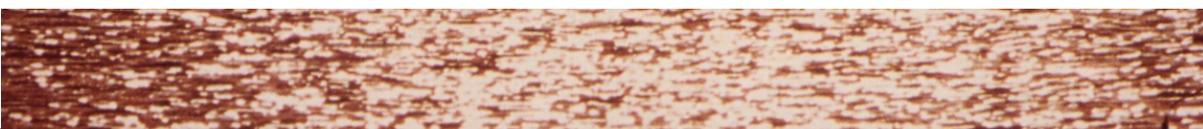


FINAL REPORT

**RÍO MÁXIMO FAUNA REFUGE:
AN INTERNATIONALLY IMPORTANT CUBAN WETLAND**



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SUMMARY

Cuba is the biggest island in the Caribbean and 15% of its surface is occupied by wetlands. These ecosystems constitute a key place for the waterbird populations that breed in North America because they constitute a key site of stopover and/or winter residence. The main objective of the project was to generate the necessary information to propose Río Máximo Fauna Refuge as an Important Bird Area (IBA), and to support as well the proposal as Wetland of International Importance (Ramsar Site). Nine visits were done to the area each one of them with duration of three to seven days. In these visits the waterbirds community was sampling and it was searched the reproductive populations of waterbirds making emphasis in the West Indian Whistling-Duck (*Dendrocygna arborea*). The results of the project contributed to support the declaration proposal as Ramsar site, which was granted in November 18th 2002, being Río Máximo Fauna Refuge of the six Cuban Ramsar sites. The information obtained through the project allowed proposing the locality as the first Important Bird Area in Cuba due to nine species of birds present in the area fulfil three of the four categories proposed by Birdlife for this designation. In the area was located one of the biggest populations of West Indian Whistling-Duck of the country ($n=115.0 \pm 27.0$ individuals, range: 91-161) that uses the area like refuge, rest and reproduction place. Besides, it is also reported a new locality for the Snowy Plover (*Charadrius alexandrinus*) in Cuba, with a resident population of 61.3 ± 7.6 individuals that use the area like feeding and resting place. In the area exists a resident population of Caribbean flamingos (*Phoenicopterus ruber*) that is increased during the reproductive stage, reaching a maximum during the period of study of more 50 000 breeding pairs. In the study area 55 species of waterbirds were detected, some of them reported as strange for Cuba and other not ever reported for the area. Six reproductive colonies of waterbirds were located in the area with nine species breeding. The main results of the project have also contributed to the implementation of the Conservation Plan of the Area and it have been disclosed through four radio interviews, three journalistic articles, three scientific papers and 7 works presented in 4 scientific events. The images obtained during the project has been used in the preparation of an exhibition photographic and in the university teaching activities related with Ecology and Conservation. Talks about the area have also been offered as a part of the program of environmental education that develops our working group in other provinces of the country and it has been supported the environmental education work that is developed in the area.

INTRODUCTION

The Caribbean region is considered as one of the principal hotspots for global biodiversity conservation. Hotspots are defined as critical areas for the preservation of life diversity on the Earth (Mittermeir *et al.* 1998) and on those that it is necessary to act to fulfill this purpose. Until this moment our region has lost more than 88% of their original vegetation and most of the natural ecosystems have been seriously degraded or destroyed (Myers *et al.* 2000).

Wetlands are one of the most damaged Caribbean ecosystems with more than 50 % of their in degradation state (Denis 2003). The growing tourist industry and the use of the coastal areas have increased the problems of these threatened habitats in the last 15 years in our development countries; until the point that isolated coastal areas and remote keys are now visited by tourists in search of novel experiences (Schreiber and Lee 2000).

Cuba is the biggest island of the Caribbean region and their wetlands included more than 15% of the national territory (Scott and Carbonell 1986). The country is considered as an Endemic Bird Area (EBA) (Stattersfield *et al.* 1998) and it is a key site of stopover and/or winter residence for the waterbird populations that breed in North America (Mikuska *et al.* 1998). However, the island faces the same threats that appeared in the whole region, that's why some natural wetlands, like Río Máximo acquire a bigger relevance for waterbirds.

Historically, the most significant value in the area constitutes the presence of an enormous population of Caribbean Flamingo (*Phoenicopterus ruber ruber*) during the reproductive season (Morales 1996, Bildstein *et al.* 2000). Nevertheless, Río Máximo has other natural resources that have been underestimated and little investigated up to now. For only to mention an example, it is known that Río Máximo Fauna Refuge harbours populations, of at least, five species of vertebrates globally threatened, but practically data don't exist on its distribution and state of their populations (Table I).

Table I. Species of vertebrates globally threatened that are present in Río Máximo Fauna Refuge, Cuba.

Class	Common Name	Scientific Name	Threatened Category (IUCN 2000)
Reptilia	American Crocodile	<i>Crocodylus acutus</i>	VU A1 ac
Reptilia	Cuban Boa	<i>Epicrates angulifer</i>	LR/nt
Aves	West Indian Whistling-duck	<i>Dendrocygna arborea</i>	VU B1+2abcde
Aves	Fernandina's Flicker	<i>Colaptes fernandine</i>	EN C2 a
Mammalia	Caribbean Manatee	<i>Trichechus manatus</i>	VU A2d

Waterbird community is one of the most conspicuous elements in wetlands, and in many occasions it has been used to evaluate the state of conservation of an area (Custer and Osborne, 1977). However, the composition, dynamics and use of habitats of this group has also escaped to the investigation and the public's interest in general.

