CONTRIBUTION TO THE KNOWLEDGE OF THE AVIFAUNA IN MARIA LIZAMBA AND ASSOCIATED BODIES OF WATER

[CONTRIBUCIÓN AL CONOCIMIENTO DE LA AVIFAUNA EN MARÍA LIZAMBA Y CUERPOS DE AGUA ASOCIADOS]

Axel Fuentes-Moreno[1]*, Helxine Fuentes-Moreno[2], Eduardo Padilla-Cuéllar[1] and Antonio Pérez-Pacheco[1]

[1]Universidad Veracruzana. Facultad de Ciencias Biológicas y Agropecuarias, Región Orizaba Córdoba. Camino Peñuela-Amatlán, Amatlán de los Reyes, Peñuela, Veracruz, México.
[2]Instituto Politécnico Nacional. Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional, Unidad Oaxaca. Hornos No. 1003, Col. Noche Buena, Santa Cruz Xoxocotlan, Oaxaca, México.
**Corresponding author: euphagus@hotmail.com*

SUMMARY

The state of Veracruz, Mexico has many water bodies which are used by both men and birds. This study surveyed the avifauna of the lagoons Maria Lizamba, la Piedra, and small sections of the rivers Camaron and Estanzuela in Tierra Blanca, Veracruz. During February 2010 visual surveys of these aquatic habitats were conducted by walking and motorboat, including vegetated areas and surrounding villages. Species were identified by comparing to field guides both visually using binoculars and identification of songs and calls. Forty nine species were documented and comprised 25 families. The most diverse families were the *Ardeidae* with 7 and *Icteridae* 6 species respectively. Sixteen families were represented by only a single species. We found 14 species of migratory birds and we found three species (*Cathartes burrovianus, Psarocolius montezuma* and *Campylorhynchus rufinucha rufinucha*) considered to be at risk status according to the Mexican list of endangered and threatened species (NOM-059-SEMARNAT-2010). The avifauna was similar to that of the Alvarado Lagoon System, with between 17 % and 22 % of the species recently recorded there. The areas surrounding Maria Lizamba are used by numerous species of birds, however many species were aquatic and wintering migratory birds.

Key words: Migratory birds; Veracruz; aquatic birds.

RESUMEN

El estado de Veracruz, México, cuenta con numerosos cuerpos de agua que son aprovechados tanto por el hombre como por las aves. En este estudio se planteó conocer la avifauna de las lagunas María Lizamba, La Piedra y de pequeños tramos de los ríos Camarón y Estanzuela, en Tierra Blanca, Veracruz. Durante febrero de 2010 se realizaron recorridos a pie y en lancha, que abarcaron cuerpos de agua, áreas con vegetación y poblados circundantes. Para determinar las especies de aves presentes se observó a simple vista y con binoculares, se escucharon los llamados y cantos y se cotejó con guías de campo. Se encontraron 49 especies pertenecientes a 25 familias. Las familias con mayor número de especies fueron Ardeidae (7 especies), e Icteridae (6 especies); 16 familias estuvieron representadas por una sola especie. Se hallaron 14 especies migratorias; tres especies (*Cathartes burrovianus, Psarocolius montezuma* y *Campylorhynchus rufinucha rufinucha*) se encuentran en riesgo según la Norma Oficial Mexicana (NOM-059-SEMARNAT-2010). La avifauna encontrada en este estudio mostró semejanzas con la del Sistema Lagunar de Alvarado, con 17 a 22 % de las especies registradas recientemente en campo para dicho humedal. El área de estudio es utilizada por numerosas especies de aves, muchas de ellas acuáticas, y en invierno es ocupada por aves migratorias.

Palabras clave: Aves migratorias; Veracruz; aves acuáticas.

INTRODUCTION

The State of Veracruz concentrates 33 % of the water resources of Mexico, with a surface runoff of 121,000 million of m^3 (CSVA, 2006). This runoff becomes evident with the numerous rivers, lakes and lagoons that extend through the State, which are a source of food, natural resources and economic income for a large number of people who live in their surroundings. Moreover, they are the habitat for numerous organisms, such as birds. However, many of these bodies of water have not been extensively studied in some biological aspects, such as the diversity of the avifauna of María Lizamba Lagoon.

Human activities developed within or near the bodies of water, such as hunting, fishing, agriculture, livestock production and industry, put pressure on their ecosystems. For this reason it is important to carry out actions that lead to the conservation and sustainable use of the resources provided by these ecosystems. Thus, it is essential to know the different species that are found in the areas considered for preservation and/or utilization.

