RIAT
Revista Interamericana de Ambiente y Turismo
Interamerican Journal of Environment and Tourism
Print version ISSN - 0717 - 6651, Online version ISSN - 0718 - 235X
http://dx.doi.org/10.4067/S0718-235X2022000100087
http://riat.utalca.cl
www.fen.utalca.cl

Research paper

Ecotourism in Peru: Laguna de los Patos as a case study

Ecoturismo en Perú: Laguna de los patos como caso de estudio

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Received: 2022-04-11 Accepted for publication: 2022-05-25 Published: 2022-06-30

ABSTRACT

Aviturismo or birdwatching tourism is part of an emerging subsector in the nature tourism industry. Although bird watching is established in Peru, it has been concentrated to a greater extent in conservation areas. However, the Piura region is also home to a great diversity of birds in areas that have not been declared protected, such as the "Laguna de los Patos" wetland located in the district of Querecotillo. The objective of this study is to investigate the potential of birdwatching that can occur in the "Laguna de los Patos" wetland, together with an update of the species. A non-experimental research work was carried out with field collection and bibliographic information. The results obtained allowed us to conclude that the wetland has a fairly high potential to develop bird tourism and contribute to the conservation of the area and the species, also benefiting the economy of the surrounding local populations.

Keywords: birds, ecotourism, sustainability, tourism

RESUMEN

El aviturismo o turismo de observación de aves forma parte de un subsector emergente en la industria del turismo de naturaleza. Aunque la observación de aves se encuentra establecida en el Perú, se ha concentrado en mayor medida en las áreas de conservación. Sin embargo, la región Piura también alberga una gran diversidad de aves en áreas que no se han declarado en protección, como el humedal "Laguna de los Patos" ubicado en el distrito de Querecotillo. El objetivo de este estudio es investigar el potencial del aviturismo que se puede presentar en el humedal "Laguna de los Patos", junto a una actualización de las especies. Se realizó un trabajo de investigación no experimental con recopilación de campo e información bibliográfica. Los resultados obtenidos permitieron concluir que el humedal presenta un potencial bastante alto para desarrollar el aviturismo y contribuir en la conservación del área y de las especies, beneficiando también a la economía de las poblaciones locales aledañas.

Palabras clave: aves, ecoturismo, sostenibilidad, turismo

INTRODUCCIÓN

Peru represents one of the countries with the greatest biodiversity in the world due to the great wealth of species, especially birds, that it possesses. According to the latest research, in Peru, a total of approximately 1,877 bird species are estimated, of which 109 are endemic (Plenge, 2021), thus reaffirming the statement that Peru is a megadiverse country.

In terms of the context of biodiversity, the study of birds or "ornithology" in this country is not a recent field. In this sense, the number of people interested in studying, con- ducting research, or recreational activities related to the observation or study of birds increases every day (Caba- nillas-Trujillo et al., 2021). To cite an example, in 2015 and 2016, Peru was the country with the highest number of bird sightings during the Global Big Day, the largest bird watching competition in the world (Sevillano, 2017).

However, despite everything described above, in Peru, there is still a great gap in the knowledge of birds, the importance of conserving their habitats and the relevance of managing activities such as birdwatching. This situation is mainly due to the fact that attention, with respect to the study of birds, follows an almost exclusive course to study their ecology (biodiversity), leaving aside, many times, the importance of studying the fauna-human relationship. (Córdova-Tapia and Zambrano, 2015; Proaño-Varela et al., 2021).

One of the many departments of Peru, which is home to a large number of bird species, is Piura. This region is located in the area of global endemism for birds called EBAs (Ende- mic Bird Areas) where species of limited distribution have been recorded that are unique in the world, making it one of the most attractive areas for bird watching (Ugaz and Saldana, 2014). The main reason for this situation is due, in large part, to the orographic particularities of the Huanca- bamba deflection and to the oceanographic characteristics of the sea off its coast. Likewise, in Piura, ten wetlands stand out, one of them being the Laguna de los Patos, a place where there are high levels of endemic fauna and flora that, unfortunately, are threatened by the high degree of frag- mentation and human intervention that exists (Silva, 2014).

In general terms, the Laguna de los Patos or Laguna Los Patos, is a wetland that was baptized with that name, by the inhabitants of the area, in honor of the diversity of "ducks" that use that body of water as a place to carry out Your activities. The place was formed by one of the great "El Niño" phenomena that occurred in the 20th century and that flooded farmland that to date remains under water (Ugaz and Saldaña, 2014). However, despite the fact that it has a great diversity of birds, scientific research and the promotion of activities, such as birdwatching, have not yet been promoted efficiently. This situation is easily evident, especially because to date only two thesis works have been carried out in the area, dating from 2014.