In the present report we expose the information obtained about waterbird community of Río Máximo Fauna Refuge, focusing in four interesting species with a high conservation concern at world or regional level: 1) West Indian Whistling-Duck (*Dendrocygna arborea*) an endemic species of the West Indies, considered as Vulnerable (UICN 2002) product of the continues lost and degradation of their scarce and fragmented habitats; 2) Caribbean Flamingo (*P. ruber ruber*), a charismatic species that uses the area fundamentally during the reproductive season, forming the biggest breeding colony of this species in the region; 3) Brown Pelican* (*Pelecanus occidentalis occidentalis*), a Caribbean endemic subspecies with population estimates of only 1500 pairs, reason for what it is considered threatened in the region, their main risks are due to the human disturbance and the loss or degradation of their resting and breeding habitats (Collazo *et al.* 2000; Schreiber 2000); and 4) the Magnificent Frigatebird* (*Fregata magnificens*), species with less than 4300 – 5300 pairs in the region (Schreiber 2000), the 75 - 80% of these located in five colonies (Lindsey *et al.* 2000), so the effects of the human disturbance, introduced predators and hurricanes threaten their survival continually.

**Note: The threat categories for these species are at regional level and they appear in the Conservation and Action Plan for Caribbean Seabirds (Schreiber and Lee 2000). The authors use the approaches of the UICN, according to Collar *et al.* (1994), as a guide to categorize the populations of seabirds inside the Red List for the region.*

GOALS AND AIMS

GOALS

- 1) To generate the necessary information to propose Río Máximo Fauna Refuge as an Important Bird Area (IBA), and to support as well the proposal as Wetland of International Importance (Ramsar Site).
- 2) To obtain information about the status of the main species of waterbirds in the area.

AIMS

- 1) Describe the dynamics of the waterbird community in the area.
- 2) Investigate the status and distribution in the area of the four prioritized species in the project.
- 3) Identify the possible threats that waterbird community face in the area.
- 4) Increase public conscience, so much at local as national level, in aspects related to the importance of Río Máximo Fauna Refuge and the importance of wetlands conservation.

STUDY SITE

Río Mximo Fauna Refuge (-7726'77 "W, 2142'52 "N) is located to the north of the Camagy province, Cuba and it has 22 500 ha of extension, 13 000 of them are marine areas and 9 500 are terrestrial (Fig. 1). This coastal-marine wetland of natural origin is characterized by the presence of marshy areas, tidal mudflats, mangrove, as well as coastal lagoons with depths smaller than three meters, surrounded of small keys.



Figure 1. Study area map of the Ro Mximo Fauna Refuge, Cuba.

The mangrove forest is the most frequent and abundant vegetation in the coastal region. This can be observed in different variants as for example: monodominant mangrove of Black Mangrove (*Rhizophora mangle*) with height of 3 to 12 m; mixed mangrove of Black Mangrove (*R. mangle*) and Red Mangrove (*Avicennia germinans*) of 10 to 12 m, with a bigger conservation degree in the outlet of the Mximo river, and in the highest areas it is common to find a mixed mangrove of *R. mangle*, *A. germinans*, *Laguncularia racemosa* and *Conocarpus erectus*.

The halophyte vegetation is the second type of vegetation in importance of the coastal area. It is characterized by plants of brackish marshy areas, tolerant to high salinity and temperatures like *Batis maritima*, *Hygrophila brasiliensis*, *Sesuvium portulacastrum* y *S. microphyllum*. These communities usually settle down in areas temporarily flooded by waters, for this reason they can be associated to some elements of the mangrove swamp like *A. germinans* and *L. racemosa*.

This landscape possesses a high primary productivity enhanced with the decomposition of the organic matter and the contribution of fresh water. These conditions create an ideal place for the breeding of waterbirds, as well as an important insect's biotope, that transforms it into a reservoir of high biological diversity.

METHODS

Censuses were conducted in May, June, October and November of 2002 and January, February, April and July of 2003. A total of 9 visits to the area were done, each one of them with duration of three to seven days. In each one of the trips we carried out three fundamental activities: 1) Sampling of the waterbirds community; 2) Search and monitoring of the reproductive populations' of waterbirds; and 3) Search and monitoring West Indian Whistling-Duck (*D. arborea*) population that inhabits in the area.

1. Sampling of the waterbird community.

To carry out the research of waterbird community dynamics three characteristic and representative habitat of the area were selected, they were: tidal mudflat, mangrove swamp and dead mangrove swamp (Fig. 2). In there, censuses were conducted from 07:00 to 10:00 hours. The presence and number of birds were registered along a 1 km transect for the tidal mudflat and in a 0.8 km transect for the other two habitats. The variation in the transect size was in particular due to the accessibility of each habitat. Each place was sampling in general, twice for visit, for a total of 30 samplings for the tidal mudflat, 11 for the dead mangrove swamp and 16 for the mangrove swamp.



Tidal mudflat

Dead Mangrove Swamp

Mangrove

Figura 2. Habitats where we conducted the sampling of the waterbird community at Río Máximo Fauna Refuge.

The abundance was calculated as the mean number of waterbirds of the two monthly censuses for each habitat, to minimize problems associated with repeated measures (Hulbert 1984). The patterns of abundance were expressed as the monthly density of birds and as the density of the trophic guilds of this community for each habitat in particular. The population averages of interest species was expressed as the mean value (\pm Standard Error).

2. Search and monitoring of waterbirds reproductive populations.

In each visit, one or two days were dedicated to the search of the breeding places of waterbirds. Firstly the potential breeding places were settled down starting from surveys carried out to the local residents. A total of 6 visits were done to the potential waterbirds breeding colonies identified. These places were visited on foot or in boat to confirm their existence and to estimate the size of the breeding populations.

In the small reproductive colonies were carried out direct counts of the nests; their contents and the number of adults detected in the surroundings were registered. In the mixed reproductive colony of egrets, sequencing species registers were carried out to estimate the specific proportions (Denis 2003). In the breeding colony of flamingos a count of the nests once finished the breeding season was carried out to estimate the number of breeding pairs. During these journeys were also registered all the evidence that can indicate potentials causes of threats for the waterbird community.

