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Wild birds´ illegal trade and their abundance in areas where they are captured, Niceto Perez municipality

Comercio ilegal de aves silvestres y su abundancia en áreas donde son capturadas, municipio Niceto Pérez

Comércio ilegal de aves silvestres e sua abundância nas áreas onde são capturadas, município de Niceto Pérez

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ABSTRACT

Wild animals´ illegal or prohibited trade is a global problem and constitutes a serious risk to threatened and endangered species. The research was carried out in Niceto Pérez municipality, Río Frío locality in Guantánamo province. The objective was to determine the species of wild birds that are illegally traded and their abundance in the municipality. A total of 95 surveys were applied to people involved in poaching for various purposes. A total of 16 most traded species in the municipality were identified during the period

from November 2018 to May 2019. 15 census routes of four m wide by 1 000 m long for a total of 6 ha were surveyed, within which ten counting points were established in each one, with a distance from each other of 100 m. All birds seen or heard during ten minutes were inventoried. As a result of the inventory, 20 bird species were counted, grouped into six orders, 15 families and 21 genera. The order Passeriformes was the most representative, 62 % were permanent residents; of these, only six species coincided with those reported in the surveys as illegally hunted. It was found that, there are significant differences in the areas studied between the months monitored, especially in those that coincide with the reproductive period of the species.

Keywords: Birds; Abundance; Hunting; Ilegal.

RESUMEN

El comercio ilegal o prohibido de animales salvajes es un problema global y constituye una amenaza seria para las especies amenazadas y en peligro de extinción. La investigación se realizó en el municipio Niceto Pérez, localidad Río Frío de la provincia Guantánamo. El objetivo consistió en determinar las especies de aves silvestres que se comercializan ilegalmente y su abundancia en el municipio. Se aplicaron 95 encuestas a personas que se dedican a la caza furtiva para diversos fines. Se identificaron un total de 16 especies más comercializadas en el municipio durante el período comprendido entre noviembre de 2018 hasta mayo de 2019. Además, fueron levantados 15 itinerarios de censo de cuatro m de ancho por 1000 m de largo para un total de 6 ha, dentro de los cuales se establecieron diez puntos de conteo en cada uno, con una distancia uno de otro de 100 m. Fueron inventariadas todas las aves vistas u oídas durante diez min. Como resultado del inventario se contabilizaron 20 especies de aves y agrupadas en seis órdenes, 15 familias y 21 géneros. El orden Passeriformes fue el más representativo, el 62 % residentes permanentes; de ellas, solo seis especies coinciden con las reportadas en las encuestas como cazadas ilegalmente. Se comprobó que existen diferencias significativas en las áreas estudiadas entre los meses monitoreados, sobre todo en los que coinciden con el período reproductivo de las especies.

Palabras clave: Aves; Abundancia; Ilícita; Cantidad.

RESUMO

O comércio ilegal ou proibido de animais selvagens é um problema global e constitui uma séria ameaça às espécies ameaçadas e em perigo de extinção. A pesquisa foi realizada no município de Niceto Pérez, na localidade de Rio Frío, na província de Guantánamo. O objetivo era determinar as espécies de aves silvestres que são comercializadas ilegalmente e sua abundância no município. Um total de 95 pesquisas foi administrado a pessoas envolvidas na caça furtiva para diversos fins. Um total de mais 16 espécies foram identificadas como comercializadas no município durante o período de novembro de 2018 a maio de 2019. Além disso, foram pesquisadas 15 rotas censitárias de quatro m de largura por 1000 m de comprimento para um total de 6 ha, dentro das quais foram estabelecidos dez pontos de contagem em cada uma, com uma distância de 100 m uma da outra. Todas as aves vistas ou ouvidas durante dez minutos foram inventariadas. 20 espécies de aves foram contadas como resultado do inventário

e agrupadas em seis ordens, 15 famílias e 21 gêneros. A ordem Passeriformes era a mais representativa, 62% das quais eram residentes permanentes; destas, apenas seis espécies correspondiam àquelas relatadas nas pesquisas como caçadas ilegalmente. Foram encontradas diferenças significativas nas áreas pesquisadas entre os meses monitorados, especialmente nos meses que coincidem com o período reprodutivo da espécie.