In this area of study, no avifauna research has been carried out, although related studies have been conducted in other areas in the Alvarado Lagoon System, which belongs to Maria Lizamba. The María Lizamba Lagoon is considered as: a) Wetland of international importance (Ramsar site 1355- Sistema Lagunar Alvarado; the RAMSAR Convention on Wetlands and CONANP, 2003); b) Area of importance for the conservation of birds in Mexico (AICA 41-Alvarado Wetlands; Ramírez *et al*., 2000); c) Priority area for land conservation in Mexico (RTP 124-Humedales del Papaloapan; Arriaga *et al*., 2000); d) Priority Marine Region (RMP 50-Sistema Lagunar Alvarado; Arriaga *et al*., 1998); and e) Priority Hydrological Region (RHP 79-Humedales del Papaloapan, San Vicente y San Juan; Arriaga *et al*., 2002).

In the Alvarado Lagoon System, ornithological studies have pointed out the presence of over 200 species, where a large number of migratory, aquatic, resident and a few vulnerable bird species can be found (De Sucre *et al*., 1996; Vázquez, 1998; Cruz, 1999).

This study aimed to obtain new information on the species that compose the avifauna of the María Lizamba Lagoon and the bodies of water and land areas surrounding it.

MATERIALS AND METHODS

Area of study

The study was conducted in the municipality of Tierra Blanca, Veracruz, Mexico (18°31' and 18°28' NL, 96°01' and 95°58' WL, at 3 to 10 m of altitude). In this area climate is Aw2 (w), hot sub-humid with summer rains; mean annual temperature is 26.5 °C, and mean annual rainfall is 1356.5 mm (Gobierno del Estado de Veracruz, 1998; INAFED, 2005). The most part of the study was carried out in bodies of water, accounting an extension of 826.28 ha, including María Lizamba and La Piedra Lagoons, the rivermouth of Estanzuela River and a section of Camarón River. Also, 41.79 ha of land areas were included in this study, located close to the community of Rincón Miguel, close to María Lizamba, and surrounding villages in proximity of Camarón River (Fig. 1).

In the surroundings of María Lizamba Lagoon System the predominant vegetation is the tular (*Typha* spp.), along with the ferns *Acrostichum* sp. (Pteridaceae) and *Marsilea* sp. (Marsileaceae), *Pontederia sagitatta* (Pontederiaceae) and Cyperaceae, among others. Induced pasturelands and secondary vegetation derived from the low deciduous forest that are used for cattle grazing, can be found farther down from the lagoon. In this environment it is possible to find herbaceous plants such as *Leonurus sibiricus* (Lamiaceae), shrubs such as *Acacia cornigera* (Fabacea), and trees such as *Spondias mombin* (Anacardiaceae), *Parmentiera aculeata* and *Tebebuia rosea* (Bignoniaceae), *Pachira aquatica* and *Ceiba* spp. (Bombacaceae) and palm tree *Sabal mexicana* (Arecaceae). Epiphytic plants growing on trees belong to the families Cactaceae and Bromeliaceae; it is also frequent the presence of parasitic plants of the genus *Ficus* (Moraceae) growing on *Sabal mexicana*. Several floating plants grow in the bodies of water, such as *Eichhornia crassipes* (Pontederiaceae), *Pistia stratiotes* (Araceae) and *Nymphaea* spp. (Nymphaeaceae); underwater algae of the genus *Chara* (Characeae) can also be found.

Field work

The area of study was visited on February 6, 14 and 27, 2010. Observations and recordings of species were completed during 1100 min, of which 620 min were in water areas and 480 min in land areas.

Recordings of bird species were made during foot and motorboat surveys, the first ones carried out near Rincón Miguel and villages along the Camarón River (only on February 14), and the last ones were made on a 7 m long boat with a 75 hp outboard motor, traveling through María Lizamba Lagoon, passing by the rivermouth of Estanzuela River and going upstream by Camarón River up to La Piedra Lagoon, and returning to Rincón Miguel. During the visit on February 27, only María Lizamba and Rincón Miguel were surveyed.

Identification of birds in land and also in bodies of water was conducted at plain sight and with the aid of 8×40 binoculars; also, bird calls and songs were listened to. Bird guides of Peterson and Chalif (1989) and Howell and Webb (1995) were used to compare identifications made.

Data analysis

Seasonality of the different species was established according to Howell and Webb (1995), and Montejo and McAndrews (2006). The Mexican list of endangered and threatened species (NOM-059-

SEMARNAT-2010) was consulted to define which species were listed under a risk category.