Due to the above and knowing the importance of managing the promotion of environmentally friendly activities that at the same time allow the economic development of the inhabitants, such as birdwatching, it was considered important to carry out this research whose main objective was determine the tourist potential of the avifauna present in the "Laguna de los Patos" wetland.

LITERATURE REVIEW

Ecotourism as a source of environmental conserva- tion and economic development

Ecotourism, as a cultural ecosystem service, is an essential part of rural economic growth. The development of viable methods and indicators for ecotourism values is vital to explore the interactions between public preferences and ecosystems, thus providing information for the sustaina- ble management of ecosystems (You et al 2022).

In other words, ecotourism could be defined as responsible travel to natural areas that protects the natural environment and improves the well-being of the local community (Moons et al 2020). This trip is made with the objective of being able to study, admire, praise and enjoy the appearance of nature (the flora and fauna of the place) as well as the scenic beauty of the landscape. It will also allow visitors to learn about the cultural characteristics of different past and present local communities (Hosseini et al 2021). Therefore, due to the significant and positive effects of ecotourism development as well as the high desire of people to be able to visit natural areas, the development of ecotourism is necessary and essential (Gigović et al 2016).

An important point to keep in mind is that, in order to develop ecotourism in a region, it is first necessary to ca- refully carry out a study that covers its concepts, objec- tives and principles. Once all this has been done, we pro-

ceed to examine and identify both the potential and the obstacles to its management. Based on this, the most appropriate scenarios and strategies are proposed. Finally, once the most appropriate strategies have been identified, they are implemented (Mosammam et al., 2016).

Thus, the main positive effects of ecotourism, for a region, are the improvement of its economic situation, cultural exchange and the conservation of its natural resources (Ts- eng et al 2019; Omarzadeh et al 2021). Therefore, among the various types of tourism, there is a higher probability of benefiting from the field of ecotourism to contribute to the development of the country (Hosseini et al 2021).

Ecotourism in Peru

In general terms, as mentioned above, ecotourism seeks as its main objective to minimize the impact on the envi- ronment caused by conventional tourism and thus create environmental awareness in residents and tourists. Li- kewise, it also allows providing economic benefits to local populations (Cajas et al., 2021).

Projects related to ecotourism share three fundamental criteria. The first of these refers to the fact that the attrac- tions must be based on nature. The second criterion refers to the fact that all activities must promote, among many other things, socio-economic and environmental sustai- nability. Finally, the third criterion points out that the ex- perience that visitors go through should focus on learning and education (Walter, 2020).

In Peru, this activity exists as an alternative, as in many other countries, for the economic and social development of communities, mainly those that live in rural areas. In this context, in general, projects aimed at ecotourism practices are related to the purpose of generating, as is customary, income for the residents. It is for this reason that, in Peru, there is currently a proposed National Tourism Strategic Plan for 2025, which is considered a key element for the sustainable development of tourism in the country (Maldonado-Oré, 2020).

The Laguna de los Patos as an object of study

Biological and natural diversity sustains life and the economy in Peru. This statement is based on the fact that natural capital is an important element of identity, economy and culture. This is how the ecosystems that the country possesses provide a service called scenic beauty (landscapes) on which the tourist activity that has generated US $ 4,895 million in foreign exchange in 2018 is based. For this reason, the resources cultural, natural and heritage forms part of a network of great wealth and value that can be found promoted and marketed in a sustainable manner, in order to improve the socioeconomic well-being of local populations and the conservation of resources (Esenarro et al., 2020).

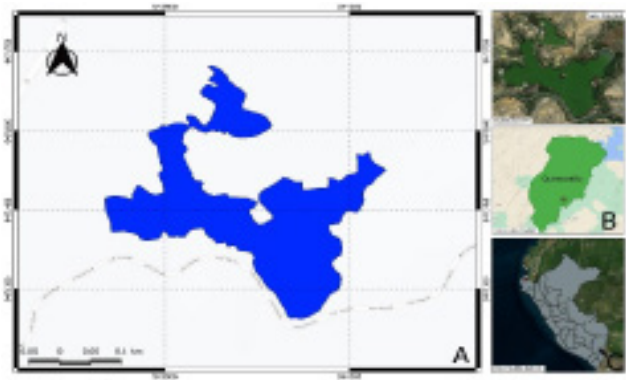
The Laguna de los Patos, a wetland caused by the filtering of water from the rainy season and the Poechos dam, represents a beautiful place that is frequently inhabited by numerous species, especially birds (WALLAC, 2020). However, as indicated above, this beautiful wetland is constantly abandoned and in danger. This situation would be due, in large part, to the lack of information by the inhabitants of the area and the little research carried out in the area.