Palavras-chave: Aves; Abundância; Ilegal; Quantidade; Abundância.

RESUMEN

El comercio ilegal o prohibido de animales salvajes es un problema global y constituye una amenaza seria para las especies amenazadas y en peligro de extinción. La investigación se realizó en el municipio Niceto Pérez, localidad Río Frío de la provincia Guantánamo. El objetivo consistió en determinar las especies de aves silvestres que se comercializan ilegalmente y su abundancia en el municipio. Se aplicaron 95 encuestas a personas que se dedican a la caza furtiva para diversos fines. Se identificaron un total de 16 especies más comercializadas en el municipio durante el período comprendido entre noviembre de 2018 hasta mayo de 2019. Fueron levantados 15 itinerarios de censo de cuatro m de ancho por 1 000 m de largo para un total de 6 ha, dentro de los cuales se establecieron diez puntos de conteo en cada uno, con una distancia uno de otro de 100 m. Fueron inventariadas todas las aves vistas u oídas durante diez min. Como resultado del inventario se contabilizaron 20 especies de aves, agrupadas en seis órdenes, 15 familias y 21 géneros. El orden Passeriformes fue el más representativo, el 62 % residentes permanentes; de estas, solo seis especies coinciden con las reportadas en las encuestas como cazadas ilegalmente. Se comprobó que existen diferencias significativas en las áreas estudiadas entre los meses monitoreados, sobre todo en los que coinciden con el período reproductivo de las especies.

Palabras clave: Aves; Venta; Ilícita; Cantidad.

INTRODUCTION

Wild animals´ illegal or prohibited trade is a global problem and constitutes a serious risk to threatened and endangered species. This includes pets or other domestic animals, and products derived from them, such as hunting trophies, fashion items or art objects, ingredients for traditional medicine and meat for human consumption (Hernández, 2003).

According to Neme (2015) the trafficking of exotic birds is a problem that has been escalating for several years, and it has affected the flora and fauna worldwide, making it a problem of great importance. Thousands of exotic species are trafficked from developing to developed countries. The animals themselves or products derived from them, such as feathers, are trafficked.

Birds rank third in pet preferences globally and it is estimated that the traffic of these could reach three million specimens per year, of which almost 80 000 come from the Caribbean (CITES, 2017).

The local bird trade could have a substantial impact on the conservation of populations, but remains unquantified in Cuba. Moreover, without detailed information on the species traded and the number of specimens involved, it is impossible to accurately judge the impact of this trade (Ferrer and Rodríguez, 2015). The province of Guantánamo is not exempt from the illegal bird trade because of its geographical characteristics, it has areas for the conservation and protection of the environment. In that province, there are species of ecological interest that are attractive for the illegal activity due to the different characteristics of the birds, either by the song or the color of the feathers. For all of the above, this research aims to determine the species of wild birds that are illegally traded in the municipality of Niceto Perez in Guantanamo province, as well as their abundance.

MATERIALS AND METHODS

The research was carried out in areas of semi-deciduous forest belonging to the municipality of Niceto Pérez, located in the southwestern portion of the province of Guantánamo, at coordinates 200 07' 39'' N latitude and 750 20' 32'' W longitude, occupying an area of 639.8 km^2. Bordered to the north by the municipality of El Salvador, to the east by the municipalities of Caimanera and Guantánamo, to the south by the Caribbean Sea and to the west by the province of Santiago de Cuba. The combined action of different natural components has provided the existence of soils with well-defined characteristics. The alluvial is among these soils, it is pale yellow and sandy on the surface, and its clay content increases with depth. This locality is a lowland plain with a poor surface drainage highly salinized, shallow and clayey texture, traditional for growing pasture.

