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PRELIMINARY DIAGNOSIS OF BIRDLIFE COMPONENT ON PARQUE TURÍSTICO NUEVA LOJA, SUCUMBÍOS-ECUADOR

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ABSTRACT: *Ecuador is the fourth country with the most incredible bird biodiversity worldwide, with an estimated 50% located in the Amazon region. Therefore, expanding research and conservation efforts is important. In this context, the Parque Turístico Nueva Loja is a suitable place for developing this zoological group, so we propose to determine the richness and relative abundance of birds in different habitats and identify their trophic guilds.The Parque Turístico Nueva Loja covers 30 hectares, where eight counting points were established. Data collection was carried out during December 2022, starting at 05:30, when all birds were recorded by observation and song for 30 minutes. For statistical analysis, calculations were made for richness, relative abundance, and alpha and beta diversity. Range-abundance and species accumulation curves were also projected, and corresponding trophic guilds were recorded. A total of 407 individuals belonging to 52 species from 26 families were recorded, with the most abundant species being Ara Severus (14.74%). The family with the highest abundance was Psittacidae, while the family with the highest richness was Tyrannidae. The most well-represented trophic guild was frugivorous (28.85%). In terms of biodiversity, an Inverse Simpson Index of 16.7 was obtained, and regarding Jaccard's Index, the highest similarity was between forest and anthropic zones with a value of 0.5. In conclusion, due to Parque Turístico Nueva Loja location, anthropogenic activities in its surroundings influence the abundance and richness of birds, resulting in low biodiversity and high dominance of generalist and opportunistic species. However, the park has suitable habitats and resources for birds, making it an important site for biodiversity conservation.*

KEYWORDS: Abundance, Amazonia, birds, richness, trophic guild.

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INTRODUCTION

Ecuador is recognized as one of the countries with the highest biodiversity globally regarding species and natural environments. Geological conditions, such as the presence of the Andes Mountain range, facilitate the formation of various climatic zones, each with its distinct characteristics. Additionally, the influence of marine currents, such as the cold Humboldt Current and the warm El Niño Current, contributes to the formation of microhabitats, enabling the establishment of a wide array of species (Bravo, 2014).

The country's avian biodiversity is extensive. According to the updated Checklist of the Birds of Ecuador, as of July 2022, there are 1,722 species (Frele et al., 2022). Furthermore, it harbors 11 areas of bird endemism (Bravo, 2014), positioning it as the fourth country with the highest number of bird species worldwide (Freile, 2021). However, according to the IUCN, it also ranks eighth globally in the number of threatened bird species (Bravo, 2014).

Of the total bird species recorded in the country, it is estimated that 50% are found in the Amazonian region (Bravo, 2014). The conservation of this zoological group is of paramount importance as they perform functions such as insect pest control, pollination, seed dispersal, particularly of trees and shrubs, as well as carrion removal, activities that contribute to the maintenance and functioning of ecosystems (BirdLife International, 2018; SEO BirdLife, 2020). Nevertheless, knowledge regarding the ecology, distribution, and conservation of the avifauna in this region remains very limited (Ordóñez-Delgado et al., 2017), and further studies on functional ecology, diet, habitat association, and responses to disturbances are needed to understand better the role that birds play within the various ecosystems (Freile, 2021).

In this context, within the province of Sucumbíos, the Parque Turístico Nueva Loja (PTNL), belonging to the Secretaría Técnica de Gestión Inmobiliaria del Sector Público (INMOBILIAR). This park serves as a recreational and educational area in the city's central zone and amidst the Amazonian forest of Lago Agrio (Mestanza-Ramon et al., 2019). The park harbors a significant diversity of flora and fauna native to the region, strengthening the natural and cultural heritage of the Amazonian nationalities (Chicaiza, 2019).

Research on biodiversity within the PTNL is limited, with a greater focus on studies related to the area's tourism potential. Therefore, this study proposes a preliminary bird assessment using a simple methodology, which allows for an overview description of this component (Suárez, 2013). This study aims to determine the richness, abundance, and composition of bird species present in the anthropogenic zone, the transition zone, water bodies, and forest remnants. Additionally, it aims to identify their trophic guilds, as the PTNL presents suitable habitats for developing the avifauna component. Therefore, the results obtained are expected to generate information that contributes to aspects such as improving natural resource management and protection. Moreover, it could serve as a tool for biodiversity management and conservation plans.

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METHODOLOGY

Study Area

The PTNL is a recreational and educational area in northern Ecuador, in the central zone of the city of Nueva Loja, Lago Agrio canton (Sucumbíos). It encompasses a surface area of 30 hectares, with an altitudinal range of 150 to 300 meters above sea level (m.a.s.l.) (Guevara et al., 2013: Mestanza-Ramon et al., 2019), corresponding to the Eastern Tropical Zoogeographic Zone (Albuja et al., 2012). Regarding its botanical composition, the study area belongs to the Lowland Evergreen Forest of the Aguarico-Putumayo-Caquetá (Guevara et al., 2013).

The study area comprises a diverse assemblage of epiphytic plants, herbs, shrubs, and trees, including native and introduced species (Chicaiza, 2019). Four landscape areas were selected for this study: Anthropogenic, Forest, Water Bodies, and Transition zones. Each area was assigned two counting points for data collection (Fig. 1).