The richness of species among habitats (terrestrial vs. aquatic) was compared using the qualitative Sørensen's similarity index, $C_s = 2j/(a+b)$, where "j" is the number of species present in both habitats, "a" is the number of aquatic species and "b" is the number of terrestrial species. Results with values of 0 indicated no similarity, and results with values of 1 indicated total similarity (Magurran, 1989).

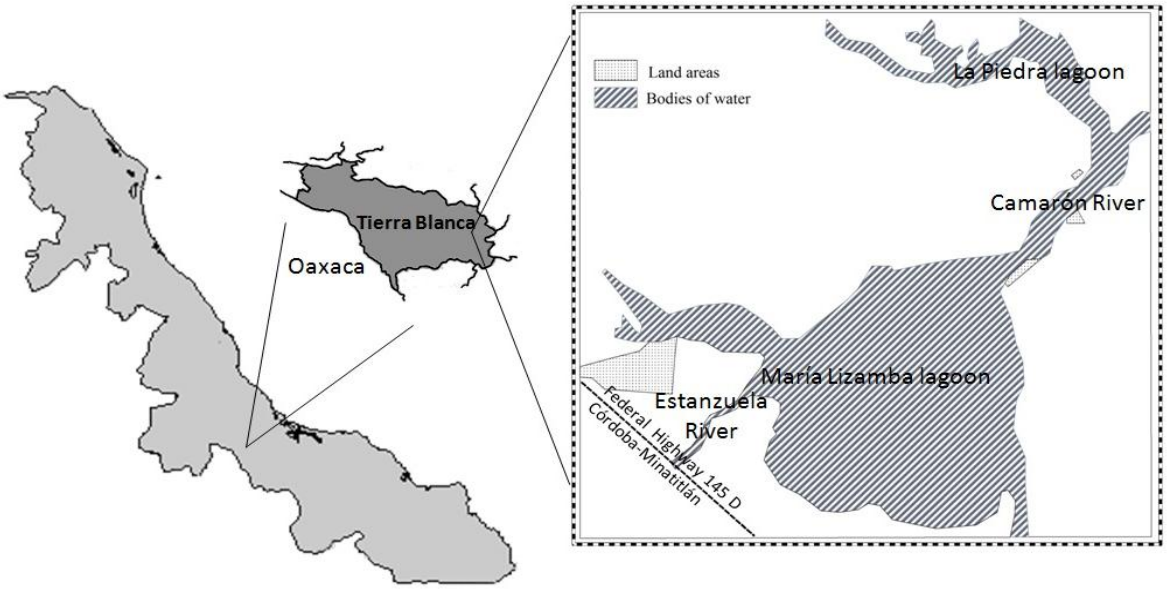

Figure 1. Location of the bird study area in the María Lizamba Lagoon, Veracruz, Mexico.

RESULTS

Forty-nine bird species belonging to 25 families and 13 orders were found in the study area. Families that had the greatest number of species were Ardeidae (7 species), Icteridae (6 species) and Parulidae (5 species). The greatest number of species was recorded during foot surveys, with a total of 36, whereas the number of species recorded while sailing in the motorboat along the bodies of water was 29 (Table 1). Many observed birds are close related with water activities and habitats, such as *Anas discors*, *Fulica americana* and *Butorides virescens*. Other species did not show a close relationship with water, such as *Buteo magnirostris*, *Columbina talpacoti* and *Icterus cucullatus*.

Within land areas, 20 species were registered in Rincón Miguel, same number than those found in villages surrounding Camarón River. However, during the observation period, both areas shared only four species: *Ardea herodias*, *Butorides virescens*, *Dendroica petechia* and *Icterus gularis.*

Of all species found in bodies of water and land areas, 16 were shared by both environments, 20 were found only in land, and 13 species were found only in water areas.

The Sørensen's similarity index showed a value of 0.49, indicating intermediate similarity between habitats, meaning that there is a large number of species that are shared by both of them. In most cases, species shared were birds with preferably terrestrial habits, but developing their activities on the shore of bodies of water; also birds flying over them to move from one place to another, being the case of *Quiscalus mexicanus* or *Melanerpes aurifrons*; terrestrial birds with some affinity for water, such as *Tachycineta albilinea* or *Agelaius phoeniceus*; and in smaller numbers, aquatic birds flying over the land to move from one water area to another, or developing their activities between land and water, such as *Ardea herodias*, *Jacana spinosa* or *Cathartes burrovianus*.

Based on the selected season of the year, it was possible to find migratory birds, specifically winter visitors, with 14 species belonging to this category and representing 29 % of the total avifauna recorded; all other species (35) are considered resident birds, accounting for 71 % of the total (Fig. 2).