According to González *et al*., (2017), in the area there is a tropical savanna climate (Aw), with rainfall ranging from 980 mm throughout the southern slope and from 1 000-1 200 mm in the northernmost area. The number of days with average annual rainfall is 104; intense and short duration rains are frequent, the rainy season is between the months of (May-October).

Temperatures are relatively high, with an annual average of 25.6^0 C in its lowest parts on the northern and southern slopes coinciding with the area's boundaries and buffer zones, gradually decreasing with altitude to 23^0 C.

Conducting surveys

Based on knowledge of the illegal trade of wild bird species in the municipality of Niceto Pérez, an anonymous questionnaire was applied to residents who illegally trade birds (hunters), to learn about the main problems and proposals for alternatives to the illegal trade in the area.

In those surveys, we inquired about the different species of wild birds that are most popular among the so-called aviaries to be kept in captivity, the capture methods most used by them, the purpose of the captures and the life stage at which the individuals are extracted from their natural state.

Sampling methodology for birds

In order to know the abundance of birds that are most illegally traded in the municipality under study. A sampling was conducted in areas in which they were captured by combining the methods of census itinerary count and circular plots, as suggested by González *et al*., (2017).

For the selection of this, we took into account the characteristics of the study area, which correspond to those of a semi-deciduous forest. The inventory was carried out in the morning (from dawn to 11 am) since this is the time when the birds are most active.

A total of 15 census routes of 1 km in length were delimited through the vegetation and at a distance of 200 m from each other. Ten plots with a fixed radius of 12.64 m and a separation between plots of 100 m were located on each of these, in order to avoid double counting and to obtain equal coverage throughout the area and adequate statistical independence in the data (Ralph *et al*., 1996), and as a fundamental requirement that they be far from the edge. In each sampling unit, birds were identified by direct observation and/or song, within a period of 10 min at each point.

The birds were sampled from November 2018 to May 2019 by monthly counts.

According to Pérez (2004) various studies have shown that with four replications 96 % of the bird species in an area are detected at least once. During the time the sampling lasted, the order in which the points were visited was changed; that is, during the first sampling, we started with point one, in the second we started sampling by the last one, and so on, in order to reduce the effects of sequence-time bias (Gram and Faaborg 1997) cited by Alonso (2016).

For the identification of these birds, Nikon Action 8 x 40 binoculars were used, in addition to the field guide Aves de Cuba (Garrido and Kirkconnell 2011). Each sampling began with the arrival of the observer at the center of the plot and the birds that flew out of the plot upon arrival were considered as present (Hutto *et al.,* 1986). To determine the adequacy of the sampling effort, the area-species curve was constructed using Biodiversity Pro version 2.0 for Windows.

Classification of birds according to their residence in Cuba and endemism

The birds detected in the counts were classified and placed by category of permanence in Cuba and by their endemism, according to the criteria of González *et al*., (2017): Permanent Resident (PR), Winter Resident (IR), Summer Resident (SR), Bimodal Resident (BR) and Transient (T).

Classification of birds according to their threat category

The threat category of the species found was determined using the criteria of Navarro (2020).

Alpha (α) diversity of birds

The diversity (alpha) of birds in each transect line was estimated by species richness. For the study of diversity, we used the interpretation of the relative abundance graph, also known as the dominance-diversity graph, range-abundance graph or

"Whittaker curves", proposed by (Feinsinger 2003) for its simplicity and effectiveness in comparison with the diversity indexes.

Beta diversity β)

To evaluate the similarity in species composition between the census routes and the birds inventoried, a cluster analysis was performed using the PC-ORD software version 4.17 (McCune and Mefford 1999), using the quantitative Sorensen distance measure (Bray-Curtis) and the method of association of the groups was that of Wards.

Frequency of occurrence of illegally hunted species

The inventoried species were classified according to the frequency of occurrence using the criteria proposed by Vargas (2011) using the following equation: $F = (ni/N) \times 100$, where: ni = number of individuals per species and N = total number of individuals.