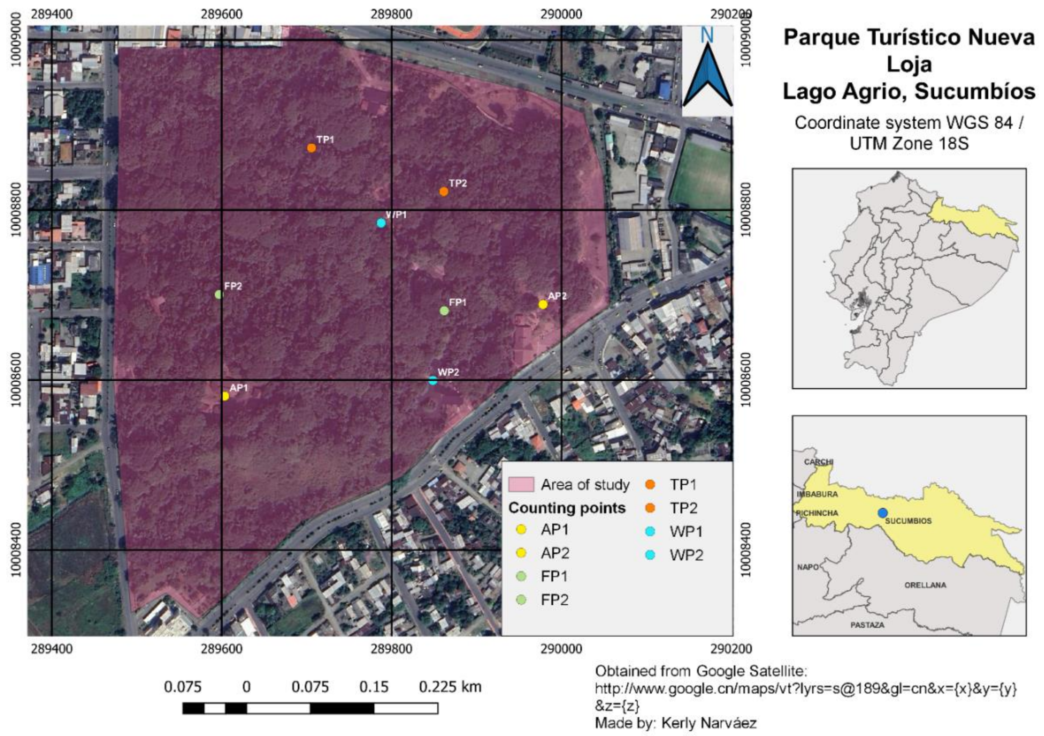

Fig. 1. Sampling area and bird counting points within the PTNL: AP) Anthropogenic Point, FP) Forest Point, WP) Water Body Points, and TP) Transition Points.

Methodology

Data collection was conducted in December on the following dates: AP on December 5th and 11th, 2022; WP on December 6th and 12th, 2022; TP on December 8th and 13th, 2022; and finally, FP on December 8th and 20th, 2022.

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Counting Points

Eight counting points were established, with two points assigned to each landscape area. Each counting point had a diameter of 40 meters, maintaining a minimum separation of 200 meters between them. Sampling was carried out in the morning, starting at 05:30, and all bird species observed within a 30-minute period at each point were recorded.

Vocalizations

Birdsong recordings were conducted at the counting points where necessary, as individuals can be less conspicuous in forest areas. Vocalizations were recorded for subsequent identification using the Merlin Bird ID application by Cornell Lab (Cornell University, 2023).

Statistical Analyses

Species richness was calculated using the formula **S/N x 100** to determine relative abundance. Inverse Simpson Index (**$1/\sum(pi)^2$**) and Jaccard's index (**c/a+b-c**) were used to calculate alpha and beta diversity, respectively. Trophic guilds were analyzed using a simple proportion rule based on the total number of individuals and the number of individuals within each tropical guild.

To determine community structure, the proportion of individuals was calculated on a base-10 logarithmic scale using rank-abundance curves (Whittaker, 1972). Species accumulation curves were projected to estimate sampling efficiency using the Estimates software (Colwell, 2022) employing the nonparametric CHAO 1 estimator (Chao, 1984).

RESULTS

Relative abundance

The total number of bird individuals recorded in the eight-sampling point was 407, belonging to 52 species and 26 Families. The most abundant species was *Ara Severus*, with 60 records (14.74%), followed by *Rostrhamus sociabilis*, with 38 individuals (9.34%), and *Psarocolius angustifrons* and *Megarynchus pitanga*, each with 33 records (8.11%), as shown in Table 1.

TABLE 1. Recorded bird families and species with their primary trophic guild and abundances; *=Specialized Carnivore; PTNL, Lago Agrio canton, Sucumbíos, Ecuador.

Family/Specie	Tropic guild	Abundance (n)	Relative abundance (%)
Accipitridae			
Chondrohierax uncinatum	Carnivorous*	2	0,49
Helicolestes hamatus	Carnivorous*	1	0,25
Rostrhamus sociabilis	Carnivorous*	38	9,34
Rupornis magnirostris	Carnivorous	2	0,49
Alcedinidae			
Megaceryle torquata	Carnivorous*	2	0,49
Apodidae			

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Tachornis Squamata	Insectivorous	17	4,18
Ardeidae			
Bubulcus ibis	Omnivorous	2	0,49
Butorides striata	Carnivorous	1	0,25

Family/Specie	**Trophic guild**	**Abundance (n)**	**Relative abundance (%)**
Bucconidae			
Monasa nigrifrons	Insectivorous	24	5,90
Capitonidae			
Capito auratus	Frugivorous	2	0,49
Capito aurovirens	Frugivorous	7	1,72
Cathartidae			
Coragyps atratus	Omnivorous	2	0,49
Charadriidae			
Vanellus chilensis	Carnivorous	1	0,25
Columbidae			
Columbina Talcott	Granivorous	2	0,49
Cracidae			
Ortalis guttata	Frugivorous	9	2,21
Cuculidae			
Crotophaga ani	Omnivorous	1	0,25
Fringillidae			
Euphonia xanthogaster	Frugivorous	1	0,25
Furnariidae			
Dendrexetastes rufigula	Insectivorous	3	0,74
Galbulidae			
Galbalcyrhynchus leucotis	Insectivorous	1	0,25
Icteridae			
Cacicus cela	Insectivorous	9	2,21
Psarocolius angustifrons	Frugivorous	33	8,11
Parulidae			
Setophaga petechia	Insectivorous	1	0,25
Picidae			
Melanerpes cruentatus	Omnivorous	6	1,47
Psittacidae			
Amazona amazonica	Granivorous	5	1,23
Ara ararauna	Frugivorous	6	1,47
Ara severus	Frugivorous	60	14,74
Brotogeris cyanoptera	Frugivorous	1	0,25
Orthopsittaca manilatus	Frugivorous	22	5,41
Rallidae			

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Aramides cajaneus	Omnivorous	4	0,98
Porphyrio martinica	Omnivorous	1	0,25
Ramphastidae			
Pteroglossus castanotis	Omnivorous	1	0,25
Pteroglossus inscriptions	Frugivorous	8	1,97
Strigidae			
Megascops choliba	Insectivorous	2	0,49
Thraupidae			
Cissopis leverianus	Frugivorous	2	0,49
Dacnis flaviventer	Insectivorous	3	0,74
Family/Specie	**Trophic guild**	**Abundance (n)**	**Relative abundance (%)**
Thraupidae			
Thraupis episcopus	Frugivorous	4	0,98
Thraupis palmarum	Insectivorous	11	2,70
Volatinia jacarina	Granivorous	6	1,47
Trochilidae			
Anthracothorax nigricollis	Nectarivorous	3	0,74
Chionomesa fimbriata	Nectarivorous	2	0,49
Phaethornis boucieri	Nectarivorous	1	0,25
Phaethornis malaris	Nectarivorous	3	0,74
Troglodytidae			
Troglodytes aedon	Insectivorous	14	3,44
Turdidae			
Turdus ignobilis	Omnivorous	7	1,72
Tyrannidae			
Legatus leucophaius	Insectivorous	1	0,25
Megarynchus pitangua	Frugivorous	33	8,11
Myiarchus tuberculifer	Insectivorous	1	0,25
Myiozetetes granadensis	Insectivorous	1	0,25
Myiozetetes similis	Frugivorous	3	0,74
Pitangus lictor	Insectivorous	6	1,47
Pitangus sulphuratus	Omnivorous	14	3,44
Tyrannus melancholicus	Frugivorous	15	3,69
	Total	**407**	**100**

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Trophic Guilds

The most represented trophic guild was the frugivorous group, comprising 28,85% of the recorded species, with *A. severus* contributing the highest proportion to this percentage (Table 2).