Of the migratory birds, eight species are aquatic, while six species have terrestrial habits, although *Geothlypis trichas* and *Parkesia* spp., tend to be very often in bodies of water.

This study did not follow a systematic methodology to conduct a census of observed species. However, it is worth mentioning that approximately 500 individuals of *Anas discors* were recorded during the last two visits. Also, approximately 100 individuals of *Phalacrocorax brasilianus* were found, with numbers of this species being similar during the three visits.

Table 1. Bird species recorded in the María Lizamba Lagoon and surrounding areas.

Recorded species	Seasonality	Motorboat surveys	Foot surveys
Order Anseriformes			
Family Anatidae			
Anas discors	W	X	
Order Suliformes			
Familia Phalacrocoracidae			
Phalacrocorax brasilianus	R	X	X
Order Pelecaniformes			
Family Pelecanidae			
Pelecanus erythrorhynchos	W	X	X
Family Ardeidae			
Ardea herodias	W	X	X
Ardea alba	R	X	
Egretta caerulea	W	X	
Bubulcus ibis	R		X
Butorides virescens	R		X
Nycticorax nycticorax	R	X	
Nyctanassa violacea	R	X	
Family Threskiornithidae			
Plegadis chihi	W	X	
Order Accipitriformes			
Family Cathartidae			
Coragyps atratus	R	X	X
Cathartes burrovianus[Pr]	R	X	X
Family Pandionidae			
Pandion haliaetus	W	X	
Family Accipitridae			
Buteo magnirostris	R		X
Order Falconiformes			
Family Falconidae			
Caracara cheriway	R	X	X
Falco sparverius	W		X
Order Gruiformes			
Family Rallidae			
Fulica americana	R	X	
Order Charadriiformes			
Family Jacanidae			
Jacana spinosa	R	X	X
Family Laridae			
Leucophaeus atricilla	R	X	
Hydroprogne caspia	W	X	
Thalasseus maximus	W	X	

Recorded species	Seasonality	Motorboat surveys	Foot surveys
Order Columbiformes			
Family Columbidae			
Patagioenas flavirostris	R	X	X
Columbina inca	R		X
Columbina talpacoti	R		X
Order Cuculiformes			
Family Cuculidae			
Crotophaga sulcirostris	R	X	
Order Apodiformes			
Family Trochilidae			
Amazilia yucatanensis	R		X
Order Coraciiformes			
Family Alcedinidae			
Megaceryle torquata	R		X
Order Piciformes			
Family Picidae			
Melanerpes aurifrons	R	X	X
Order Passeriformes			
Family Tyrannidae			
Pyrocephalus rubinus	R		X
Pitangus sulphuratus	R	X	X
Tyrannus melancholicus	R	X	X
Family Corvidae			
Psilorhinus morio	R	X	
Family Hirundinidae			
Tachycineta albilinea	R	X	X
Stelgidopteryx serripennis	R	X	X
Family Troglodytidae			
Campylorhynchus r. rufinucha[TE]	R		X
Family Parulidae			
Dendroica petechia	W		X
Setophaga ruticilla	W		X
Parkesia spp.	W		X
Geothlypis trichas	W	X	X
Wilsonia citrina	W		X
Family Thraupidae			
Thraupis episcopus	R		X
Family Emberizidae			
Sporophila torqueola	R		X
Family Icteridae			
Agelaius phoeniceus	R	X	X
Dives dives	R		X
Quiscalus mexicanus	R	X	X
Icterus cucullatus	R		X
Icterus gularis	R		X
Psarocolius montezuma[Pr]	R		X

Seasonality: R = resident; W = winter visitors. The order of species follows AOU (2008). Seasonality is according to Howell and Webb (1995), and Montejo and McAndrews (2006). [Pr] = subject to special protection. [T] = threatened. [E] = endemic, according to the Mexican list of endangered and threatened species (NOM-059-SEMARNAT-2010).

