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Rediscovering the Richness and Endemism of the Tetrapod Fauna within the Utcubamba River Key Area for Biodiversity, in Northwestern Peru †

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Abstract: The tropical Andes in South America stand at the top of the world's list of endemism hotspots due to their high species richness per unit area. Thus, our study focuses on the Key Biodiversity Area (KBA) Utcubamba River(PER-84) one of the 96 KBAs, with an extension of 35,534 hectares. This area is located in the northwest Peru, within the hotspot of the tropical Andes. The study area is well known as the waterfalls valley, which holds the world's third highest waterfall "Gocta", an outstanding national and international tourist attraction.Nevertheless, despite its great ecological and tourist value, research reports are deficient in the area. Therefore, we conduced a biological inventory in 2019 during the wet season, whit the aim of recording and identifying species of tetrapod fauna as well as promoting actions for their conservation. Based on field assessments, the following number of species wasrecorded: amphibians (14), reptiles (6), birds (229), and mammals (20). Interestingly, for the first time, 2 species of amphibians *(Gastrotheca aguaruna* and *Gastrotheca spectabilis)* and 2 reptiles (Dipsas *palmeri* and *Tachymenis affinis),* have been recorded;, furthermore, it has been observed several endemic species: amphibians (3), reptiles (2), birds (3) and mammals (1) that have not yet been reported for the ACB, which have not yet been reported for the KBA. This finding in fact increases the number of especies of endemism in this part of Peruvian territory. Consequently, this study aims to be the basis for promoting further research to discover new species for science and to propose strategies for their conservation over time.

Keywords: biodiversity; ornitology; herpetofauna; mastozology; Amazonas

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1. Introduction

Across the world, only 36 regions meet the criteria for biodiversity hotspots; which must have 1500 vascular plant species (more than 5% of the global population) and have lost at least 70% of their original habitat [1]. Initially, these areas covered an area of 23.5 million km^2 (15.7% of the earth's surface), but unfortunately over time they have been

deteriorated and it is now believed that only 2.3% of their surface is covered by natural vegetation;, but interestingly, this area holds most of the planet's biodiversity [2].

The tropical Andes hotspot, the coldest and longest region in the tropics, spans the Andes Mountains from Venezuela to Argentina with an area of 33.2 million hectares; it is home to the greatest diversity of flora (30,000 species of vascular plants), the greasted variety of amphibians on the planet (981 species), 1724 species of birds, 570 species of mammals and the second greatest diversity of reptiles (610 species) after Mesoamerica [3]. It ranks first in endemism, marking it the world's biodiversity epicentre; however, it is one of the most severely threatened areas [4,5]. This hotspot is divided into 474 sites known as Key Biodiversity Areas (KBAs), of which 96 are in Peru, and one of them is the Rio Utcubamba KBA(PER-84) [3], where this research takes place.

On the other hand, knowledge of biodiversity is one of the most important tools for conservation of nature [6], because it makes it possible to establish the importance of certain ecosystems, as well as the threats to which it is exposed; taking into account that all hotspots are seriously threatened [2]. Consequently, this study presents for the first time some species of tetrapod fauna for the KBA, and their conservation status worldwide; which aims to inform theri ecological importance so that strategies for their conservation can be proposed.

2. Materials and Methods

2.1. Study Area

The evaluations were carried out within the KBA "Río Utcubamba" (Code PER-84), which covers an area of 35,534,000 hectares, located in the Northeast of Peru [3]. Part of this territory, is also known as the waterfalls valley and includes the third highest waterfall in the world "Gocta", an outstanding national and international tourist attraction. According to the Ecosystems map of Peru [7], it is composed of Yunga Altimontano (Pluvial) Forest, Yunga Basimontan Forest, Yunga Montane Forest, Jalca, Grasslands/Grasslands and Secondary Vegetation. Surveys were conducted in two camping sites in the districts of Cuispes and San Pablo de Valera between 2600 and 3000 m of altitude (Figure 1), during the wet season from mayo 01 to14, 2019. These districts present a slightly humid and warm temperate climate, with a rainfall index between 20 and 40% and monthly rainfall of 33.9 and 147.7 mm [8].