Statistical analysis

For these analyses, only bird species that are illegally hunted in the territory were taken into account. Taking into account that the data analyzed did not follow a normal distribution, the Kruskal-Wallis rank comparison test was used to determine if there were differences between the abundance values of the birds detected, the census routes and the months sampled. The Mann-Whitney U test was also used to establish the differences. The statistical software IBM SPSS Statistics for Windows ver. 23.0, was used.

RESULTS AND DISCUSSION

Survey results

The surveys were done to a total of 95 people (all men and hunters), with an average age of 45 years. They recognized that they illegally hunted more than 18 species of wild birds belonging to 3 genera and 14 families.

The ¨reguilete¨ or cage trap is the most used method by the extractors to capture birds, 53 % say they use it to capture them. 40 % say that they use the ¨lira¨, an instrument that is a bit dangerous for the birds because it has glue that can damage the animal; 7 % use the ornithological net, but this is less used due to the complexity of its use.

The species cited by the surveyed are hunted at different stages of development: 21 % in chicks, 18 % in juveniles and 3 % in adults; on the other hand, 31 % of the surveyed claim to hunt birds in all three life stages, 21 % harvest birds in chicks and juveniles and the remaining 6 % in juvenile and adult stages. Birds are harvested for pets, sale and other uses. According to the data from the surveys, only 43 % of the illegal hunters claim to extract birds for pets; the remaining 47 % state that their hunting is destined for sale and other uses such as cage fighting of *Phonipara canora.* The results of the surveys coincide with those reported by García *et al.,* 2011*,* who determined that the most captured birds in the provinces of Ciego de Avila, Granma and Santiago de Cuba were: *Passerina cyanea*, *Passerina ciris*, *Tiaris olivacea*, *Mimus polyglottos*, *Phonipara canora* and *Melopyrrha nigra*, however, the most quoted species were: *Amazona*

leucocephala, *M. nigra*, *M. polyglottos*, *P. cyanea* and *P. ciris*, with prices ranging from 150.00 to 2000.00 pesos.

Similar results were obtained by Ferrer *et al.,* (2017), in a study of wild birds as pets in the central region of Cuba, where the most abundant species as pets were*: P. cyanea, M. nigra, T. olivaceus, P. ciris* and *A. leucocephala.*

Characterization of the birds inventoried

In the areas studied, a total of 20 bird species were detected, which were grouped into six orders, with Passeriformes being the best represented, 15 families and 21 genera (Table 1), with a total of 381 individuals. Of the total number of birds inventoried, 6 species are those illegally traded in the territory according to the surveys conducted.

Table 1. - List of bird species present in the studied areas

Scientific Name	Species	Acronyms	Order	Family	Endemic
Bubulcus ibis	cattle egret	Bubibi	Pelecaniformes	Ardeidae	
Cathartes aura	aura tiñosa	Cataur	Accipitriformes	Cathartidae	
Zenaida macroura	pigeon rabiche	Zenmac	Columbiformes	Columbidae	
Columbina passerina	tojosa	Colpas	Columbiformes	Columbidae	
Patagioenas leucocephala	white-headed Goose	Patleu	Columbiformes	Columbidae	
Coccyzus merlini	muleteer	Cocmer	Cuculiformes	Cuculidae	X
Crotophaga ani	jewish	Croani	Cuculiformes	Cuculidae	
Chlorostilbon ricordii	zunzun	Chlric	Apodiformes	Trochilidae	X
Multicolor Todus	cartacuba	Todmul	Coraciiformes	Todidae	X
Myiarchus sagrae	big Bobito	Myasag	Passeriformes	Tyrannidae	X
Empidonax virescens	green Bobito	Empvir	Passeriformes	Tyrannidae	
Tyrannus cubensis	royal whistle	Tyrcub	Passeriformes	Tyrannidae	X
Dumetella carolinensis	thrush cat	Dumcar	Passeriformes	Mimidae	
Mimus polyglottos	mockingbird	Mimpol	Passeriformes	Mimidae	
Turdus plumbeus	fieldfare	Turplu	Passeriformes	Turdidae	X
Setophaga caerulescens	black-throated blue bijirita	Setcae	Passeriformes	Parulidae	
Polioptila caerulea	babuita	Polcae	Passeriformes	Polioptilidae	X
Melopyrrha nigra	negrito	Melnig	Passeriformes	Thraupidae	X
Phonipara canora	tomeguín del pinar	Phocan	Passeriformes	Thraupidae	X
Quiscalus niger	chichinguaco	Quinig	Passeriformes	Icteridae	X