TABLE 2. Trophic guilds identified in the study with their corresponding percentage relative to the number of species recorded in the PTNL, Lago Agrio canton, Sucumbíos, Ecuador.

Trophic guild	Individuals (n)	Species (n)	Total percentage (%)
Frugivorous	206	15	28,85
Insectivorous	94	14	26,92
Omnivorous	38	9	17,31
Carnivorous	47	7	13,46
Nectarivorous	9	4	7,69
Granivorous	13	3	5,77
Total	**407**	**52**	**100**

Abundance and Species Richness

The families with the highest abundance of individuals were Psittacidae, Tyrannidae, Accipitridae, and Icteridae (Fig. 2), while the families with the most incredible species richness were Tyrannidae, Psittacidae, and Thraupidae (Fig. 3).

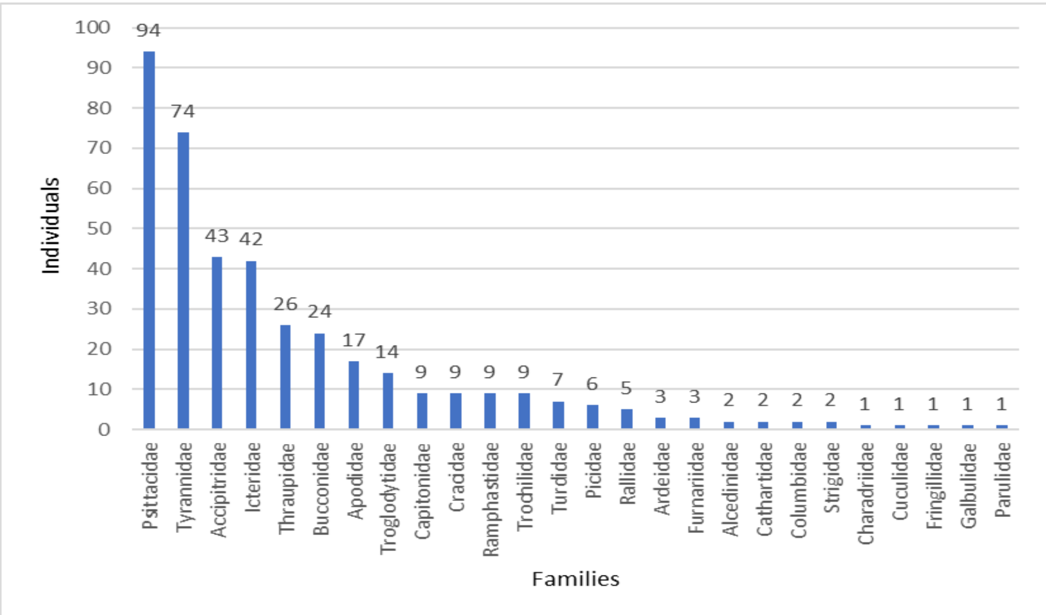

FIG. 2. Abundance of individuals per bird family recorded in the PTNL, Lago Agrio canton, Sucumbíos, Ecuador.

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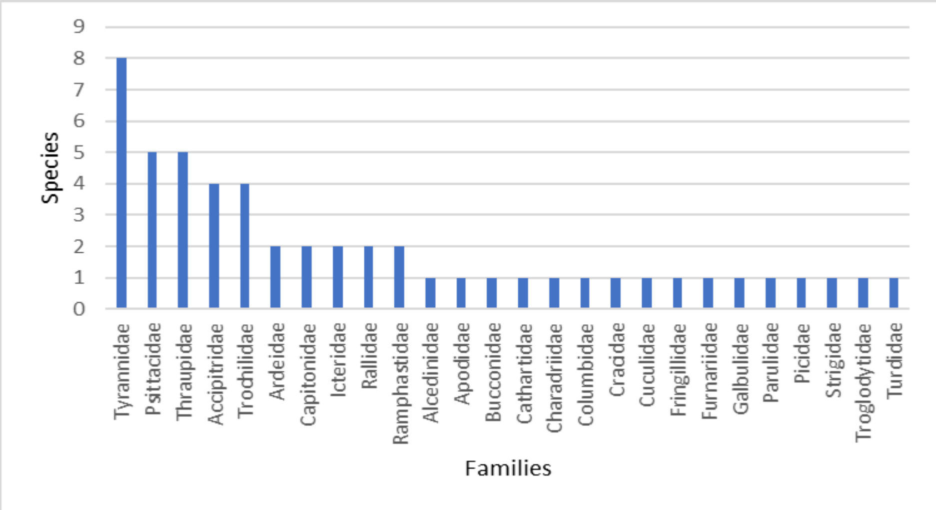

FIG. 3. Species richness per bird family recorded in PTNL, Lago Agrio canton, Sucumbíos, Ecuador.

Rank-Abundance Curves

The most abundant species recorded were *A. severus*, *R. sociabilis*, *M. pitanga, and P. angustifrons*, which were readily observed in all four sampled habitats. In contrast, *B. cyanoptera*, *B. striata*, *C. ani*, *E. xanthogaster*, *G. leucotis*, *H. hamatus*, *L. leucophaius*, *M. tuberculifer*, *M. granadensis*, *P. boucieri*, *P. martinica*, *P. castanotis*, *S. petechia*, and *V. Chilensis*, are rare species, as shown in Figure 4.