3. Search and monitoring of West Indian Whistling-Duck (*D. arborea*).

The methodology used for the samplings of the waterbirds community and the detection and monitoring of their reproduction places was also used to search and monitoring the diurnal refuges of West Indian Whistling-Duck population. Once detected some individual the geographical coordinates of the place were taken, using a GPS, as well as the activity that was carrying out.

The population estimates for this species are much more effective in those places where they congregate to forage during the night. Surveys to the local residents and different observation points mounted during the field trips were carried out to find these feeding places. Once located these feeding areas, four night counts were carried out during the months of February and April of 2003 between the 18:00 and 21:00 hours. In these counts were registered all the sighted individuals and those that emitted vocalizations while they flew.

RESULTS

1. Ramsar Site

The Río Máximo Fauna Refuge was declared in November 18th 2002, like one of the 6 Cuban Ramsar sites (Ramsar Site n° 1237). The results obtained through the project about the number of waterbirds using the area as place of rest, wintering, feeding and reproduction, contributed to support this declaration in its final phase. The declaration has been disclosed by national and international media, and it has contributed to elevate the interest and support for the conservation of the area.

For a detail information visit: http://www.ramsar.org/profiles_cuba.htm

2. Important Bird Area (IBA).

The information obtained through the project allowed proposing Río Máximo Fauna Refuge as the first Important Bird Area in Cuba (IBA). Nine species of birds fulfill with three of the four criteria proposed by BirdLife International to designate IBA's (Table II). The criteria used for the proposal were: Globally threatened species (Category A1), Restricted-range species (Category A2) and Globally important congregations (A4i).

Table II. Species for which Río Máximo Fauna Refuge was proposed as the first Cuban Important Bird Area.

Species (scientific name)	Stationality	Abundance	Year	Min	Max	Criteria
<i>Dendrocygna arborea</i>	Resident		2003	160	300	A1
<i>Charadrius alexandrinus</i>	Resident		2003	2	132	A1
<i>Phoenicopterus ruber ruber</i>	Resident		2003	50 000	50 000	A4i
<i>Polioptyla lembeyi</i>	Resident	Common				A2
<i>Teretistris fornsi</i>	Resident	Common				A2
<i>Accipiter gundlachi</i>	Unknown	Uncommon				A1
<i>Colaptes fernandinae</i>	Unknown	Uncommon				A1
<i>Aratinga euops</i>	Unknown	Uncommon				A1
<i>Geotrygon caniceps</i>	Unknown	Uncommon				A1

The first three species that appears in the table (*D. arborea*, *Charadrius alexandrinus* y *P. ruber*) correspond with aquatic birds contemplated in our conservation project. Due to this, we have quantitative information on the state of their populations in the area that are exposed next.

Globally threatened species (Category A1):

West Indian Whistling-Duck (*Dendrocygna arborea*):

The West Indian Whistling-Duck (*D. arborea*) is a waterfowl species confined exclusively to the West Indies. Their populations have suffered an alarming decline (Todd 1996). Due to, this species have been included in the Red List under the Vulnerable category (UICN 2002). Our results highlight the importance of Río Máximo Fauna Refuge for the conservation of the West Indian Whistling-Duck.

These results evidence that West Indian Whistling-Duck population of Río Máximo is generally distributed in small flocks in coastal swamps with Black Mangrove, and used them fundamentally as places of diurnal rest and reproduction.

In all the diurnal samplings, flocks with few individuals of West Indian Whistling-Duck were detected, dispersed mainly among the patches of Black Mangrove (*A. germinans*) in little depth lagoons (Fig. 2). In most of the cases, groups from 1 to 8 individuals were seen resting at mangroves shade. The biggest flocks (of 10 to 50 individuals) in diurnal resting places were recorded in July. Also, in this month were carried out observations of two pairs with 6 and 10 chicks of two weeks of age.

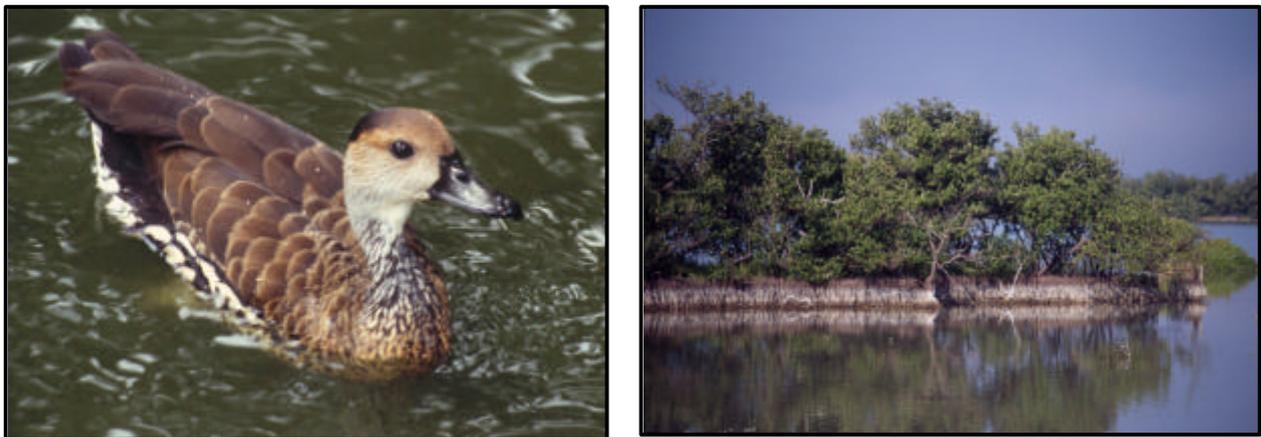


Figure 2. West Indian Whistling-Duck (*D. arborea*) and their diurnal roosting habitats in Río Máximo Fauna Refuge.

