Avifauna of the Cañete and Omas drainage basins, department of Lima, Peru

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Received 10 October 2024; final revision accepted 20 April 2026
Cotinga 48 (2026): 40–63
published online 19 June 2026

Los valles de Cañete y Omas, departamento de Lima, se ubican en la vertiente occidental de los Andes de Perú. Estos valles presentan una transición notable y rápida desde la árida llanura costera, a través de matorrales áridos y bosques relictos de la cuenca media, hasta los bosques de *Polylepis*, bofedales, pastizales de puna y nevados de la cordillera Occidental, sobre 5800 m de altitud. Como consecuencia, tienen una alta diversidad de hábitats, muchos de los cuales solo se encuentran en la vertiente occidental de los Andes en el Pacífico de Perú. Además, esta vertiente forma parte de tres áreas de endemismo de avifauna. En este estudio, examinamos la diversidad de aves y la extensión de los hábitats clave en los valles de Cañete y Omas. Registramos 272 especies de aves, 17 de ellas endémicas de Perú, 6 consideradas en la categoría Vulnerable, 2 En Peligro, una En Peligro Crítico y otras 10 Casi amenazadas. Presentamos datos de distribución y abundancia de 25 especies focales. También describimos la condición de los bosques de *Polylepis* y los humedales andinos, y estimamos su extensión ya que son hábitats clave para la conservación de la biodiversidad endémica de la región.

Peru has one of the world's richest avifaunas, with 1,885 species of which 118 are currently considered endemic[3]. Although much of this diversity is found in the humid rainforests of the Amazonian region, the less diverse Pacific slope of the Andes and intermontane Andean drainage basins harbour a higher number of endemic taxa[32]. Of those species listed as endemic to Peru, approximately 51 are restricted to the Pacific slope and intermontane Andean drainage basins, 61 to humid cloud forests of the east Andean slope above 600 m elevation and only five to lowland Amazonia[33]. These figures illustrate the complexity of Andean biogeography and the importance of the Pacific slope and intermontane Andean drainage basins for the conservation of Peruvian biodiversity[27,36]. In spite of this biological richness, knowledge of the avifauna on the Pacific slope away from a small number of well-studied sites remains poorly developed, with few published comprehensive surveys[14,18].

The Cañete and Omas valleys, in the department (dpto.) of Lima, lie on the Pacific slope of Peru. They present conspicuous and rapid transitions from the arid coastal plain, through arid scrub and relict woodlands of the mid-catchment, to the *Polylepis* woodlands, puna grasslands, wetlands and icefields at 5,750 m in the Cordillera Occidental[12,19]. These unique habitats fall into three distinct areas of avifaunal endemism, i.e., Endemic Bird Areas (EBAs) as defined by BirdLife International[8]: the Peru–Chile Pacific slope, the Peruvian High Andes and the Junín Puna.

The Peru–Chile Pacific slope EBA is a narrow strip of the Pacific slope extending from the coastal plain to c.1,500 m elevation, from 11°S in northern Lima south to Tarapacá in Chile. In central Peru it encompasses a mosaic of open desert, coastal wetlands and riparian habitats. Above 200 m, moisture from coastal fog permits the growth of vegetation in fog oases, known as *lomas*. The Peruvian High Andes EBA, which extends from the Ecuadorian border south through the Andes to the Bolivian and Chilean borders, is mapped in a discontinuous sequence of biologically unique subregions at subtropical and temperate elevations[8]. On the Pacific slope, this includes drier wooded habitats, dense montane scrub, relict cloud forests, and *Polylepis* woodlands. Lastly, the Junín Puna EBA extends from Lago Junín to southern dpto. Huancavelica and largely comprises puna grasslands, with a mixture of lakes and peatlands, known in Peru as *bofedales*[15,34].

Despite high levels of biological endemism and the relative accessibility of the Pacific slope, the region has received comparatively little ornithological attention, with most studies concentrated in the more northerly Tumbesian region and in well-studied Andean areas such as Cordillera Blanca, and a few isolated sites further south[4,10,11,24]. In the Cañete drainage basin, preliminary work reported on the avifauna of the Reserva Paisajística Nor Yauyos-Cochas[22] and this, together with extensive work undertaken by Maria Koepcke[18,19] and fieldwork conducted for *Birds of the high Andes*[14], forms the basis for our knowledge of this region.