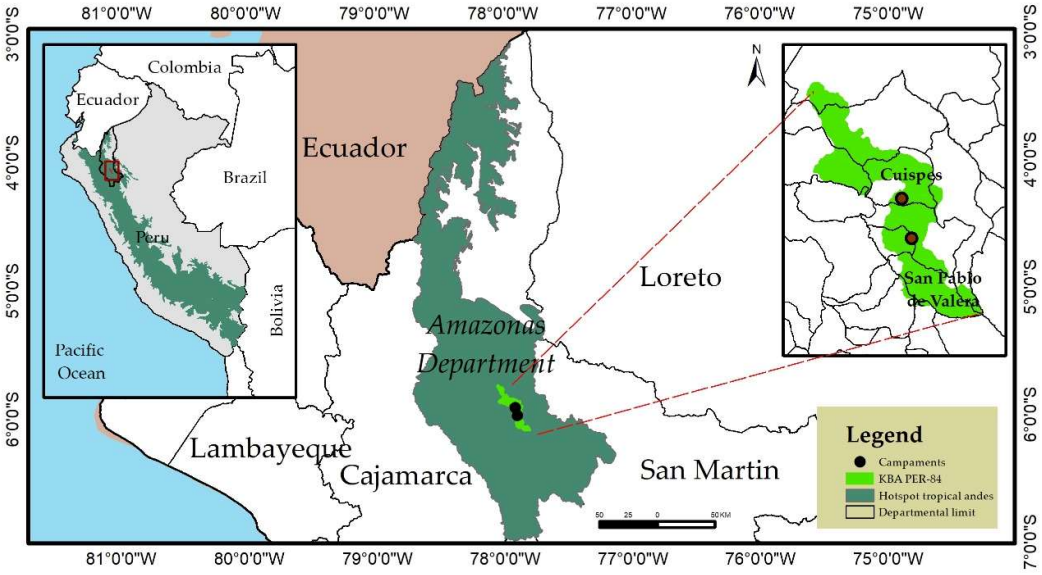

Figure 1. Study area.

2.2. Methodological Design

The methodology used depend on the taxonomic group: for amphibians and reptiles the visual encounters was used(*Visual Encounter Survey*) [9,10] method was used, lasting one hour, between 09:00 and 16:00 and 19:00 and 00:00 h. Species listing for amphibian and reptile followed the taxonomic order of Amphibian Species of the World [11] and The Reptile Database [12] respectively. For birds, we used Fixed List Units [13,14]; targeted search for key species: endemic, restricted distribution, migratory and threatened; capture of birds without collection using mist nets [14,15] and Play Back [16]. For smaller terrestrial mammals, tramping metods [17], were employed, using live traps (Sherman) and pitfall traps Two linear transects of 100 m. were established, with Pitfall traps, in each of the evaluated localities, with 5 stations separated between 10 to 15 m. with a sampling effort of 69 traps/night.

Preliminary identification of rodent species was reviewed in the field to genus and/or species based on expert literature [18–20]. For the identification of marsupials, guides were used [21,22]. For smaller flying mammals, mist nets were used along a 100 m transect lenght including cave surverys. 27 nets were established/night, these were located in two transects near streams, creeks, open areas within or at the edge of the forest and were kept active from 17:30 to 23:30 h. Species identification was done using publications made in 2016 [23] and 2009 [24]. For larger mammals, 15 transects were traced, 8 in San Pablo de Valera and 7 in Cuispes, between 08:00 and 12:00 h, using direct records (observations) and indirect records (tracks, paths, faeces, hairs and/or bristles, odoriferous substances, etc.).

Finally, the list of mammals (major and minor) follows the taxonomic order and the state of residence and Peruvian endemism according to the article Diversity and endemism of the mammals of Peru [25]. In addition, the threat categories (Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Data Deficient (DD), Least Concern (LC)) of the species were reviewed in the Red List of Threatened Species of the International Union for Conservation of Nature—IUCN [26].

3. Result and Discussion

3.1. Herpetology

Of the total amphibian species recorded, eight are endemic to Peru, three have been identified only to the genera (*Hyloxalus sp*., *Gastrotheca sp.* and *Pristimantis sp*.) It is important to note that for the first time two species are identified in the study area: *Gastrotheca aguaruna* (Figure 2a) y *Gastrotheca spectabilis* (Figure 2b). *G. aguaruna* was found in the district of San Pablo de Vlera at coordinates 5°59’39.88”S and 77°51’37.87”W at an altitude of 3035 m.. This species is endemic to Peru and its distribution is restricted to nine geographical localities in the northern part of the central cordillera in the departments of Amazonas and San Martín, at altitudes between the 2360 to 3308 m [27,28]. *G. spectabilis,* was reported at 6°00’01”S and 77°52’52”W, at an altitude of 2805 m. Previously, this species was known only from type locality in Hornillo (6°30’05’’S and 77°29’04.9’’ W), Vista Alegre District, Rodríguez de Mendoza Province, Amazonas at 3308m [29,30]; futhermore, it is listed as Not Evaluated (NE) by the IUCN. Both species are recorded for the first time in the KBA, thereby extending their range of distribution..