MATERIAL AND METHODS

Description of the study área

The "Laguna de los Patos" wetland (A) is located to the south of the district of Querecotillo (B) and to the nor- thwest of Peru (C) (Figure 1). It is located 18 km from the province of Sullana in the Piura region and at an altitude of 70 m above sea level. n. m.

Figure 1. Location of the "Laguna de los patos"



Species count

The count of bird species in the Laguna de los Patos was carried out during the months of January and March 2021. The sampling was done through an evaluation of transects without bandwidth in a limited area. A total of 80 species were recorded, identified based on the work carried out by Schulenberg et al. (2010) and Ugaz and Saldaña (2014), and classified taxonomically according to the last list updated by Plenge (2021). In addition, because the sampling effort was minimal (less than 150 hours per person), the species accumulation curve was not performed in this study.

Evaluation of the potential of birdwatching in the "Laguna de los Patos"

The potential birdlife value of each species recorded in the wetland was tabulated taking into consideration the criteria of Muñoz-Pedrero and Quintana (2010), and Almendras et al. (2017) who recommend using the following parameters: Conservation status (Sc), Endemism (En), Taxonomic singularity (Ts), Aesthetic value (Av) and Bird Perceptibility (Bp). These, in turn, present rating subcategories. The variables mentioned and the meaning of the scores assigned in the study are presented below (Table 1).

Table 1: Assessment criteria and scores for obtaining birdwatching potential

Value	0	1	2	3
Conservation status (Cs)	Not Threatened	Near Threatened	Vulnerable	In danger
Endemism (En)	Species not endemic to the country	Non-endemic species of the tumbesian region of endemism	Endemic species of the Tumbesian region of endemism	Endemic species of the study area
Taxonomic singularity (Ts)	Genus with five or more species	Genus with 2-4 species	Monotypic of the genus	Monotypic to family or higher level
Aesthetic value (Av)	Low aesthetic value	Average aesthetic value	High aesthetic value	Very high aesthetic value
Bird Perceptibility (Bp)	Imperceptible to non-specialized observers	Low perceptibility	Medium perceptibility	High perceptibility

The aviturims potential of each species (PAV) results from the weighting of each mentioned parameter, according to the following formula [1]:

$$\mathbf{PAV} = \sum \mathbf{1,5Av} + \mathbf{1,5Bp} + \mathbf{Cs} + \mathbf{En} + \mathbf{0,5Ts} \quad [\mathbf{1}]$$

The description of each parameter is detailed below: Conservation status (Cs): The national category (DS 004-2014) that approves the list of classification and categorization of wildlife species that are threatened and legally protected by the Peruvian State (MINAM, 2019) was considered as a reference.

Endemism (En): Exclusivity that the species present with respect to the territory where they live. Therefore, the avifauna may be directly related to the study area or be cosmopolitan (Muñoz-Pedrero and Quintana, 2010; Almendras et al., 2017).

Taxonomic singularity (Ts): Relationship that the avifauna presents in terms of its taxonomic classification. This study was based on the Plenge (2021) classification.

Aesthetic value (Av): Visual and aesthetic perception of the species based on their characteristics such as colors, sizes and shapes. To obtain the quantitative value, a survey was sent to a group made up of 30 specialists or people related to the subject. Said survey consisted of 80 high-resolution photos, to which values were assigned from 0 to 3, with 0 being the score to categorize the species as less visually attractive and 3 being the most attractive (Muñoz-Pedrero and Quintana, 2010; Almonds et al., 2017).

Perceptibility of the bird (Bp): Set of characteristics of the avifauna that allow direct observation or hearing of their songs to different degrees. To place the appropriate score, the Ebird (2021) database was used to verify photographs and identify characteristic sounds of birds. Likewise, the opinion of different connoisseurs and experts was considered, which were chosen based on their experience in the study of birds in Peru, based on the subcategories mentioned in table 2 (Muñoz-Pedrero and Quintana, 2010; Almonds et al., 2017).

Table 2. Evaluation criteria and scores for the perceptibility parameter of the bird.