During the interviews carried out to the workers of the Fauna Refuge and the local residents in the initial phase of the project, was obtained information about discreet groups of West Indian Whistling-Duck detected in the outskirts of the protected area (Table II).

Table II. Observations of West Indian Whistling-Duck flocks (*D. arborea*) outside of the limits of the Río Máximo Fauna Refuge, according to surveys carried out to local residents.

Date	Hour	Locality	Distance (km)	Numbers of birds
March 18th	20:00	Rice plot	1	10
March 21th	19:00	Rice plot	1	25
May 4	12:00	Presa Anguila	7	7
May 6	18:00	Presa Anguila	7	18
May 12	19:00	Presa Anguila	7	100

Using the information of the surveys we decided to carry out night samplings in a small plot of rice of approximately two hectares that is located to less than 1 km of the limits of the area. The mean number of West Indian Whistling-Duck registered was 115.0 ± 27.0 individuals ($N = 4$, range: 91-161), that which constitutes more than the 1% of world population's (Wetlands International 2000). Due to the night counts are biased toward the individuals that sing while they fly, or toward those that respond to location vocalizations, we estimate that the population of West Indian Whistling-Duck of Río Máximo Fauna Refuge could be bigger than 300 individuals.

The observed population values are among the highest registered until the moment in the country, if they are compared with those reported by Mugica *et al.* (2002). All the observed individuals came from the protected area and once in the rice fields, they assemble in different flocks to carry out feeding activities.

In summary, the West Indian Whistling-Duck population of Río Máximo used the protected area as refuge, rest and reproduction site, while the feeding activities, in general, are carried out outside of the area.

The main cause of threat identified for the species, is the high congregation of individuals outside of the protected area. This fact causes the unavoidable risk of activities of illegal hunting, more when this species is considered by some locals as a plague of the rice culture. Without place to doubts it is necessary to take management actions that assure the conservation of this important population. The creation of feeding places for the species inside the area, as well as a bigger work of Environmental Education with local residents could be the more effective conservation measures that can be taken at short or medium term.

On the other hand, a lot of evidence was found about the presence of wild dogs and wild cats inside the area. This constitutes a serious threat mainly for the species during the breeding stages, when adults and chicks are very vulnerable to the attack of these predators.

Snowy Plover (*Charadrius alexandrinus*):

Snowy Plover's Caribbean subspecies (*C. alexandrinus nivosus*) is considered as a threatened bird in the region (Raffaele *et al.* 1998, Garrido and Kirkconell 2000). This shorebird is not very common in Cuba and until the moment it was only considered the existence of winter populations in five localities and the presence of two breeding populations in Guantánamo and Sabinal Key (Blanco *et al.* 2001).

Our results allowed including Río Máximo as a new locality for this species in Cuba. During the carried out samplings a population resident of 61.3 ± 7.6 individuals was detected and it used the Fauna Refuge like feeding and resting place. The biggest numbers of Snowy Plover were registered during the months of May and November (132 and 121, respectively) (Fig. 3). The high population variation during the sampling months was related with the high variability in the hydrology of the tidal mudflat where the species was observed. June was the month with smaller number of individuals, probably because they went to other areas to breed.

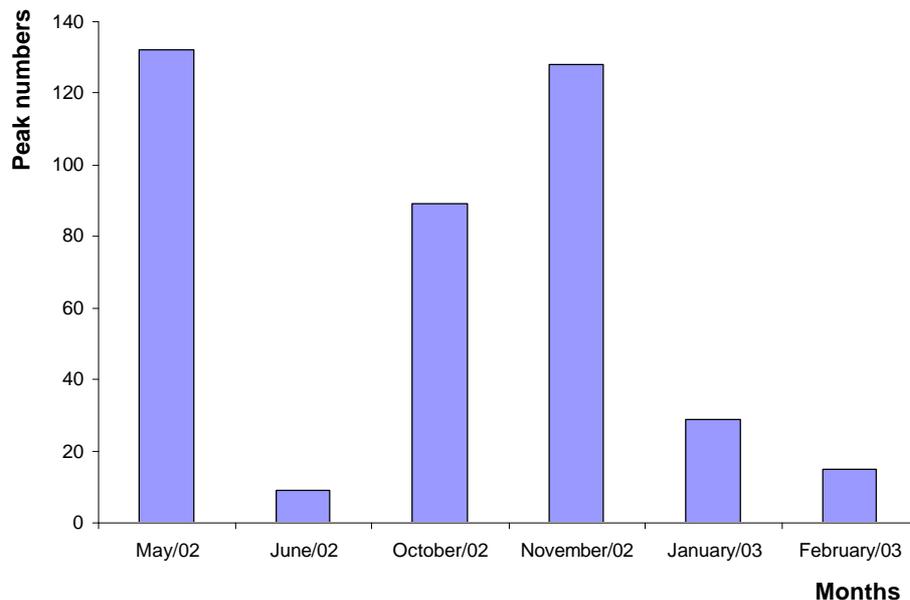


Figure 3. Maximum number of Snowy Plover individuals' (*Charadrius alexandrinus*) observed in a tidal mudflat at Río Máximo Fauna Refuge, Camagüey, during the years 2002 at 2003.

The mean population value and the peak number of Snowy Plover observed in the area were superior to those reported by Collazo *et al.* (1995) in Salinas de Cabo Rojo, Puerto Rico. The population's size average of Snowy Plover registered in Río Máximo represented the 2.4% of the regional population (Wetland International 2002) and is the highest estimate for the West Indies. For this reason, the area seems constitute an important place for the conservation of the species in the region.