Furthermore, six species of reptiles were found, three are endemic to Peru, two species correspond to the family Tropiduridae (*Stenocercus sp1* and *Stenocercus sp2*), these species identified up to genus level are likely new to science. In addition, they are reported for the first time *Tachymenis affinis* (Figure 2c) and *Dipsas palmeri* (Figure 2d). According to its coloring characteristics and the typology of its molecular phylogeny [31], *D. palmeri* was synonymous with *D. peruana* [12,32] and reappeared as such in 2018 [33]. For its part, *T. affinis* is an endemic species for Peru [34], in Amazonas, its unique habitat is near the Community of Ocol, Molinopampa district, Chachapoyas province (6°14’23.8”S and 77°35’35.0” W) [35], this species inhabits humid montane forests, thickets and grasslands

[36]. Therefore, our records are the first for the KBA Utcubamba River and will contribute to knowing its range of distribution.

Figure 2. This figure shows the species reported for the first time for the KBA–Rio Utcubamba (PER-84): *G. aguaruna* (**a**); *G. spectabilis* (**b**); *T. affinis* (**c**) and *D. palmeri* (**d**).

3.2. Birds

Our study reports the sighting of 229 birds species, distributed in 45 families. Of these, eight are endemic to Peru: Metallura theresiae, Loddigesia mirabilis, Thaumasius (Leucipus) taczanowskii, Picumnus steindachneri, Grallaria przewalskii, Scytalopus macropus, Scytalopus femoralis y Poecilotricus luluae [37]. P. steindachneri (Figure 3a), P. luluae (Figure 3b) and L. mirabilis (Figure 3d), they are distributed only in Amazonas and San Martín regions [38–40].

3.3. Mammals

Twenty mammals species are reported for the KBA, distributed in 15 families. Out of the total species found, five have been identified to genus (*Marmosops sp1., Marmosops sp2., Thomasomys sp., Cavia sp. y Dactylomys sp.)*. Likewise, according to the IUCN, *Cuniculus taczanowskii* is categorized as NT, *Sylvilagus brasiliensis* as EN, *Tremarctos ornatus* as VU, it is important to note that the only endemic species for Peru is *Thomasomys ischyrus* [41].

The individuals of *T. ischyrus* (Figure 3c) were captured by live-capture (Sherman) and Pitfall traps, in the district of Ciuspes (5°56′25.68″S; 77°54′47.42″O) and in San Pablo de Valera (6°0′8.41″S; 77°53′4.64″O) respectively. This species inhabits between 2280 and 3350 m on the eastern slopes of the Andes in northern and central Peru, in Amazonas, San Martín and Huánuco regions [25,41,42].

Figure 3. This figure shows endemic fauna species recorded in the KBA- Rio Utcubamba (PER-84): *P. steindachneri* (**a**); *P. luluae* (**b**), *T. ischyrus* (**c**) and *L. mirabilis* (**d**).

Our area of study lacks detailed research, those that have been previously carried out over time, with the purpose of implementing projects, whose objective is the creation of Regional Conservation Areas (RCA), within which is the project for the creation of the RCA "Gocta, Yumbilla and Chinata Falls" in the provinces of Bongará and Chachapoyas [8], study that reported the existence of species of mammals (52), reptiles (15), amphibians (18). In addition, the existence of 223 species of birds was reported [43], including endemic amphibian species (*C. lemniscatum, G. aguaruna y G. spectabilis)*, reptiles (*T. affinis)*, birds (*G. przewalskii, S. macropus* y *S. femoralis)* and mammals (*T. ischyrus)*. With these records, the number of endemism for the KBA-Rio Utcubamba is increased, which makes it an area with a higher number of bird endemics than the western side of Paso Porculla and the Huancabamba-Chamaya sub-basin, where up to four endemic bird species have been reported [44]. It moreover shares a similar number of endemics with the Inter-Andean Seasonally Dry Tropical Forests of the Marañón valley, where four species of amphibians, 28 reptiles, 13 birds and 5 mammals endemic to Peru have been reported [45]. From this, our research contributes to rediscover the species of wildlife in the KBA- Rio Utcubamba (PER-84), being an input for the implementation of species conservation policies and the creation of areas for the protection of these.

4. Conclusions

We conclude from the aforementioned findings that the Río Utcubamba KBA is a vital centre of faunal biodiversity, as it contains a large number of endemic species to Peru, which, together with those reported by Terán [8], reach a total of 36 endemic species: twelve of amphibians, six of reptiles, twelve of birds and six of mammals. Furthermore, our study reports for the first time 2 species of amphibians (*G. aguaruna* and *G. spectabilis*) and 2 reptiles (*D. palmeri* and *T. affinis*) on the territory of the KBA. That number may increase, considering that the study presents ten specimens among amphibians, reptiles and mammals that have been identified up to genus, and the implementation of further research, thereby increasing their importance for further research and conservation

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