Value	0	1	2	3
Activity period (Ap)	Nocturnal species, active when there is no sunlight	Crepuscular species, which develop activities during the sunset	Diurnal species, with activities during the period of sunlight	Diurnal-crepuscular species, with activity throughout the day
Colorful and mimicry (Cm)	Very low coloring and very mimetic plumage.	Medium color with gray, greenish, Brown and other opaque plumages.	Colorful tall and striking with a strong contrast with the surroundings. Pure white or black predominate	Very high and bright colors (reds, yellows and blues) that give it a very high perceptibility.
Size (S)	Small: less than 20 cm in length	Medium: length 20-35cm	Large: length 35-60cm	Very large: greater than 60 cm in length
Acoustic perceptibility (Acp)	No acoustic perceptibility	Average acoustic perceptibility	High acoustic perceptibility	Very high acoustic perceptibility

The sum of each subcategory is defined according to the weighting described in the following formula [2]:

$$Pa = \sum 1{,}5Ap + \ 1{,}5Cm + 1{,}5S + Acp \ \ [2]$$

RESULTS AND DISCUSSION

In the species registry, a total of 80 species belonging to 20 orders and 32 families were obtained (table 3). Among them, the species *Spatula discors, Calidris pusilla and Actitis macularius* occur regularly in Peru, but only in a non-breeding period; as noted by Plenge (2021).

In this sense, as previously described, the present study sought to demonstrate the potential of the "Laguna de los Patos" wetland for having a great diversity of birds. To the date of this work, few studies have been carried out such as that of Portocarrero et al. (2012) who recorded 92 species of birds and, some time later, 98 species were recorded by Silva (2014). In another more recent investigation, carried out by Ayala et al. (2018), it is mentioned that despite the few records they had, the birds could be seen carrying out the foraging activity, inferring that the water quality was in optimal conditions. However, Sabalú (2014) mentions that the burning of grasslands, poaching and environmental pollution are becoming the main threats to the wetland, the latter being visualized by the authors of the work. Given this, Salinas and Cámara (2016) recommend encouraging research and birdwatching to correct the effects that may occur.

Table 3. List of bird species recorded in the "Laguna de los Patos" wetland during the months of January and March 2021

Order	Family	Scientific name	Common Name (English/Spanish)
Accipitriformes	Accipitridae	*Parabuteo unicinctus*	Harris's Hawk /Gavilán mixto
		Buteogallus meridionalis	Savanna Hawk /Gavilán sabanero
Anseriformes	Anatidae	*Spatula discors*	Blue-winged Teal/Pato de Ala Azul
		Spatula cyanoptera	Cinnamon Teal/Pato Colorado
		Sarkidiornis sylvicola	Comb-Duck/Pato Crestudo
		Anas bahamensis	White-cheeked Pintail/Pato Gargantillo
Apodiformes	Trochilidae	*Amazilis amazilia*	Amazilia Hummingbird/Colibrí de Vientre Rufo
Caprimulgiformes	Caprimulgidae	*Chordeiles acutipennis*	Lesser Nighthawk /Chotacabras Menor
Cathartiformes	Cathartidae	*Coragyps atratus*	Black Vulture/Gallinazo de Cabeza Negra
		Cathartes aura	Turkey Vulture/Gallinazo de Cabeza roja
Ciconiiformes	Ciconiidae	*Mycteria americana*	Wood Stork/Cigüeña Gabán
Columbiformes	Columbidae	*Columbina cruziana*	Croaking Ground Dove/Tortolita Peruana
		Zenaida auriculata	Eared Dove/Tórtola Orejuda
		Columba livia	Rock Pigeon/Paloma Doméstica
		Zenaida meloda	West Peruvian Dove/Tórtola Melódica