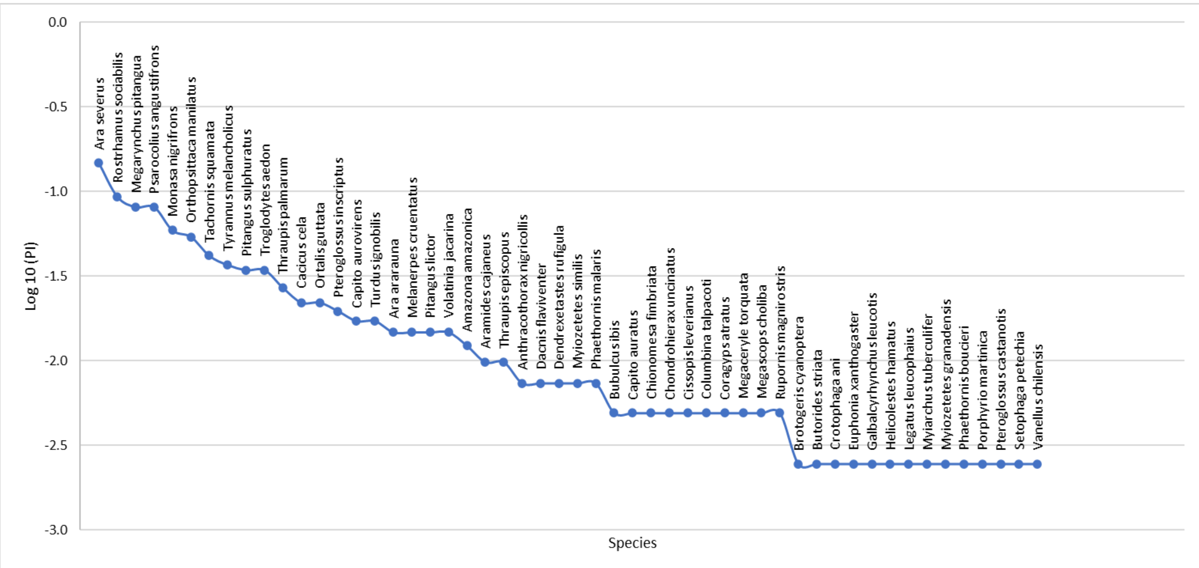

FIG. 4. Rank-abundance curve of the total bird species recorded in the PTNL, Lago Agrio canton, Sucumbíos, Ecuador

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Regarding the four sampled habitats, the most abundant species were: in Anthropogenic Points (AP), *M. nigrifrons, and P. angustifrons* (Fig. 5A); in Forest Points (FP), *M. pitangua*, *P. sulphuratus, and P. angustifrons* (Fig. 5B); in Water-bodies Points (WP)*, R. sociabilis, and A. severus* (Fig. 5C); and Transition Points (TP) *A. severus* and *O. manilatus* (Fig. 5D).

Conversely, the rare species with a single record in each habitat were: in Athropogenic Points (AP), *A. nigricollis*, *C. cela*, *C. atratus*, *D. flaviventer*, *D. rufigula*, *O. guttata*, *P. castanotis*, *R. sociabilis*, *R. magnirostris*, and *T. episcopus* (Fig. 5A); in Forest Points (FP), *A. ararauna*, *C. cela*, *C. uncinatus*, *C. leverianus*, *O. guttata*, *P. boucieri*, *R. magnirostris*, *T. ignobilis*, and *V. jacarina* (Fig. 5B); in Water-bodies Points (WP), *B. cyanoptera*, *B. striata*, *C. atratus*, *E. xanthogaster*, *G. leucotis*, *H. hamatus*, *L. leucophaius*, *M. choliba*, *M. tuberculifer*, *M. granadensis*, *P. malaris*, *P. martinica*, *S. petechia*, *T. episcopus*, *T. ignobilis*, and *V. chilensis* (Fig. 5C); and in Transition Points (TP), *A. cajaneus*, *C. aurovirens*, *C. uncinatus*, *C. leverianus*, *C. ani*, *M. choliba*, *M. cruentatus*, *M. similis*, *R. sociabilis*, and *T. aedon* (Fig. 5D).

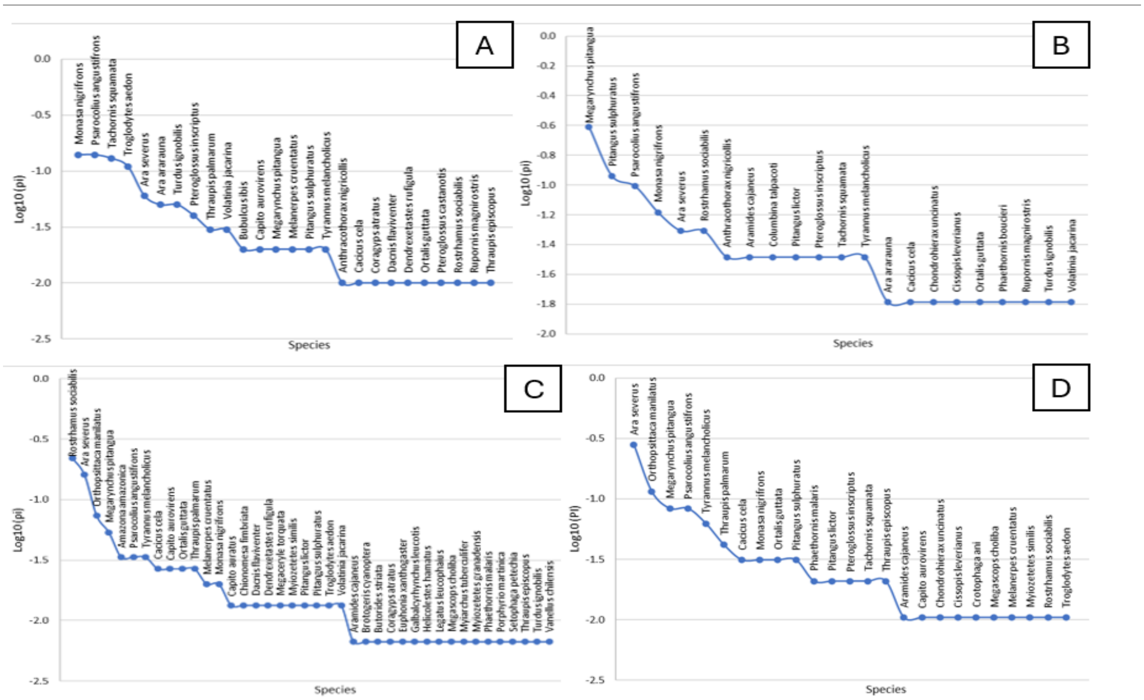

FIG. 5. Rank-abundance curves of birds recorded in the different sampled habitats: A) Anthropogenic Points (AP), B) Forest Points (FP), C) Water-bodies Points (WP), and D) Transition Points (TP). PTNL, Lago Agrio canton, Sucumbíos, Ecuador.