Globally important congregations (Category A4i):

Caribbean Flamingo (*Phoenicopterus ruber ruber*):

The area has a resident population of flamingos that increases its numbers during the reproductive season, when individuals coming from the keys of the north of Cuba and probably other Caribbean islands, arrive to Río Máximo. This increment began at the first days of March and it reaches its maximum values in May. During April and first weeks of May flamingos were involved in courtship activities, concentrating big flocks of this species on the tidal mudflat and in the dead mangrove swamp.

In May most of the adults were in nests construction duties. For this activity they selected a muddy and swallow swamp that formerly was a very developed mangrove, of which are only the remains of ancient trees. The characteristics of the ground in this place and the rests of dead vegetation offered unique possibilities to flamingos for the construction of their nests (Fig. 4).



Figure 4. Habitat where was located the breeding colony of Caribbean Flamingo (*Phoenicopterus ruber ruber*) in Río Máximo Fauna Refuge, Cuba.

In Cuba exist more than eight important localities where flamingos breed, but Río Máximo harbors the biggest reproductive population in the country (Fig. 5) (Acosta *et al.* In press). The area has experienced a significant increase since it settled down as an protected area in 1989 (Morales 1996). This tendency reached a maximum value during the study period when more than 50 000 nests were detected once concluded the breeding season (Morales pers.comm.). This, numbers of birds represents at least the 30% of the regional population (Wetland International 2002).

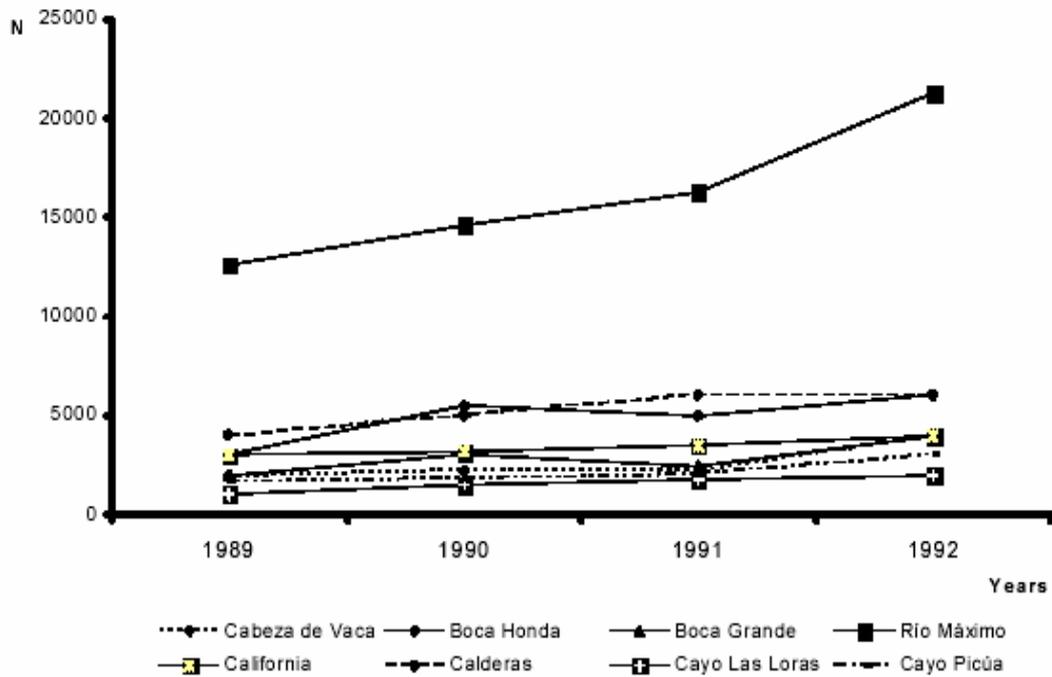


Figure 5. Number of active nests of Caribbean Flamingo (*P. ruber ruber*) in eight Cuban breeding localities, from 1989 to 1992 (Acosta *et al.* In press).

In good measure this result has been possible thanks to the conservation measures taken in the area. Among them are include the increment of the fresh water supply to the area through man made floods, and the waters levels control during the rainy season to diminish the loss of eggs in the nests. During the study period was taken a new conservation action: the construction of two observation towers in key habitats (resting, feeding and breeding sites) for the species from where are carried out sampling activities and surveillance (Fig. 6).



Figure 6. A y B: Observation towers built in important habitats for the flamingos population at Rio Máximo Fauna Refuge, Cuba. C: Measuring salinity in important resting habitat for the flamingos.

With the purpose of detecting the most important habitats for the species, it was carried out a pilot study about the daily activity budget of these birds in three different localities (Estuary, Tidal Mudflat and Dead Mangrove Swamp). Among the most interesting results it was observed that in the estuary, where it happens mixture of fresh water with brackish water, flamingos concentrate on big flocks (437.5 ± 15.5 individuals, range: 200 to 850 individuals) and they use most of the time resting and preening (Fig. 7, Fig. 8).

Apparently these places of low salinities allow the individuals to take water and to clean their feathers moving away the mud and the salt that they have accumulated during the day. This activity stays during the whole year and even. Also these habitats constitutes an important refuge for the juvenile less developed of the previous season. This result can constitute another scientific argument that supports the measure of causing floods that it is carried out in the area for years.