Regarding the species detected through the inventory, the richness values were lower than those obtained in semi-deciduous forests in different regions of the country, such as those published by Pérez (2007) in the Guanahacabibes Peninsula. The order Passeriformes was the best represented in genus and number of species, being this

result similar to that reported by Ugalde (2010), Pérez (2015) and Gómez (2019), in different vegetation formations where semi-deciduous forests are included.

From the birds detected as permanence, 13 species were classified as permanent resident (PR); three as winter resident (IR), three as bimodal resident (BR) and one species as transient (T). Ten species are endemic.

According to the degree of threat, *Tyrannus cubensis* is endangered (EN)*, Patagioenas leucocephala* is in the vulnerable category (VU) and 18 species are in the category of least concern (LC). Regarding threatened species, *Patagioenas leucocephala* is threatened mainly by pressure from consumptive use and habitat loss (Weintraub and Joly-Lopez, 2009) cited by Blanco (2012). According to Kirkconnell (2012), *Tyrannus cubensis is* considered endangered because of its limited distribution in certain regions of Cuba and the low abundance of its populations.

Species curve for wild birds

The area-species curve (Figure 1) indicated that sampling with 15 census trails distributed in the area was sufficient to represent the birds associated with these semi-deciduous forests.
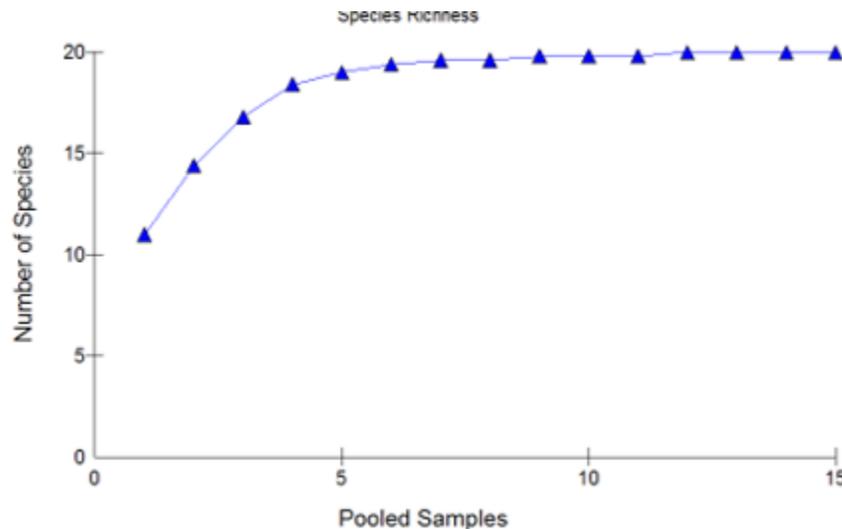
Figure 1. - Area-species curve for the monitored sites

From transect nine onwards, the asymptote is reached, which indicates that most of the bird species were identified, so that an increase in sampling intensity would not provide a significant increase in the detection of new species.

Species diversity

Figure 2 shows the Whittaker curve or abundance range for the sites studied, showing the abundance of *Todus multicolor* and *Crotophaga ani* at these sites. The least abundant species was *Bubulcus ibis*, which could be due to the fact that this species is not characteristic of semi-deciduous forests but of open areas according to the criteria of Garrido and Kirkconnell (2011), Gortázar (2012).

Regarding the relative abundance of the species, the values obtained differ in each of them, *Todus multicolor* is the most abundant followed by *M. nigra despite* the fact that the latter is one of the most hunted species in the country. Similar results were obtained by Gómez (2019) in a study of bird communities in submontane rainforests in Alejandro de Humbolt National Park (Figure 2).