		Leptotila verreauxi	White-tipped Dove/Paloma de Puntas Blancas
Coraciiformes	Alcedinidae	*Chloroceryle americana*	Green Kingfisher/Martín Pescador Verde
		Megaceryle torquata	Ringed Kingfisher/Martín Pescador Grande
Cuculiformes	Cuculidae	*Crotophaga sulcirostris*	Groove-billed Ani/Garrapatero de Pico Estriado
		Tapera naevia	Striped Cuckoo/Cuclillo Listado
Charadriiformes	Recurvirostridae	*Himantopus mexicanus*	Black-necked Stilt/Cigüeñuela de Cuello Negro
	Charadriidae	*Charadrius collaris*	Collared Plover/Chorlo Acollarado
		Charadrius vociferus	Killdeer/Chorlo Gritón
	Laridae	*Chroicocephalus cirrocephalus*	Gray-hooded Gull/Gaviota de Capucha Gris
	Scolopacidae	*Calidris pusilla*	Semipalmated Sandpiper/Playerito Semipalmado
		Actitis macularius	Spotted Sandpiper/Playero Coleador
Falconiformes	Falconidae	*Caracara plancus*	Crested Caracara/Caracara Crestado
		Falco peregrinus	Peregrine Falcon/Halcón Peregrino
Gruiformes	Rallidae	*Gallinula galeata*	Common Gallinule/Polla de Agua Común
		Fulica ardesiaca	Slate-colored Coot/Gallareta Andina
	Tyrannidae	*Pseudelaenia leucospodia*	Gray-and-white Tyrannulet/Moscareta Gris y Blanca
		Myiodynastes bairdii	Baird's Flycatcher/Mosquero de Baird
Passeriformes		*Todirostrum cinereum*	Common Tody-Flycatcher/Espatulilla Común
		Tachuris rubrigastra	Many-colored Rush Tyrant/Siete Colores de la Totora
		Camptostoma obsoletum	Southern Beardless-Tyrannulet/Mosquerito Silbador
		Muscigralla brevicauda	Short-tailed Field Tyrant/Dormilona de Cola Corta
		Euscarthmus meloryphus	Fulvous-crowned Scrub-Tyrant /Tirano de Matorral de Corona Leonada
		Tyrannus melancholicus	Tropical Kingbird/Tirano tropical
	Hirundinidae	*Pyrocephalus rubinus*	Vermilion Flycatcher/Mosquero Bermellón
		Hirundo rustica	Barn Swallow/Golondrina Tijereta
		Progne chalybea	Gray-breasted Martin/Martín de Pecho Gris
		Stelgidopteryx ruficollis	Southern Rough-winged Swallow/Golondrina Ala-Rasposa Sureña
		Tachycineta stolzmanni	Tumbes Swallow/Golondrina de Tumbes
	Thraupidae	*Volatinia jacarina*	Blue-black Grassquit/Semillerito Negro Azulado
		Thraupis episcopus	Blue-gray Tanager/Tangara Azuleja
		Sporophila telasco	Chestnut-throated Seedeater/Espiguer de Garganta Castaña
		Sporophila peruviana	Parrot-billed Seedeater/Espiguero Pico de Loro
		Sicalis flaveola	Saffron Finch/Chirigüe Azafranado
		Saltator striatipectus	Streaked Saltator/Saltador Rayado
	Thamnophilidae	*Thamnophilus bernardi*	Collared Antshrike/Batará Acollarado
		Campylorhynchus fasciatus	Fasciated Wren/Cucarachero Ondeado
	Troglodytidae	*Troglodytes aedon*	House Wren/Cucarachero Común
		Cantorchilus superciliaris	Superciliated Wren/Cucarachero con Ceja

	Mimidae	*Mimus longicaudatus*	Long-tailed Mockingbird/Calandria de Cola Larga
	Furnariidae	*Synallaxis stictothorax*	Necklaced Spinetail/Cola-Espina Acollarado
		Furnarius leucopus	Pale-legged Hornero/Hornero de Pata Pálida
		Phleocryptes melanops	Wren-like Rushbird/Junquero
	Icteridae	*Dives warczewiczi*	Scrub Blackbird/Tordo de Matorral
		Molothrus bonariensis	Shiny Cowbird/Tordo Brilloso
		Icterus graceannae	White-edged Oriole/Bolsero de Filos Blancos
		Icterus mesomelas	Yellow-tailed Oriole/Bolsero de Cola Amarilla
	Polioptilidae	*Polioptila plumbea*	Tropical Gnatcatcher/Perlita Tropical
Pelecaniformes	Ardeidae	*Nycticorax nycticorax*	Black-crowned Night-Heron/Huaco Común
		Bubulcus ibis	Cattle Egret/Garcita Bueyera
		Ardea cocoi	Cocoi Heron/Garza Cuca
		Ardea alba	Great Egret/Garza Grande
		Ixobrychus exilis	Least Bittern/Mirasol Leonado
		Egretta thula	Snowy Egret/Garcita Blanca
		Egretta tricolor	Tricolored Heron/Garcita tricolor
		Nyctanassa violacea	Yellow-crowned Night-Heron/Huaco de Corona Amarilla
	Threskiornithidae	*Platalea ajaja*	Roseate Spoonbill/Espátula Rosada
Piciformes	Picidae	*Colaptes rubiginosus*	Golden-olive Woodpecker/Carpintero Olivo y Dorado
		Dryobates callonotus	Scarlet-backed Woodpecker/Carpintero de Dorso Escarlata
Podicipediformes	Podicipedidae	*Tachybaptus dominicus*	Least Grebe/Zambullidor Menor
		Podilymbus podiceps	Pied-billed Grebe/Zambullidor de Pico Grueso
Phoenicopteriformes	Phoenicopteridae	*Phoenicopterus chilensis*	Chilean Flamingo/Flamenco Chileno
Psittaciformes	Psittacidae	*Forpus coelestis*	Pacific Parrotlet/Periquito Esmeralda
Strigiformes	Strigidae	*Athene cunicularia*	Burrowing Owl/Lechuza Terrestre
		Glaucidium peruanum	Peruvian Pygmy-Owl/Lechucita Peruana
Suliformes	Phalacrocoracidae	*Phalacrocorax brasilianus*	Neotropic Cormorant/Cormorán Neotropical