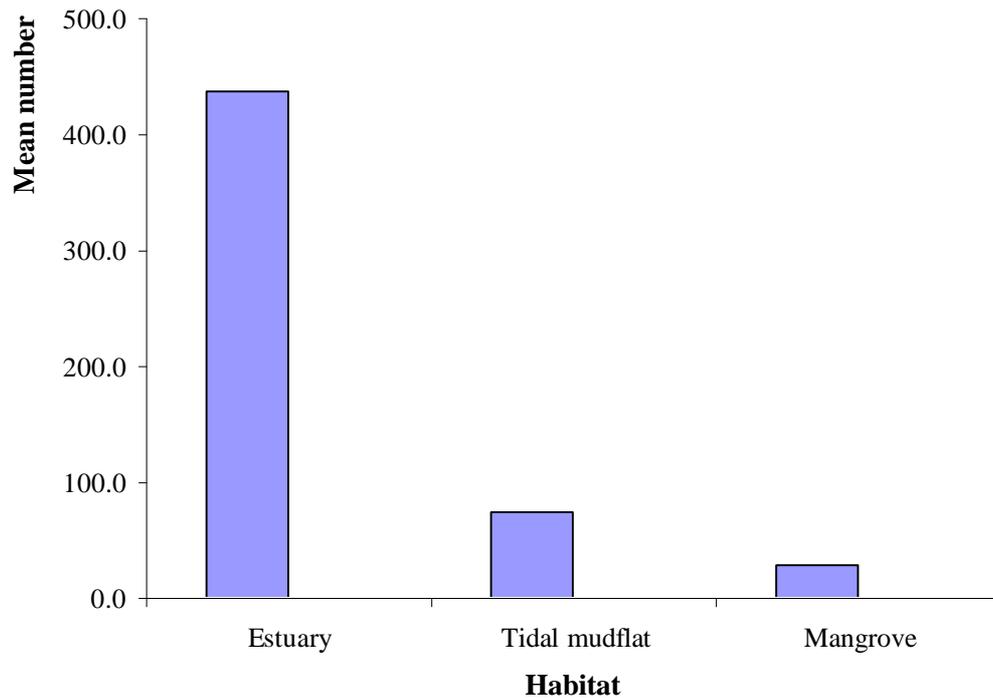


Figure 7. Mean number of Caribbean Flamingo (*Phoenicopterus ruber ruber*) using three habitats of Río Máximo Fauna Refuge.

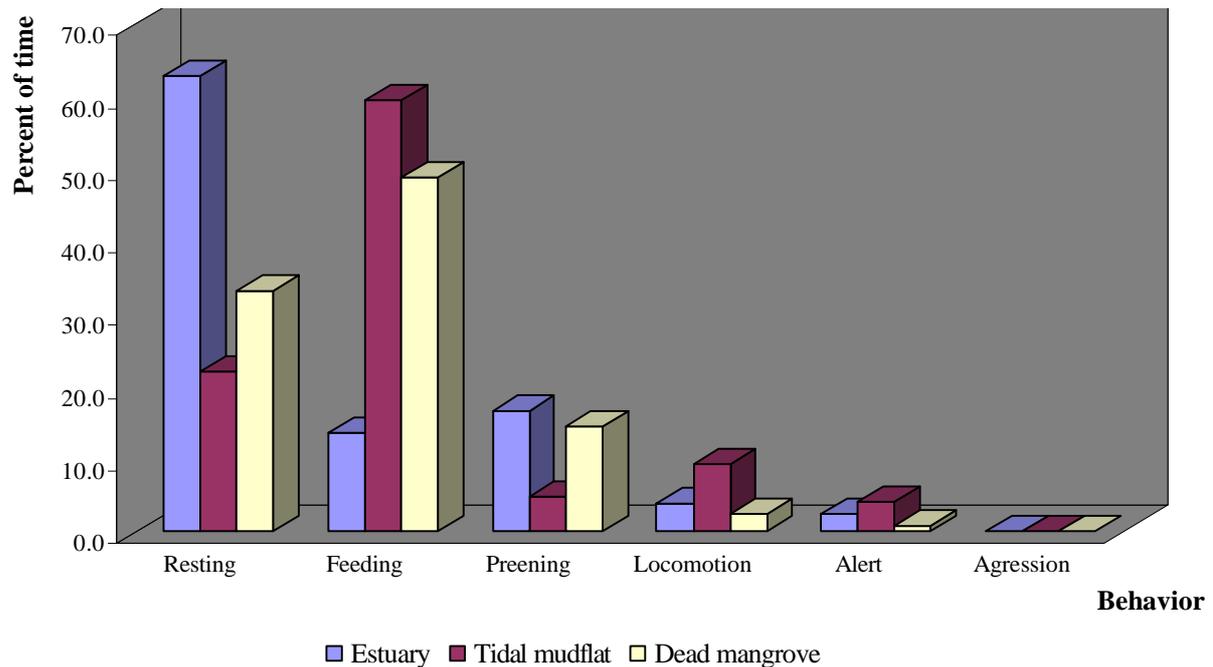


Figure 8. Percent time spent in different activities by Caribbean Flamingos (*Phoenicopterus ruber ruber*) in three habitats of Río Máximo Fauna Refuge.

The feeding activities were developed mainly in the Tidal Mudflat and in the Dead Mangrove Swamp, where the flamingos flocks were relatively small (Fig. 7 and Fig. 8). This result seems to indicate that the food, at least during this stage, it is not very abundant and it is distributed in small patches inside these habitats. Nevertheless, we frequently observed groups of flamingos feeding in other habitats where we did not conduct behavior samplings (swallow brackish lagoons, mangroves patches and marshes with dead vegetation).

Preening and resting activities were also relatively important in the Dead Mangrove Swamp. The aggression levels inside the flocks of flamingos stayed low in all habitats and the alert state was more marked in the Tidal Mudflat because this it is an open area that did not offer protection against potentials predators and where it is more marked the human disturbance.

Other species for which is considered the area as an IBA.

Other six species supported the proposal of IBA of Río Máximo, although it is only had qualitative information about their seasonality and abundance in the area. Four of them fulfilled the category A1 and both remaining with the category A2.

Fernandina's Flicker (*Colaptes fernandinae*) it is an endemic woodpecker and it is included in the Bird's Red List under the category Endangered (UICN 2002). Its presence in the area is very recent and just a couple has been registered in the vicinity of the gallery forest.

