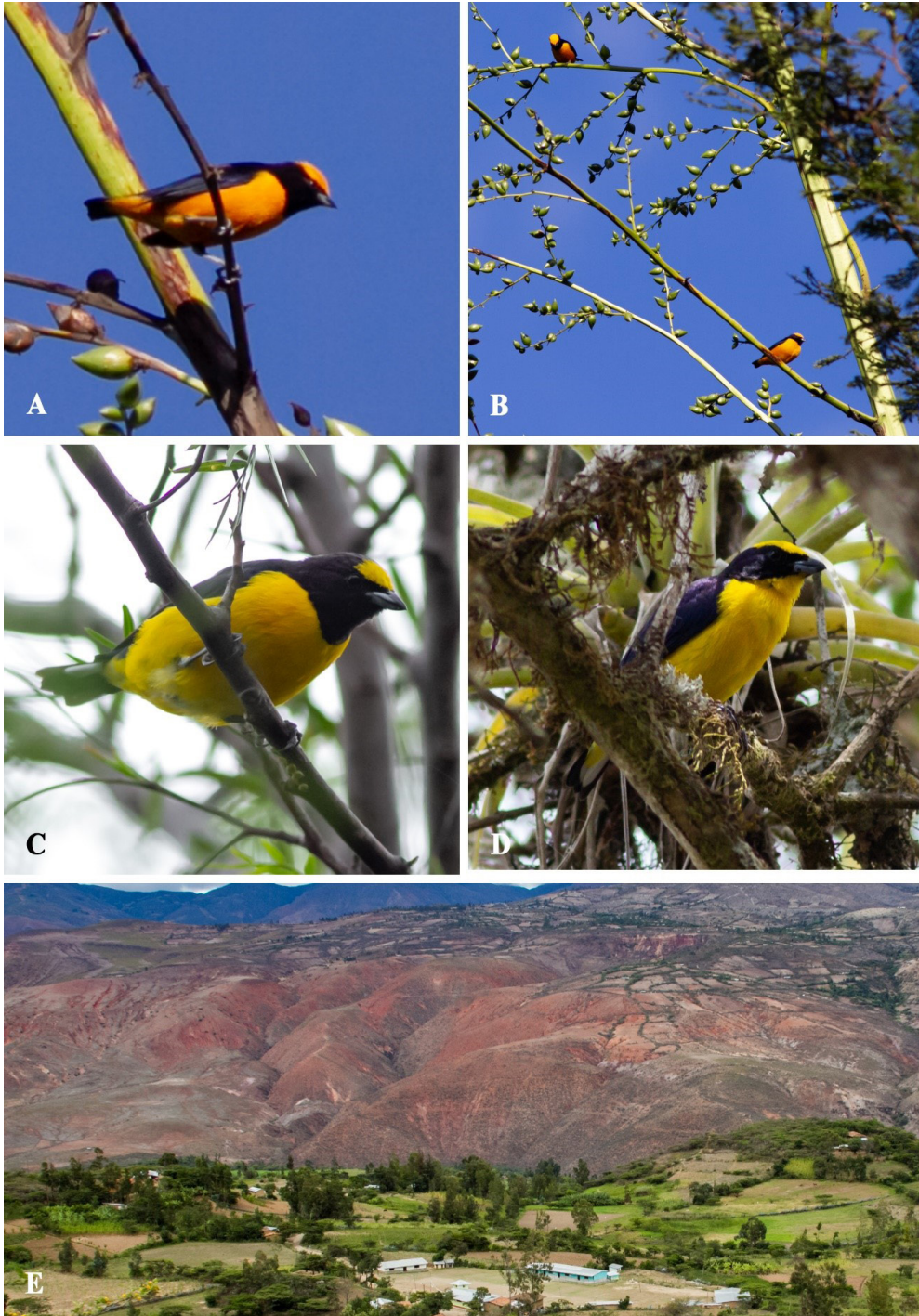


Fig. 11. A. *Euphonia saturata* (male); B. *Euphonia saturata* (two males); C. *Euphonia chlorotica taczanowskii* (male); D. *Euphonia laniirostris hypoxantha* (male); E. The progress of deforestation in the Huancabamba-Chamaya river sub-basin.