Diversity

The Inverse Simpson Index obtained in this study is 16.7, which indicates low biodiversity. It is significantly below the maximum possible value of 52, representing less than one-third of the maximum. This further confirms low biodiversity and, consequently, the high dominance of the species *A. Severus*, *R. sociabilis*, *M. pitanga,* and *P. angustifrons* (Fig. 4).

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The Jaccard's Index reveals a moderate similarity between the forest and anthropogenic points, as they share 16 species out of the 48 present in both habitats. In contrast, the similarity between forest and water-bodies points is lower, with 13 shared species out of the 62 recorded across both habitats (Table 3). The similarity among the four sampling habitats is nine species out of the 52 recorded: *A. severus*, *C. cela*, *M. pitangua*, *M. nigrifrons*, *O. guttata*, *P. sulphuratus*, *P. angustifrons*, *R.sociabilis*, and *T. Melancholicus*.

TABLE 3: Jaccard Index among the four sampling habitats: AP) Anthropogenic Points, FP) Forest Points, WP) Water-bodies Points, and TP) Transition Points within the PTNL, Lago Agrio canton, Sucumbíos, Ecuador.

Jaccard's Index	**AP**	**FP**	**WP**	**TP**
AP	1	-	-	-
FP	0,500	1	-	-
WP	0,404	0,265	1	-
TP	0,457	0,469	0,444	1

Species Accumulation Curve

As shown in the species accumulation curve (Fig. 6), 52 species were recorded, while the nonparametric CHAO 1 estimator predicts 60 species. This results in a sampling completeness of 86.31% relative to the estimator, which indicates that bird sampling was adequate within the study area.

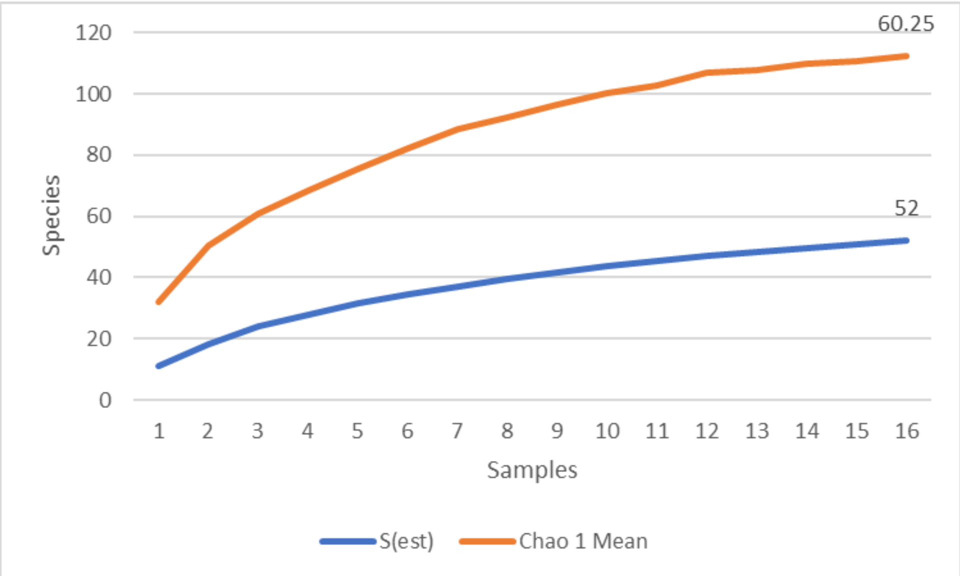

FIG. 6. Potential species richness of birds of the PTNL, Lago Agrio canton, Sucumbíos, Ecuador.

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DISCUSSION

The present study on bird abundance and richness in the PTNL indicates that the families with the highest abundances are Psittacidae, Tyrannidae, Accipitridae, and Icteridae. Regarding the Psittacidae family, most species are generalists with a high capacity for adaptation to diverse habitat conditions and resources, which allows them to establish populations near human settlements (Del Valle, 2008). This group forms flocks that are easily observed and are highly diverse in the lowlands of the Amazon (Del Valle, 2008; Carillo & Capera, 2020), which explains the high species richness (5) recorded. Most individuals were observed in the transition zone, where the limited canopy cover facilitated bird detection during their passage. However, individuals were recorded in flight or by vocalization. We cannot confirm that these birds inhabit the park, but it is evident that they utilize the resources.

Regarding the Tyrannidae family, it exhibits high abundance (74 individuals) and richness (8 species), consistent with results from various studies on avian communities in Amazonian regions (Cardozo *et al.*, 2008; Peña-Nuñez & Claros-Morales, 2016; Peña-Núñez *et al.*, 2017; Carrillo & Capera, 2020; Shiguango-Yumbo & Bañol-Pérez, 2020). Tyrannids are highly diverse within their distribution, as most species are generalists and adapted to anthropogenic environments; hence, they are also considered opportunistic. This is the reason why they are associated with a more significant number of habitats (Peña-Núñez *et al.*, 2017; Carrillo & Capera, 2020), as is the case with *M. pitangua, P. sulphuratus,* and *T. melancholicus,* which were found in all sampling points. These species exhibit low sensitivity to environmental disturbances and can readily adapt to modified habitats with anthropogenic activity (Peña-Núñez & Claros-Morales, 2016; Pizo & Tonetti, 2020).

The species *M. pintagua* exhibited higher abundance in forest habitats, which aligns with its behavioral ecology. This bird demonstrates a semi-dependence on forested environments but can also frequently be observed in open habitats (Jahn *et al.*, 2002; Pizo & Tonetti, 2020). Similarly, *P. sulphuratus,* whose behavior is independent of forests, generally prefers open areas, grasslands, aquatic vegetation, and urban environments due to its high dietary plasticity (Latino & Beltzer, 1999). Regarding this, *T. melancholicus* has been recorded in open habitats, grasslands, and shrublands (Alessio *et al.*, 2005).

In contrast, the Accipitridae family presented high abundance among the four recorded species, with *R. sociabilis* being the most frequently observed. This was primarily in water bodies because this species has a specialized diet of snails, and their colonial behavior facilitates its observation (Correa & García, 2019). Finally, regarding the Icteridae family, although a high abundance of 42 individuals was recorded, only two species (*P. angustifrons* and *C. cela*) were present across all habitats. This demonstrates high dominance within the park, consistent with the findings of Cardozo *et al*. (2008), which suggest that this family is associated with multiple environmental units. As a result, while abundance is expected, it does not necessarily correlate with species richness.