Regarding the aesthetic value, evaluated by the 30 interviewees, the score of the first 15 bird species that were visually more attractive was obtained. Among them, the following species stand out, with scores higher than 2.6: Phoenicopterus chilensis, *Parabuteo unicinctus, Pyrocephalus rubinus and Falco peregrinus* (figure 2).

Figure 2. Aesthetic value of the birds of the Laguna de los Patos wetland

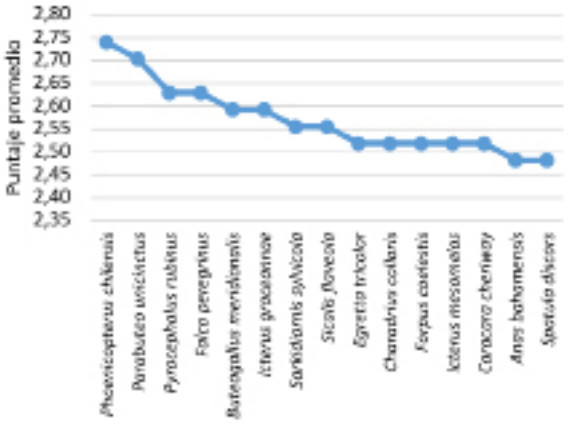


Table 4 shows the 10 species with the highest perceptibility rating, among which *Platalea ajaja, Ardea alba and Egretta thula* stand out for having higher scores in the subcategories of size and high color. On the contrary, the last 10 species, of small size, medium color and low acoustic perceptibility, such as *Calidris pusilla* and *Muscigralla brevicauda*, presented a lower perceptibility assessment.

Table 4. Evaluation of the perceptibility of the birds in the "Laguna de los Patos" wetland

N°	Species	Ap	Cm	T	Pac	Percep.
1	*Platalea ajaja*	2	3	3	1	13.00
2	*Ardea alba*	2	2	3	2	12.50
3	*Egretta thula*	2	2	3	2	12.50
4	*Phoenicopterus chilensis*	2	3	3	0	12.00
5	*Buteogallus meridionalis*	2	2	2	3	12.00
6	*Parabuteo unicinctus*	2	2	2	3	12.00
7	*Himantopus mexicanus*	2	2	2	3	12.00
8	*Icterus graceannae*	2	3	1	3	12.00
9	*Icterus mesomelas*	2	3	1	3	12.00
10	*Mycteria americana*	2	2	3	1	11.50
71	*Progne chalybea*	2	1	0	2	6.50
72	*Stelgidopteryx ruficollis*	2	1	0	2	6.50
73	*Sporophila telasco*	2	1	0	2	6.50
74	*Sporophila peruviana*	2	1	0	2	6.50
75	*Polioptila plumbea*	2	1	0	2	6.50
76	*Cantorchilus superciliaris*	2	1	0	2	6.50
77	*Troglodytes aedon*	2	1	0	2	6.50
78	*Thamnophilus bernardi*	2	1	0	2	6.50
79	*Calidris pusilla*	2	1	0	1	5.50
80	*Muscigralla brevicauda*	2	1	0	1	5.50

Note. Activity period (Ap), Color and mimicry (Cm), Size (S), Acoustic Perceptibility (Acp)

According to the data obtained and based on the bibliographic review, it is known that one of the most important parameters for the promotion of bird watching, as a tourist potential, is the perceptibility of the bird and its aesthetic value (Jácome-Negrete and Monar, 2020), which are the ones with the highest weighting in the application of the multi-criteria evaluation methodology. Regarding the perceptibility parameter obtained in this investigation (table 4), it is highlighted that the diurnal activity in most of the identified birds, in the Laguna de los Patos, led to the score assigned for this variable being the same for the majority, for this reason this characteristic was not a differentiating element. Meanwhile, heterogeneous and distinctive attributes of each species such as color, size and acoustic perceptibility were determining elements when assigning the respective scores.