Cuban Parakeet (*Aratinga euops*) was a very abundant species historically in the area, but in the last 20 years the population has diminished significantly, being considered at the moment as uncommon and any indication of recent breeding has been detected. This species is considered Vulnerable (UICN 2002).

Gundlachs' Hawk (*Accipiter gundlachii*) is an endemic and rare species, considered Endangered (UICN 2002). Their distribution is confined to the relatively small forests patch remaining in the country. In the area it has been observed, although it is ignored if this species is breeding inside the limits of the protected area. It is probable that the detected individuals use Río Máximo as a feeding place and it is not discarded that they came from other forest areas relatively near to the place.

The Grey-headed Quail-dove (*Geotrygon caniceps*) it is an endemic terrestrial dove of the Caribbean. Their populations are considered Vulnerable (UICN 2002) and it is very scarce the knowledge on their status and distribution. This dove is very difficult to detect due they frequent the inferior strata of the forests. This species has been observed inside the area, specifically in the forest area. We don't have any information about their abundance in the Fauna Refuge.

3. Dynamics of the waterbird community in three habitats of the area.

The dynamics and the use of three different habitats were analyzed for this community. A total of 55 species of aquatic birds were recorded, some of them rare for Cuba and not reported for the area. The biggest density (4500 individuos/km²) and species number (S = 34) was registered in November. This was due to the use of the area that makes numerous migratory species. The best guild represented numerically was Small Probers where plovers and shorebirds are well represented. The most abundant species was the Blue-winged Teal (*Anas discors*) and the habitat with more density of birds was the Mangrove Swamp, may be because it offered protection, breeding and feeding place to birds that congregate in huge flocks as ducks, egrets, spoonbills and some shorebirds.

4. Waterbird reproductive colonies

Inside the area, 6 mixed colonies of aquatic birds were located. This confers a new importance to the protected area as a waterbird reproduction place. In general, it was not possible to carry out continues visits to the reproductive colonies found and for these reasons data about chick's growth and survival are not presented. Anyway, the number of species and the quantity of individuals breeding constitutes a good indication of the excellent conditions that the protected area has.

Brown Pelican (*Pelecanus occidentalis occidentalis*):

Two small breeding colonies of Brown Pelican were found. The bigger of them with more than 37 nests while in the other one with only 15 nests. The reproductive colonies were located in the interior of a coastal brackish lagoon protected by a curtain of numerous small keys of Black Mangrove (*A. germinans*). The breeding colonies were active from November to May; this result enlarges the period of breeding known for the species in Cuba (Palmer 1962, Garrido and Kirconnell 2000). The nests were located at 3.3 ± 0.6 m ($n = 13$) of height and separated 1.5 ± 0.5 m ($n = 7$) each other. The size of the nest was of 38.7 ± 7.6 cm ($n = 13$). The size brood average was 2.7 ± 1.2 eggs ($n = 23$). The dimensions of 52 measured eggs were of 73.4 ± 1.9 mm of long and 48.5 ± 1.4 mm of wide. After the hatching stage were found nests with one or two chicks.

Double-crested Cormorant (*Phalacrocorax auritus*):

Two colonies were located respectively with 155 and 86 nests, the same ones were used from August until January. The nests were built on Black Mangrove at 3.2 ± 0.7 m ($n = 37$) of height and they were located very near to each other (0.7 ± 0.3 m, $n = 21$). The size of the nests was 29.2 ± 4.1 cm ($n = 41$). The brood average was of 2.5 ± 1.1 eggs ($n = 44$) and the dimensions of these were 51.7 ± 1.7 mm X 33.2 ± 1.0 mm ($N = 98$ eggs). During the period of chick the most usual thing was to observe nests with one or two chicks.

Roseate Spoonbill (*Ajaia ajaja*):

The breeding area of this species was located in January 2003. This place had 20 active nests with eggs and chicks, located on the roots of Red Mangroves that formed small keys. The number of nests was related with the dimensions and vegetative development of the mangrove plants and its height average was 1.4 ± 0.3 m ($n = 3$). The nests have 21 ± 3.6 cm ($n = 3$) of diameter and contained an average of 2.5 ± 0.8 eggs ($n = 13$). The size of the eggs was of 65.2 ± 2.5 mm of long and 41.9 ± 1.4 mm of wide ($n = 32$). Only two nests were observed with two and three chicks respectively.

Reddish Egret (*Egretta rufescens*):

This species was very common in the area, where it breeds in dispersed way far from the rest of the herons, inside the brackish lagoons on small mangrove keys. 17 nests were located to a height average of 1.3 ± 0.2 m ($n = 4$) and with a diameter of 31.3 ± 6.2 cm. The quantity of eggs average for nest was 2.0 ± 0.8 ($n = 6$). The eggs dimensions was 49.4 ± 1.4 mm measured of long and 36.3 ± 0.5 mm of wide ($n = 9$). The most advanced nests in the reproductive stage contained from 1 to 2 chicks.

Egrets.

In May 2002, a mixed colony of five species of egrets and ibises was located. We estimated more than 3000 breeding pairs. The most abundant species were Louisiana Heron (*Egretta tricolor*) (30.2%), White Ibis (*Eudocimus albus*) (27.5%) and Cattle Egret (*Bubulcus ibis*) (22.2%), followed by Snowy Egret (*Egretta thula*) (18.5%), Blue Heron (*Egretta caerulea*) (1.1%) and Reddish Egret (*Egretta rufescens*) (0.5%). Already in this date, in the colony so many nests with eggs as with chicks were found. This suggests that the laying had begun from April. This colony occupied an area of more than 1.5 ha on small keys of Red and Black Mangrove from 1 to 3 meters of height in a swallow coastal lagoon.

Magnificent Frigatebird (*Fregata magnificens*):

Opposite to the results found through the surveys carry out with locals, it was not found any evidence about a breeding colony of Magnificent Frigatebird in the area during the months of study. This fact maybe was due to the apparent reproductive failure of the previous year caused by strong precipitations during the first stages of the chicks.