Among the rare species recorded across the four sampling zones were *B. cyanoptera*, *B. striata, C. ani, E. xanthogaster, G. leucosis, H. hamatus, L. leucophaius, M. tuberculifer, M. granadensis, P. boucieri, P. martinica, P. castanets, S. petechia,* and *V. chilensis*. These species are characterized by broad migratory ranges or wide geographical distribution and are typically uncommon to record (Capllonch *et al.*, 2009).

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Concerning species richness across different habitats, it would be expected that forest zones exhibit the highest number of species. Forest ecosystems are generally more attractive to avifauna due to the diversity of available food resources and the fact that they offer shelter and breeding sites (Orbe & Quispe, 2015). However, the results indicate that 40 species were recorded in water bodies. This can be attributed to these habitats providing a range of microhabitats in their surroundings, which fosters a broad diversity of resources utilized by bird species (Cardozo *et al.*, 2008).

In the anthropogenic zone, 26 species were recorded, with *M. nigrifrons* being the most dominant, which has been recorded at forest edges and is frequently observed in pairs or groups (Guilherme, 2001). The species *T. squamata* was also recorded with high abundance, often flying over open areas. This may be attributed to the abundance of palm trees near the anthropogenic zone, which serve as refuge and nesting sites for this species (Martín, 2020). Furthermore, this species has been recorded less frequently in urban areas where palm trees are commonly planted (Chantler, 2000).

An equally important aspect to consider is the record of migratory species: *B. ibis, S. petechia, P. martinica,* and *T. melancholicus.* Although the recorded species richness is not particularly high, their presence is significant, as migratory birds provide essential ecosystem services in habitats that meet suitable environmental conditions. In this way, the park contributes to the conservation of these birds.

Regarding trophic guilds, the frugivorous guild exhibits the highest representation, attributed to the various species of psittacine recorded. This reflects a significant contribution to ecosystem services, as these birds function as key agents of seed and nutrient dispersal while also playing a regulatory role in plant population dynamics and shaping vegetation structure (Sepulveda, 2019). The second most represented guild was the insectivorous one, favored by the park's open areas, the presence of poles, wiring, and scattered trees that provide perching sites for birds, thereby facilitating the observation and capture of their prey (Peña-Nuñez & Claros-Morales, 2016).

However, it is important to consider that trophic guild exhibits varying temporal dynamics depending on the species or individuals. These fluctuations are influenced by multiple factors, including migratory behavior and adaptative traits, as well as environmental factors such as seasonal food availability, nutritional value, and interspecific competition (Cardozo *et al.*, 2008; Peña-Núñez *et al.*, 2017).

It is also important to mention the significance of the specialized carnivorous diet of the raptor species recorded in this study (*C. uncinatus, H. hamatus*, and *R. sociabilis*). Raptors are organisms that serve as models for population and community studies, occupying the apex of the food chain as predators. They play a crucial role in determining the structure and organization of biological communities, functioning as umbrella species and indicators of environmental quality (Rau, 2014). Therefore, the recording of malacophagous species indicates a well-preserved aquatic ecosystem.

The similarity analysis among the four habitats using the Jaccard's Index showed a medium similarity of 0.5 (16 species) between the anthropogenic zona and the forest. This similarity may be attributed to the resource availability and the similar vegetation type, as the anthropogenic zone maintains a vegetative structure that extends from the forest zone,

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facilitating a high exchange of species and potentially leading to increased interspecific competition for food resource (Shiguango-Yumbo & Bañol-Pérez, 2020). Several studies have demonstrated that vegetation continuity between protected areas and ecotonal zones can significantly influence bird species distribution and contribute to compositional similarity. In contrast, geographic barriers, disturbed areas, and differing vegetation composition can reduce diversity, and even the size of a habitat can influence bird species richness (Martínez *et al.*, 2011; Vides-Hernández *et al.*, 2017). Consequently, a low similarity (0.265) was found between the forest habitat and water bodies, likely due to the higher degree of anthropogenic disturbance in the latter.

Regarding biodiversity within the PTNL, an Inverse Simpson Index of 16.7 was obtained, which indicated low diversity. This can be attributed to the park's location in the central area of Nueva Loja city and the surrounding anthropogenic activities that negatively impact the biodiversity of the study area. Rojas (2014) documented that 41% of the recorded species were found in urban zones, whereas 78% were present in peri-urban areas, demonstrating that bird species richness decreases with an increasing urbanization gradient.

For sampling effort evaluation, the nonparametric estimator CHAO 1 was employed. By working with abundance data, this estimator takes into account species recorded with one and two individuals (singletons and doubletons), thus providing a most rigorous estimation (Villarreal *et al.*, 2004). The results indicated that an estimated 60 species were expected to be found, of which 52 were recorded, yielding a sampling completeness of 86.31%. However, the species accumulation curve did not reach an asymptote, suggesting that an increased sampling effort could yield more species than estimated.

It is worth noting that certain observational and counting biases were detected during the present study. One factor to consider is the field of visibility within the different habitats, which can influence the recorded abundance of species. In this study, raptors and psittacines were predominantly observed in flight. In contrast, species of the Passeriformes order were directly observed in the understory, canopy, and open areas, either foraging or perching. This is reflected in the abundance of these groups across the four sampled habitats, with observation being more challenging in forest areas due to the density of foliage. These findings are consistent with previous studies conducted in structurally diverse environments by Martínez *et al*. (2011), Rojas (2014), and Shiguango-Yumbo & Bañol-Pérez (2020).

Furthermore, activity schedules also vary among bird species. Some species, such as *T. melancholicus*, exhibit a daily foraging activity rhythm starting around 08:00 (Alessio *et al.*, 2005), whereas *C. ani* demonstrates increased activity during midday hours (Beltzer et al., 2009). Since bird recording in the present study began at 05:30, this timing may not have been optimal for detecting all species.

Moreover, the methodology included the recording of bird vocalizations. While useful in habitats with limited visibility, this approach introduces several potential biases of recounting the same vocalization, misidentifying a bird based on its call, or including an individual outside the designated sampling area (Sélem-Salas *et al.*, 2011). Additionally, a prolonged sampling period increases the likelihood of recounting individuals, with 20 minutes or less being considered appropriate (Taylor, 2003). Similarly, conducting sampling sessions at one-week intervals may result in repeat counts of resident birds, particularly those present due to nesting activities or foraging behavior.