However, in this section it is important to highlight the results presented by Almendras et al. (2017), in whose study they determined that there are more specialized observers who give greater importance to less visible traits such as endemism, conservation status and taxonomic uniqueness. Thus, another subcategory of the perceptibility parameter that is distinguished by providing greater ease for observers to recognize and identify the avifauna is acoustic perceptibility. Among the species are *Parabuteo unicinctus*, which is characterized by the strident call it emits (Orellana et al. al., 2015); *Himantopus mexicanus* that emits loud cries during the flight and for warnings (Gómez et al 2017), and *Mycteria americana* that emits sounds by chattering its beaks, with the chicks emitting the loudest sounds, unlike the adults (Audobon, 2021).

On the other hand, for the aesthetic value parameter (figure 2) of the avifauna, the ones that stand out the most and coincide with those that present high perceptibility are Phoenicopterus chilensis, Parabuteo unicinctus, *Buteogallus meridionalis*, Icterus graceannae and *Icterus mesomelas*. In this sense, for many authors (Navarijo, 2000, 2014; Tafalla, 2013) this feature is one of the reasons why birds have always been a very attractive group of animals for people, for this reason it is one of the criteria which has a greater impact on the assessment of the birdwatching potential of birds.

Finally, Table 5 presents the final assessment of the ecoturism potential of the 10 species of birds identified and recorded in the "Laguna de los Patos" wetland that obtained the highest PAV and the 10 that had the lowest values. The results show that the perceptibility parameter of the bird represents the largest number of scores of the total, highlighting *Platalea ajaja, Phoenicopterus chilensis* and *Icterus graceannae*.

Tabla 5. Assessment criteria and scores for the bird's perceptibility parameter.

N°	Especie	Ec	En	St	Pa	Ve	PAV
1	*Platalea ajaja*	1	0	3	13	2,4	25,6
2	*Phoenicopterus chilensis*	1	0	3	12	2,7	24,55
3	*Icterus graceannae*	0	2	1	12	2,6	24,4
4	*Parabuteo unicinctus*	0	0	2	12	2,7	23,05
5	*Forpus coelestis*	0	2	3	10,5	2,5	23
6	*Mycteria americana*	1	0	3	11,5	2,1	22,9
7	*Buteogallus meridionalis*	0	0	2	12	2,6	22,9
8	*Himantopus mexicanus*	0	0	3	12	2,2	22,8
9	*Ardea alba*	0	0	1	12,5	2,3	22,7
10	*Egretta thula*	0	0	1	12,5	2,1	22,4
71	*Sporophila peruviana*	0	1	1	6,5	2,1	14,4
72	*Camptostoma obsoletum*	0	0	2	6,5	2,2	14,05
73	*Progne chalybea*	0	0	2	6,5	2,1	13,9
74	*Stelgidopteryx ruficollis*	0	0	2	6,5	2,1	13,9
75	*Actitis macularius*	0	0	2	6,5	2	13,75
76	*Euscarthmus meloryphus*	0	0	2	6,5	2	13,75
77	*Troglodytes aedon*	0	0	2	6,5	2	13,75
78	*Muscigralla brevicauda*	0	1	2	5,5	1,9	13,1
79	*Sporophila telasco*	0	0	1	6,5	1,9	13,1
80	*Calidris pusilla*	0	0	2	5,5	2	12,25

Nota. Valor estético (Ve), Perceptibilidad del ave (Pe), Estado de conservación (Ec), Endemismo (End) y Singularidad taxonómica (St)

Along the same lines, according to the data obtained, it was possible to determine that evaluating the potential value of birdlife in the "Laguna de los Patos" wetland is important. In this work, the species *Platalea ajaja, Phoenicopterus chilensis, Icterus graceannae, Parabuteo unicinctus* and *Forpus coelestis* obtained the highest values. Similarly, in the work of Almendras et al. (2017), the species *P. chilensis* also obtained a high score (position 1 of 16). However, many species that obtained high scores in this study, such as *Himantopus mexicanus* and *Egretta Thula*, were classified as species of low ecotourism value in the research carried out by Muñoz-Pedreros and Quintana (2010). This may be due, according to what was pointed out by Almendras et al. (2016), that more specialized observers tend to give greater importance to less visible traits such as taxonomic uniqueness, conservation status and endemism. Similarly, Quiñonez and Hernández (2017) add that observers find the species Phalacrocorax brasilianus, Tachuris rubrigastra and Phleocryptes melanops attractive due to their color and behavior, while researchers Jácome-Negrete and Monar (2020) assigned low scores to *Falco peregrinus* (rank 24 out of 58), compared to the present study (rank 12 out of 80).