We have undertaken the first thorough survey of the avifauna and key habitats in a study area comprising the Cañete and Omas drainage basins

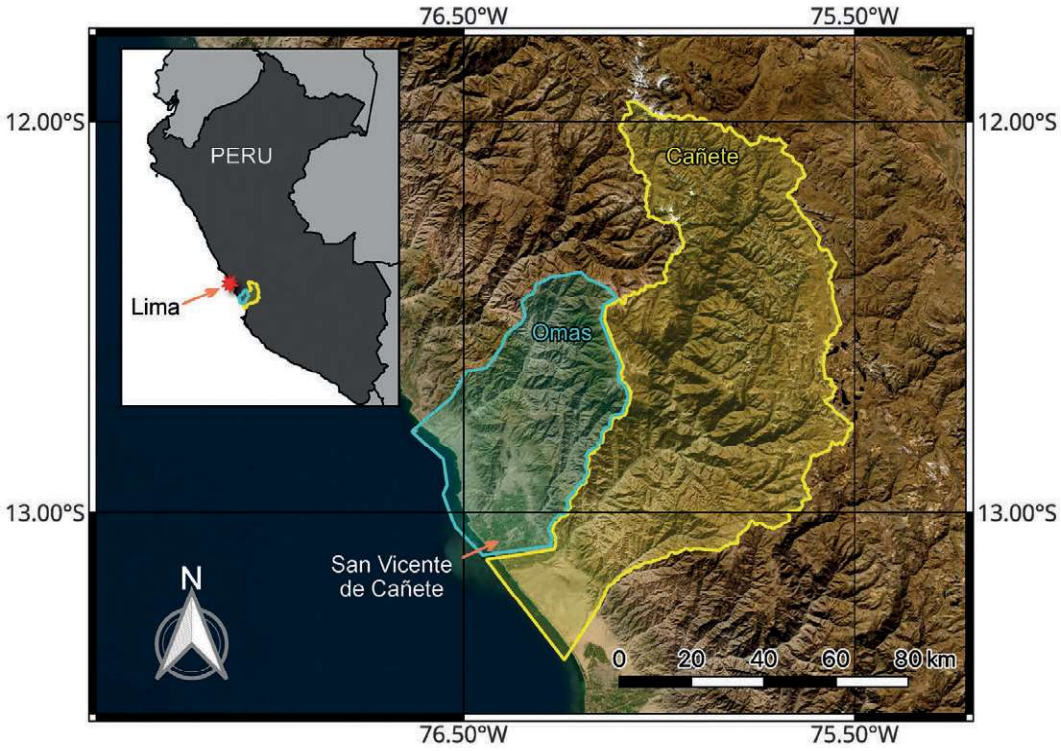

Figure 1. Cañete and Omas drainage basins, Lima, Peru. The Cañete watershed, outlined in yellow, covers c.7,181 km^2. The Omas watershed, outlined in blue, covers c.2,000 km^2. These drainage basins constitute the study area. The map was prepared using open-access QGIS software (http://www.qgis.org).

(Fig. 1). Surveys were conducted by a field team from the University of Cambridge (UCAM) and Universidad Nacional de Cañete (UNDC) in 2019–23. We present data on the distribution of key habitats, and the distribution and abundance of range-restricted, endemic and threatened species, whose presence and status is essential for accurately understanding their population dynamics and determining conservation priorities. As such, this work has four objectives: to determine the distribution and abundance of key species; to survey the avifauna of the Cañete and Omas drainage basins; to offer a preliminary survey of the extent and quality of key habitats; and to raise the profile of an important region for the conservation of endemic species and key habitats.

Study area

The Cañete and Omas drainage basins (including Quebrada Acancha) cover c.7,181 km^2 and c.2,000 km^2 respectively, extending from the Pacific coast to the high puna at nearly 5,500 m, on the Pacific slope of the Cordillera Occidental, in dpto. Lima[2] (Fig. 1). While the Omas drainage basin comprises a single, relatively small catchment, the Cañete drainage basin encompasses 12 large sub-catchments[2]. A high proportion of both catchments lie in the high puna above 4,400 m and in transitional deserts between 1,000–2,000 m.

Climatically, the Pacific slope in Peru is arid. The coastal deserts and lower slopes are arid to hyperarid, while the higher Andes experience a wet season (October–March) and a dry season (April–September)[23,38]. From the hyperarid coast to the high puna, average monthly temperatures fall from 15–22°C to 4–12°C. In contrast, average annual precipitation increases from 0.3 mm on the coast to 300 mm at 3,200 m, and to 1,000 mm at 4,500 m[38]. Below 1,000 m the climate is dominated by the coastal fog, which has a general cooling effect. This stable atmospheric system is periodically interrupted by the El Niño Southern Oscillation (ENSO), during which average temperatures and precipitation increase, often resulting in catastrophic flooding and landslides in the foothills and lower-lying areas[38,42].

Across the altitudinal and precipitation gradients, habitats grade from open desert, desert scrub and thorn woodland to subalpine dry scrub and relict cloud forest, *Polylepis* woodlands and the high puna[18]. Extending from the coast up to c.1,800 m, industrial agriculture occupies much of