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CONCLUSION

The park hosts a high abundance and diversity of arboreal species, providing various ecosystem services and habitats for a wide range of avifauna. It represents an important site for biodiversity conservation at both local and regional scales, as these habitats facilitate wildlife movement across fragmented landscapes. Furthermore, promoted activities such as reforestation with native plants represent integrated efforts to support local ecological resilience.

However, anthropogenic activities in the surrounding areas negatively affect bird abundance and species richness, leading to low overall biodiversity and a high dominance of generalist and opportunistic species.

FUTURE RESEARCH

The collected records confirmed the presence of nocturnal bird species in the park. Therefore, it is recommended that future studies implement methodologies that incorporate the sampling of these species.

Furthermore, upon recording migratory species, it is essential to conduct research across different seasons to assess the ecological relevance of the park’s resources for these birds.

Additionally, it is recommended that research efforts related to functional ecology and the analyses of interspecific and intraspecific interaction across the different habitats expand.

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REFERENCES

Albuja, L., Almendáriz, A., Barriga, R., Montalvo, L., Cáceres, F., & Román, J. (2012). *Fauna de Vertebrados del Ecuador*. Quito: Escuela Politécnica Nacional. URL: http://bibdigital.epn.edu.ec/handle/15000/6686

Alessio, V., Beltzer, A., Lajmanovich, R., & Quiroga, M. (2005). Ecología alimentaria de algunas especies de Passeriformes (Furnariidae, Tyrannidae, Icteridae y Emberizidae): consideraciones sobre algunos aspectos del nicho ecológico. *Miscelánea*, *14*, 441-482. URL: https://www.insugeo.org.ar/libros/misc_14/31.htm

Beltzer, A., Quiroga, M., Reales, C., & Alessio, V. (2009). Espectro trófico, ritmo circadiano de actividad alimentaria y uso del hábitat del Pirincho Negro *Crotophaga ani* (aves: cuculidae) en el valle de inundación del Río Paraná Medio, Argentina. *FABICIB*, *13*, 157-165. DOI: https://doi.org/10.14409/fabicib.v13i1.840

BirdLife International. (2018). *El Estado De Conservación De Las Aves Del Mundo*. Cambridge, Reino Unido.

Bravo, E. (2014). *La Biodiversidad en el Ecuador*. Quito: Editorial Universitaria Abya-Yala.

Capllonch, P., Ortiz, D., & Soria, K. (2009). Migraciones de especies de Tyrannidae de la Argentina: Parte 2. *Acta zoológica Lilloana*, *53*(1-2), 77-97. URL: https://www.lillo.org.ar/journals/index.php/acta-zoologica-lilloana/article/view/296

Cardozo, G., Beltzer, A., & Collins, P. (2008). Variación primavero-estival de la diversidad y abundancia de la comunidad de aves en la reserva ecológica de la Ciudad Universitaria U.N.L. " El Pozo." *INSUGEO*, *Miselánea*,17(2),361-365. URL: http://www.insugeo.org.ar/scg/ver-articulo.php?id=394

Carrillo, E., & Capera, X. (2020). Avifauna del Parque Andakí, piedemonte andino-amazónico, Caquetá-Colombia. *Revista Colombia Amazónica*,16,205-230. URL: https://sinchi.org.co/revista

Chantler, P. (2001). Swifts: A guide to the Swifts and Treeswifts of the World. *The Auk*, *118*(1), 274-277. DOI: https://doi.org/10.1093/auk/118.1.274

Chao, A. (1984). Nonparametric estimation of the number of classes in a population. *Scandinavian Journal of Statistics*,11(4),256-270. URL: https://www.jstor.org/stable/4615964

Chicaiza, I. (2019). *Diseño de patrones y estructuras para ser aplicadas a textiles a través de un estudio morfológico de la flora y fauna del Parque Turístico Nueva Loja*. (Tesis de pregrado). Universidad Técnica de Cotopaxi, Latacunga, Ecuador. URL: http://repositorio.utc.edu.ec/handle/27000/7218

Colwell, R. (2022). EstimateS: Statistical Estimation of Species Richness and Shared Species for Samples (Versión 9.1) [Software].

Cornell University. (2023). Merlin Bird ID de Cornell Lab (Versión 2.1.3) [Aplicación móvil].

Correa, J., & García, X. L. (2019). Distribución y abundancia del gavilán caracolero (Rostrhamus sociabilis) y la correa (Aramus guarauna), y su interacción con la chivita (Pomacea flagellata) en la Laguna de Bacalar, Quintana Roo, México. *Huitzil*,20(1),1-11. DOI: https://doi.org/10.28947/hrmo.2019.20.1.395

Del-Valle, C. M. (2008). Introducción a la Biología y Ecología de las Psitácidas Neotropicales. *Memorias De La Conferencia Interna En Medicina Y Aprovechamiento De Fauna Silvestre, Exótica Y No Convencional*,4(1),4-6. URL: https://www.revistas.veterinariosvs.org/index.php/cima/article/view/55

Freile, J. (2021). *Aves del Ecuador*. BIOWEB Ecuador. URL: https://bioweb.bio/faunaweb/avesweb/home

Article DOI: 10.52589/AJENSR-BMSETUHS
DOI URL: https://doi.org/10.52589/AJENSR-BMSETUHS

Freile, J. F., Brinkhuizen, D. M., Greenfield, P. J., Lysinger, L., Navarrete, L., Nilsson, J., Olmstead, S., Ridgely, R. S., Sánchez-Nivicela, M., Solano-Ugalde, A., Athanas, N., Ahlman, R., & Boyla, K. A. (2022). *Lista de las aves del Ecuador*. Comité Ecuatoriano de Registros Ornitológicos. URL: https://ceroecuador.wordpress.com/lista-oficial/

Guevara, J., Pitman, N., Cerón, C., Mogollón, H., & PMV. (2013). Bosque siempreverde de Tierras bajas del Aguarico-Putumayo-Caquetá. En Ministerio del Ambiente del Ecuador, *Sistema de Clasificación de los Ecosistemas del Ecuador Continental* (págs. 175-177). Quito: Subsecretaria de Patrimonio Natural.

Guilherme, E. (2001). Comunidade de aves do Campus e Parque Zoobotânico da Universidade Federal do Acre, Brasil. *Tangara, 1*(2), 57- -73.