Figure 2- Whittaker curve or abundance range for the sites studied

Legend: *Todus multicolor* (Todmul), *Melopyrrha nigra* (Melnig), *Zenaida macroura* (Zenmac), *Coccyzus merlini* (Cocmer), *Crotophaga ani* (Croani), *Mimus polyglottos* (Mimpol), Columbina passerina (Colpas), *Patagioenas leucocephala* (Patleu), *Polioptila caerulea (Polcae), Myiarchus sagrae* (Myasag), *Cathartes aura* (Cataur), *Chlorostilbon ricordii* (Chlric), *Setophaga caerulescens* (Setcae), *Dumetella carolinensis* (Dumcar), *Tyrannus cubensis* (Tyrcub), *Quiscalus niger* (Quinig), *Empidonax virescens* (Empvir), *Turdus plumbeus* (Turplu), *Phonipara canora* (Phocan), *Bubulcus ibis* (Bubibi), *Bubulcus ibis (*Bubibi), Phonipara. *canora* (Phocan).

The steepness of this curve (slope) is related according to Magurran (2004) to more favorable conditions (gentle slope), allowing bird communities to accommodate fewer or more species equally respectively.

The cluster analysis (Figure 3) shows that, even though the sites studied are distant from each other, they present similar characteristics that determine their location in the dendrogram. The census routes, according to their species composition, were basically grouped into six groups, each group with more than 50 % similarity, as follows: group I (transect 13), group II (transect 15), group III (transect 9), group IV (transect 6, 8, 10, 5, 14, 12, 11, 7, 4 and 3), group V (transect 1), group VI (transect 2).
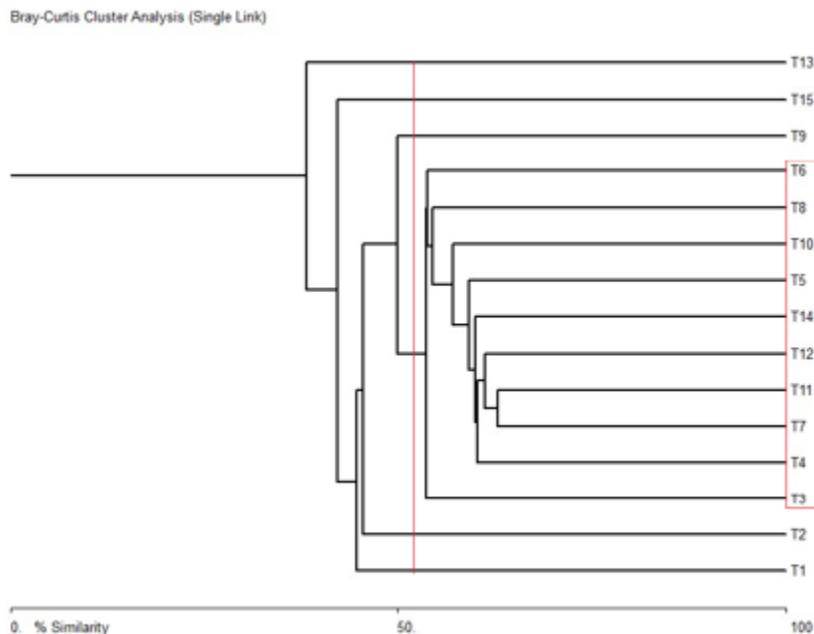
Figure 3. - Dendrogram of classification of census routes for the sites studied
Legend: Itinerary 1 (T1), Itinerary 2 (T2), Itinerary 3 (T3). Route 15 (T15)

Group I is represented by: *Todus multicolor, Coccyzus merlini, Phonipara canora, Mimus polyglottos* and *Zenaida macroura*, in group II *Todus multicolor, Coccyzus merlini, Mimus polyglottos, Tyrannus cubensis, Melopyrrha nigra, Dumetella carolinensis, Bubulcus ibis, Columbina passerina, Quiscalus niger, Setophaga caerulescens* and *Cathartes aura*.