Other species that breeds in the area.

Besides, it was also proven that other species of aquatic birds used the area like breeding place. Among those birds are Black-necked Stilt (*Himantopus mexicanus*), Wilson's Plovers (*Charadrius wilsonia*), Killdeer (*C. vociferus*), Green Heron (*Butorides virescens*), Great Blue Heron (*Ardea herodias*), Black-crowned Night Heron (*Nycticorax nycticorax*) and Anhinga (*Anhinga anhinga*).

Some forest birds also used the wetland areas, preferably the trunks of dead mangroves, as breeding places. Such is the case of Greater Antillean Grackle (*Quiscalus niger*), Tree Swallows (*Tachycinea bicolor*), Northern Flicker (*Colaptes auratus*) and West Indian Woodpecker (*Melanerpes superciliaris*).

IMPACTS ON CONSERVATION

1. **CUBAN IBAs PROGRAM:** The project was taken as an example in the First Cuban IBAs Workshop celebrated the past February 2004. Our results illustrated the need of gathering data in areas with little research. Most of the Cuban ornithologists were present in this meeting and all agreed with the designation of Río Máximo Fauna Refuge as the first Cuban IBA. We filled the IBA form to Río Máximo and sent it to BirdLife de las Américas. We are waiting for the BirdLife official designation.
2. **AREA CONSERVATION:** The results obtained through the project offered information to the elaboration of the First Technical Conservation Plan and Operative Plan of Río Máximo Fauna Refuge. The carried out work, also endorsed future national work projects with Government Organizations related with the conservation of the aquatic birds community and local environmental education works.
3. **COMMUNITY'S WORK:** During the project trainings with the workers of the area were carried out in the identification, sampling methodology and quantification of aquatic birds, as well as of use of Global Positioning System and bird banding. Also was supported the environmental education campaign that is developed in the community by means of the donation of work materials for the children (crayons, paint, paper, colour pencils and paper, posters, photos, CDs, markers, glue, etc).
4. **PHOTOGRAPHIC MATERIAL.** During the realization of the project it was obtained a group of images of wetlands and the birds that live in them. These have been used in the national and international divulgation that has been made of the project and their results. The photographic material has also supported the work of environmental education that has been carried out inside as much as outside of the area (talks and conferences). A group of these images was selected to be part of a photographic exhibition of transitory character that shows the importance of the wetlands conservation. All the pictures were incorporated to the bank of images of the National Centre of Protected Areas and they have been used in the elaboration of brochures, posters, talks, conferences and TV presentations. Also, some photos were used to illustrate an important book about Cuban birds (González, H. (ed.) 2002. *Aves de Cuba*. UPC Print, Vaasa, Finland, 161 pp).

5. **PUBLICATIONS AND SCIENTIFIC EVENTS.** Until the moment the results found have been published in a paper in an international scientific magazine and exist two approved and pending of publication in the same magazine (Journal of Caribbean Ornithology). These results have also been presented through 7 works in 4 scientific events, 3 of them with international character.
6. **DIVULGATION.** Information was offered about the BP conservation program, the species prioritized by the project and the results of this through four interviews of radio of 20 min each one in the program Cuadernos de Radio Ciudad and articles in an university magazine (Alma Mater), in the Cuba's official newspaper (Granma Internacional), so much in written press as online (1 000 000 of weekly visits). An article was also published on the area in a newspaper of Puerto Rico (The New Day) and in the Bulletin of Birdlife de las Américas. Information has also been offered to specialists on the results of the project in the XIV Annual Meeting of the Society for the Study and the Conservation of the Caribbean Birds (Tobago), and in the last meeting of Birdlife of the Americas (Paraguay). Also, the results obtained were used in some talks offered to rice field communities, using Río Máximo as an example of a natural wetland. These talks were done during a national Environmental Education Festival ("Protecting wetlands Festival") developed by our investigation group in two Cuban provinces.
7. **ONG's SUPPORT.** Through the project we have received support of three ONG's (IdeaWild, Birder's Exchange and Optics for the Tropic). This support has consisted on necessary materials to the field work (binoculars, field scales, refractometer and calipers) that have facilitated our investigation work.
8. **SUPERATION:** The data obtained with the project are being used in the elaboration of two theses to opt for the Master in Science's degree and three bachelor theses.
9. **OTHER:** All the results and photographic materials have been used in university teaching activities related with Ecology and Conservation.

FINANCIAL UPDATE

A BP award amount: £ 5,500

BP amount spent during reported period: £5492.00

B. EXPENSES

Items	Amount (£)	Expended (£)
1. Administration		
PC and accessories	700	1200
PC maintenance and reparation		100
<i>Subtotal</i>		<i>1300</i>
2. Field equipment		
? Boat engine	670	634
? Binoculars	200	60
? Camera	500	507
? Backpacks	270	150
Materials		
? Dry storage bags	25	16
? Insect repellent	30	27
? Film and developing	300	290
? Office equipment	100	361
<i>Subtotal</i>	<i>2755</i>	<i>2045</i>
3. Field expenses		
Reconnaissance survey	130	230
Field ration	670	867
Vehicle rent and fuel	1330	620
Vehicle maintenance		200
<i>Subtotal</i>		<i>1917</i>
4. Miscellaneous		
Environmental education materials		90
Photographic exhibition		140
<i>Subtotal</i>		<i>230</i>
TOTAL BUDGET	5055	5492

Note:

Some of the funds were reallocated in the budget because some items were obtained through other ONG's as Idea Wild, Optics for the Tropics and Birders Exchange.

The vehicle mainly used during the project was obtained by our university research team. So we saved the money for the rent of the vehicle and we reallocated it in fuel and vehicle maintenance.

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