Jahn, A., Davis, S., & Saavedra, A. (2002). Patrones en la migración austral de aves entre temporadas y hábitats en el Chaco boliviano, con notas de observaciones y una lista de especies. *Ecología en Bolivia, 37*(2), 31-50. URL: https://1library.co/document/q5e0wojq-patrones-migracion-austral-temporadas-habitats-boliviano-observaciones-especies.html

Latino, S., & Beltzer, A. (1999). Ecología trófica del benteveo *Pitangus sulphuratus* (aves: Tyrannidae) en el valle de inundación del río Paraná, Argentina. *Orsis, 14*, 69-78. URL: https://raco.cat/index.php/Orsis/article/view/24423

Martín, J. (2020). Primer registro del vencejo tijereta (*Tachornis squamata*) en Argentina. *El Hornero, 35*(2), 137-139. DOI: https://doi.org/10.56178/eh.v35i2.445

Martínez, O., Maillard, O., Vedia-Kennedy, J., Herrera, M., Mesili, T., & Rojas, A. (2011). Riqueza específica y especies de interés para la conservación de la avifauna del área protegida Serranía del Aguaragüe (Sur de Bolivia). *El Hornero, 26*(2), 111-128. URL: https://elhornero.avesargentinas.org.ar/index.php/home/article/view/683

Mestanza-Ramon, C., Cunalata-García, Á., Jiménez-Gutiérrez, M., & Chacha-Bolaños, A. (2019). Disposición a pagar por el ingreso a zonas de uso público en el Parque Turístico "Nueva Loja", Sucumbíos-Ecuador. *Polo del Conocimiento, 4*(2), 67-82. URL: https://dialnet.unirioja.es/servlet/articulo?codigo=7164301

Orbe, M. del P., & Quispe, L. M. (2015). Diversidad de aves en ambientes urbanos y periurbanos de la ciudad de Iquitos y Bosque de Varillal, Loreto-Perú. (Tesis de pregrado). Universidad Nacional de la Amazonia Peruana, Loreto, Perú.

Ordóñez-Delgado, L., Freile, J. F., Guevara, E. A., Cisneros-Heredia, D. F., & Santander, T. (2017). *Memorias de la V Reunión Ecuatoriana de Ornitología. Revista Ecuatoriana De Ornitología*,1,1-38. DOI: https://doi.org/10.18272/reo.v0i2.843

Peña-Nuñez, J. L., & Claros-Morales, A. F. (2016). Estudio preliminar de la avifauna en el campus de la Universidad de la Amazonia, en Florencia, Caquetá, Colombia. *Revista Biodiversidad Neotropical*, 6(1), 85-92. DOI: https://doi.org/10.18636/bioneotropical.v6i1.352

Peña-Núñez, J. L., Jiménez-Ferreira, V. A., & Pasaje-Bolaños, M. J. (2017). Composición, estructura y uso de hábitat de la avifauna, en un campus universitario del piedemonte andino-amazónico de Colombia. *Revista Biodiversidad Neotropical*, 7(3), 205-220. DOI: https://doi.org/10.18636/bioneotropical.v7i3.702

Pizo, M., & Tonetti, V. (2020). Living in a fragmented world: Birds in the Atlantic Forest. *The Condor Ornithological Applications, 122*, 1-14. DOI: https://doi.org/10.1093/condor/duaa023

Rau, J. (2014). *PAPEL ECOLÓGICO DE LAS AVES RAPACES: DEL MITO A SU CONOCIMIENTO Y CONSERVACIÓN EN CHILE*. Osorno: Universidad de Los Lagos.

Article DOI: 10.52589/AJENSR-BMSETUHS
DOI URL: https://doi.org/10.52589/AJENSR-BMSETUHS

URL: http://repositoriopedagogias.ulagos.cl/investigacion-publicaciones/libros/ciencias-puras/61-papel-ecologico-de-las-aves-rapaces-del-mito-a-su-conocimiento-y-conservacion-en-chile

Rojas M. 2014. Diversidad y uso de hábitat de aves en diferentes urbanos en la ciudad de Guayaquil-Ecuador. (Tesis de pregrado). Universidad de Guayaquil. Guayaquil, Ecuador.

Sélem-Salas, C., MacSwiney, C., & Hernández, S. (2011). Aves y Mamíferos. En F. Bautista, J. Palacio, & H. Delfín, *Técnicas de muestreo para manejadores de recursos naturales* (págs. 351-388). México: Instituto de Geografía. URL: https://www.ciga.unam.mx/publicaciones/images/abook_file/tmuestreo.pdf

SEO BirdLife. (2020). *Servicios ecosistémicos que nos ofrecen las aves y la natural*eza. SEO/BirdLife. URL: https://seo.org/2020/05/20/servicios-ecosistemicos-que-nos-ofrecen-las-aves-y-la-naturaleza/

Sepulveda, A. (2019). Importancia de los psitácidos: el panorama de la conservación de los loros en Colombia. (Tesis de grado). Universidad Pontificia Bolivariana, Bucaramanga, Colombia.

Shiguango-Yumbo, W. A., & Bañol-Pérez, C. (2020). Evaluación rápida de la avifauna en el Centro de Investigación, Posgrado y Conservación Amazónica (CIPCA), provincia de Napo, Amazonía Ecuatoriana. *Ciencia y Tecnología*, 13(1), 81-88. DOI: https://doi.org/10.18779/cyt.v13i1.355

Suárez F. 2013. *Propuesta para la implementación de facilidades y planta turística especializada para el desarrollo del proyecto turístico comunitario cascada Cóndor-Machay, cantón Rumiñahui, provincia de Pichincha*. (Tesis de pregrado). Universidad Internacional del Ecuador. Quito, Ecuador. URL: http://repositorio.uide.edu.ec/handle/37000/519

Taylor, R. (2003). ¿Cómo medir la diversidad de aves presentes en los sistemas agroforestales? *Agroforestería En Las Américas*, 10(39-40), 117-123. URL: https://repositorio.catie.ac.cr/handle/11554/5912

Vides-Hernández, G., Velado-Cano, M., Pablo-Cea, J., & Carmona-Galindo, V. (2017). Patrones de riqueza y diversidad de aves en áreas verdes del centro urbano de San Salvador, El Salvador. *Huitzil. Rev. Mex. Ornitol.*, *18*(2), 272-280. DOI: https://doi.org/10.28947/hrmo.2017.18.2.294

Villarreal, H., Álvarez, M., Córdoba, S., Escobar, F., Fagua, G., Gast, F., … Umaña, A. M. (2004). *Manual de métodos para el desarrollo de inventarios de biodiversidad*. Programa Inventarios de Biodiversidad & Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Bogotá. URL: http://hdl.handle.net/20.500.11761/31419

Whittaker, R. (1972). Evolution and Measurement of Species Diversity. *Taxon*, 21(2/3), 213-251. DOI: https://doi.org/10.2307/1218190