Group III is represented by: *Coccyzus merlini, Mimus polyglottos, Melopyrrha nigra, Columbina passerina, Quiscalus niger, Setophaga caerulescens, Turdus plumbeus* and *Polioptila caerulea*.

Group IV is represented by: *Todus multicolor, Coccyzus merlini, Mimus polyglottos, Zenaida macroura, Tyrannus cubensis, Melopyrrha nigra, Dumetella carolinensis, Columbina passerina, Quiscalus niger, Crotophaga ani, Setophaga caerulescens, Myiarchus sagrae, Patagioenas leucocephala, Turdus plumbeus, Empidonax virescens, Chlorostilbon ricordii, Cathartes aura* and *Polioptila caerulea.*

On the other hand, group V is composed of: *Todus multicolor, Phonipara canora, Mimus polyglottos, Dumetella carolinensis, Columbina passerina, Setophaga caerulescens, Myiarchus sagrae, Patagioenas leucocephala, Turdus plumbeus* and *Polioptila caerulea*. The VI and last group is composed of: *Coccyzus merlini, Mimus polyglottos, Tyrannus cubensis, Dumetella carolinensis, Quiscalus niger, Crotophaga ani, Myiarchus sagrae* and *Chlorostilbon ricordii.*

Similar studies were obtained by Oquendo (2018), in his characterization of the avifauna associated with gallery forests, where he evaluated the similarity of the bird groups formed depending on the climate, relief and vegetation characteristic of the formation.

Frequency of occurrence of birds

As a result of the analysis of the frequency of occurrence of birds in the sites studied of the 6 species of birds that are illegally traded, it was found that the species with the highest frequency of occurrence was *Melopyrrha nigra* present in 12 sampling sites, followed by *Mimus polyglottos*, so they are considered as frequent. The rest of the species are found between 20-60 %, the least frequent being *Phonipara canora* and *Empidonax virescens*, which are considered occasional and infrequent species.

According to the criteria used by Vargas (2011) to evaluate the frequency of occurrence it could be said that the population is frequent since it is in the range of 61-80 %. Similar results were obtained by Ramírez (2017), when conducting studies on the evaluation of biodiversity in a semi-deciduous forest on limestone soil in the Charco Mono Forestry Farm, Palma Soriano, Santiago de Cuba.

The Kruskall-Wallis test indicates that there are significant differences in the areas studied between the months monitored, in relation to the abundance of illegally hunted species present in those months, since the significance level is, 009. According to the non-parametric Mann-Whitney U test (Table 2), the following months differ significantly for the area studied in relation to the abundance of bird species: May with January, February and November; as well as February with April. In relation to the difference in the abundance of illegally hunted species in the months studied, it could be due to the influence exerted by migratory species competing for the same resources available in these areas, which corresponds to what was stated by Báez (2018). In addition, during the months of April to June, the most active period of reproduction of many of these species takes place, which favors a greater detection of them, since they vocalize more in search of a mate and some species can even walk with their offspring. This coincides with Garrido and Kirkonnell (2011) and Navarro (2015) related to the months of reproduction.

Table 2- Mann-Whitney U test, grouping variables. Abundance and months

Abundance-months	Mann-Whitney U	Z	Asymptotic sign (bilateral)
January-February	3,865,000	-1,140	,254
January-April	7,642,000	-1,269	,205
January-May	7,339,000	-1,978	,048
January-November	4,008,000	-,237	,813
February-April	7,270,000	-2,415	,016
February-May	6,980,000	-3,032	,002
February-November	3,910,000	-,893	,372
April-May	15,560,000	-,987	,324
April-November	7,564,000	-1,502	,133
May-November	7,273,000	-2,170	,030

CONCLUSIONS

As a result of the inventory, 20 species of birds were counted, grouped into six orders,

15 families and 21 genera. The order Passeriformes being the most representative, 62 % of which are permanent residents and six of which coincide with those reported in the surveys as illegally hunted.

It was found that there are significant differences in the areas studied between the months monitored, especially in those that coincide with the reproductive period of the species.

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