Other works have also emphasized the importance of developing bird tourism in Peru. For example, Salazar and Mena (2018) propose the development of activities that are friendly to conservation, such as birdwatching, since 45 species of birds were recorded in the Tabaconas Namballe National Sanctuary, including threatened, almost threatened, and endemic. Likewise, Cajas et al. (2021) carried out a study in the Tingo María National Park, and pointed out that it is possible to continue carrying out an adequate level of tourism development represented by avitourism. However, as pointed out by Jien et al. (2021), birdwatching is concentrating on places better known as protected areas, leaving aside the birdwatching potential that other areas that are not part of conserved areas may present, in this case, the "Laguna de los Patos" .

Lastly. It is important to highlight that, of the nine endemic species of the biogeographical region known as the Tumbesian endemism area (Novoa et al., 2019; Shulenberg et al., 2010; Ugaz and Saldaña, 2014), four presented a high bird-watching potential in this area: Icterus graceannae, *Sicalis flaveola, Tachycineta stolzmanni* and *Forpus coelestis*. These species give the wetland a great comparative and competitive advantage for the planned, organized and technical development of avitourism.

CONCLUSIONES

It is possible to conclude that the "Laguna de los Patos" wetland has great potential to be developed as a birdwatching attraction in the Piura region (Peru). The presence of a great diversity of migratory bird species can highlight the potential that exists in this area as a place for bird watching. Emblematic species such as *Platalea ajaja, Phoenicopterus chilensis and Icterus graceannae* can meet most

of the criteria for nature tourism and, in turn, enhance the tourist attraction in this area.

Given that some studies have already been carried out to offer the richness of bird species that exist in the wetland, this study proposes the development of bird tourism as a potential to provide considerable benefits. In addition, the incorporation of relative abundance as a parameter could modify the results of the potential birdwatching assessment of identified birds, especially those species whose sightings are achieved sporadically.

However, like this and other places, there are still important knowledge gaps in relation to the importance of birds and the development of birdwatching. Therefore, it will be necessary to adequately evaluate the scope of these activities to assess their capacity and obtain sustainable results in terms of conservation and tourism development.

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Examples of species present in the Laguna de los Patos

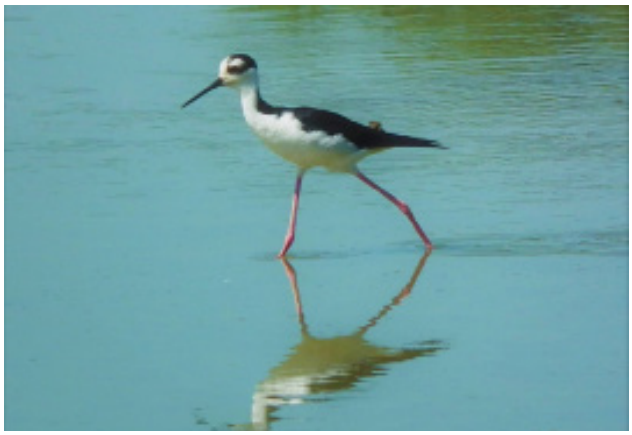
Buteogallus meridionalis
(photo by R. Seminario-Córdova)

Ardea cocoi
(photo by R. Seminario-Córdova)

Tachycineta stolzmanni
(photo by R. Seminario-Córdova)

Nyctanassa violacea
(photo by R. Seminario-Córdova)

Sarkidiornis sylvicola
(photo by R. Seminario-Córdova)



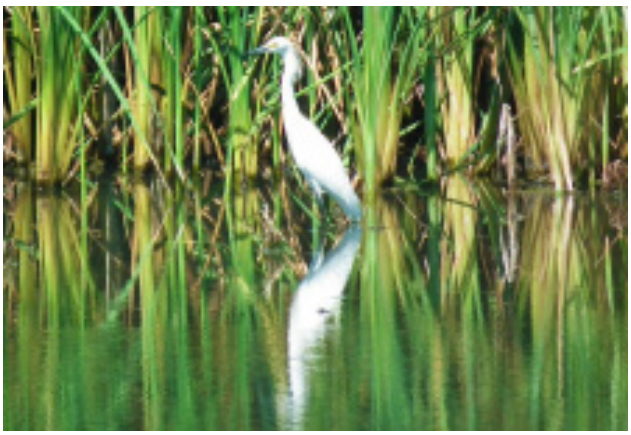
Himantopus mexicanus
(photo by R. Seminario-Córdova)

Phoenicopterus chilensis
(photo by R. Seminario-Córdova)

Furnarius leucopus
(photo by R. Seminario-Córdova)

Forpus coelestis
(photo by R. Seminario-Córdova)

Actitis macularius
(photo by R. Seminario-Córdova)



Egretta thula
(photo by R. Seminario-Córdova)

Mycteria americana
(photo by R. Seminario-Córdova)