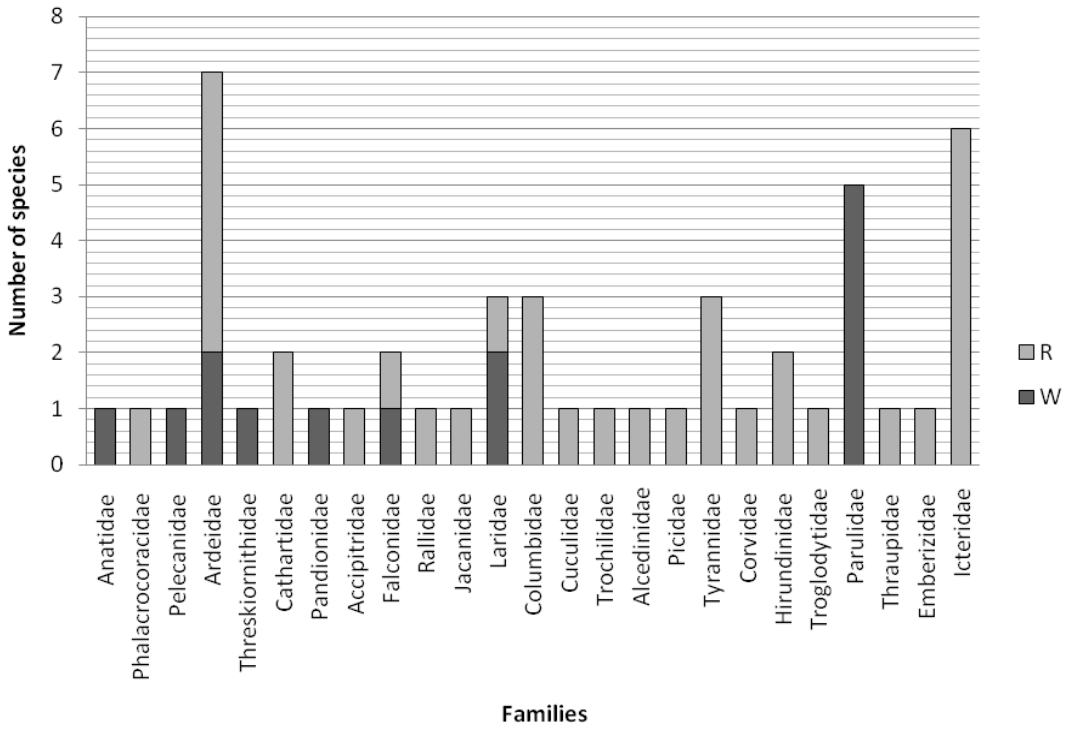

Figure 2. Number of species per family, residents (R) and winter visitors (W) recorded in María Lizamba and surrounding areas.

According to the Mexican NOM-059-SEMARNAT-2010, three taxa recorded are within some risk categories: the endemic subspecies *Campylorhynchus rufinucha rufinucha* is considered as threatened (T); *Cathartes burrovianus* and *Psarocolius montezuma* are under special protection (Pr).

DISCUSSION

Comparing the findings of the present study with those of De Sucre *et al.* (1996), Vázquez (1998) and Cruz (1999), bird composition showed similarities with that found in Alvarado Lagoon System. The number of species recorded in the field in Alvarado Lagoon System was greater (224 species in De Sucre *et al.*, 1996; 273 species in Cruz, 1999). However, comparatively the 49 species recorded in this study represented a large number, since they accounted for 22 % of the species reported by De Sucre *et al.* (1996) and 17 % of the species found by Cruz (1999).

According to seasonality, bird species were different to those reported in studies conducted at Alvarado Lagoon System. Cruz (1999) also recorded 43 % of winter migratory species, 49 % of resident species and 8 % of passage migratory species, whereas De Sucre *et al.* (1996) reported 48.2 % of resident species, 30.6 % of winter migratory species, 8.5 % of passage migratory species, 10.5 % of birds sharing the resident and winter migratory categories, and 1.5 % of birds sharing the resident and visitor categories. In both cases, percentages of winter migratory species and resident species are respectively higher and lower than those recorded in this study. This might be due to the different seasons of the year included in those studies, whereas this study only was conducted during three days in a winter month.

No passer-by migratory species were recorded, probably because in the study area these species can be found mainly during spring and fall (Howell and Webb, 1995). Likewise, it could be expected the presence of resident species during the summer, although this category is not considered by the above mentioned authors, but is indicated by Montejo and McAndrews (2006) for the birds in the state of Veracruz. The number of *Anas discors* was similar to that recorded by Cruz (1999) during a flight over the Alvarado Lagoon System (1255 individuals), whereas following the method proposed by Kasprzyk and Harrington (1989), we estimated approximately 500 individuals.

CONCLUSION

María Lizamba and La Piedra Lagoons and the rivers surrounding them, have not been studied in the same degree as other areas of Alvarado Lagoon System, they

even have been left out in some studies. The bodies of water and vegetation surrounding the areas of study are used by different bird species, many of them aquatic, several in numbers greater than 100 individuals. These areas are used during the winter by different migratory birds.

This study is pioneer in showing the avifauna from María Lizamba and its surroundings. It will be necessary to conduct more visits to the area in different seasons of the year, to integrate this information with some other studies carried out in this region. Quantitative studies offering changes in ecosystems through time would be needed.

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