FINAL REPORT

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THE ENDANGERED SPECIES PROGRAM

TEXAS

Grant No. E - 71

Endangered and Threatened Species Conservation

Winter Distribution of Piping Plover (*Charadius Melodus*) in the Laguna Madre Region of Tamaulipas, Mexico.

Prepared by:

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FINAL REPORT

STATE: Texas **GRANT NUMBER:** E - 71

GRANT TITLE: Genetic Isolation of Comal Springs Riffle Beetle Populations

REPORTING PERIOD: 8/01/05 to 9/30/07

PROJECT NUMBER: WFR25

OBJECTIVE(S):
Determine the distribution, abundance, and habitat use of wintering Piping Plover throughout the Laguna Madre Tamaulipas, as an important step toward legal protection of the areas covered in the management plan of the Laguna Madre Natural Protected Area in Mexico.

Significant Deviation:

None.

Summary Of Progress:

Please see Attachment A.

Location: Tamaulipas, Mexico

Cost: **not available at submission of report.**

Prepared by: Craig Farquhar **Date:** 29 October 2007

Approved by: _____ **Date:** _____
C. Craig Farquhar

WINTER DISTRIBUTION OF PIPING PLOVER (*Charadrius melodus*) IN THE LAGUNA MADRE REGION OF TAMAULIPAS, MEXICO.

Grant: E-71

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WINTER DISTRIBUTION OF PIPING PLOVER (*Charadrius melodus*) IN THE LAGUNA MADRE REGION OF TAMAULIPAS, MEXICO.

ABSTRACT

The following study took place from October, 2006 to February, 2007 with the purpose of knowing more on the ecology, abundance and winter distribution of the Piping Plover (*Charadrius melodus*) in Laguna Madre of Tamaulipas, Mexico. The study areas visited spanned from Rio Grande river mouth down to Soto La Marina river in La Pesca, Tamaulipas; approximately 150 lineal kilometers of sand barriers.

Ideal habitats were found for the Piping plover to feed on, such as the sand barrier named Boca Ciega South, which presents the highest number of individuals of all visited areas with 38.34% of birds during the first visit. We found this same percentage during the second visit but with a lower number of individuals as birds had already started to return to their original lands to begin the breeding process.

Other areas visited were Bagdad Beach in Matamoros, were 21% of birds were observed. Mezquital North had 7%, and in Mezquital South, with a sand barrier of 15.1 kilometers but no presence of piping plovers. Boca Ciega North and South present a high percentage of Piping plovers observed with 70%. Boca de Catan with 43.1 kilometers in length, presented a layer of shells on the beach and high vegetation in the lagoon area, therefore doesn't offer the needed conditions for piping plovers.

This research provides statistical data on the abundance and description on habitat use for the Piping plover. This information can be used in further studies of the Laguna Madre de Tamaulipas, as it has a data base and geographic information systems based maps with areas of importance.

INTRODUCTION

Laguna Madre in México, which includes the Rio Grande river mouth, maintains important tidal wetlands extending 50,800 hectares. These represent essential feeding habitat for migratory birds and are considered unique in Mexico as flooding and duration of these wetlands correspond to sites of maximum productivity worldwide, influenced by Eolithic tides and tropical storms, more than by planet influenced tides. Laguna Madre is identified as a priority biodiversity site by the Environmental Cooperation Commission of the North American Free Trade Agreement (NAFTA).

Laguna Madre is recognized as a priority region for conservation by the National Commission for the Knowledge and Use of Biodiversity (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad- CONABIO), and is recommended as a commitment by Mexico to conserve its land, marine and surface water environments; is recognized as a priority wetland for conservation for migratory birds by the International Convention on Important Wetlands, specifically as Waterfowl Habitat (RAMSAR Convention), an international commitment signed by Mexico.

The Laguna Madre region is important for more than 450 bird species, 15% of migratory birds arriving in Mexico from Canada and the United States winter here, finding sheltering and feeding sites.

The Piping plover is one of these birds undertaking long journeys. It is important because its nesting populations are decreasing (Haig 1992.). In Mexico it is listed under the Official Mexican Norm 059 classified as in danger due to habitat loss. The Piping plover is distributed throughout our country, and therefore the importance of Laguna Madre of Tamaulipas, Mexico (Figure 1) where there is high food availability for many species of migratory shore birds. This region includes ecosystems of high biological richness, but at the same time they are very fragile due to the unique characteristics of the natural environment.

OBJETIVE

Determine the distribution, abundance, and habitat use of wintering piping plover throughout the Laguna Madre Tamaulipas, as an important step toward the legal protection areas in the management plan of the Natural Protected Area.

LOCATION

The project area is in the State of Tamaulipas and includes the Mexican Coastal Plains of the Gulf of Mexico from Rio Grande Mouth in Matamoros to 250 kilometers south to La Pesca community, including, San Fernando and Soto la Marina municipalities. This area is in the wetlands of the Natural Protected Area of the Laguna Madre Tamaulipas. It includes tributaries such as El Tigre, the Conchos, Soto la Marina and the Bravo rivers. The study area is also identified as part of two Priority Land Regions for Conservation (CONABIO, 2000).

Monitoring was done in 2006 and 2007 with the purpose of having more information on the ecology, abundance and winter distribution of the Piping plover in Laguna Madre of Tamaulipas, Mexico. The field trips followed the shoreline and behind the dune lines up to the lagoon. Sites monitored were located on beaches in Bagdad and Mezquital, sand barriers in Boca Ciega North, Boca Ciega South, Boca de Catan North, and Soto La Marina river mouth towards the north up to Enramadas.

Site	Municipality	Lineal kilometers
Bagdad Beach North	Matamoros	13
Bagdad Beach South	Matamoros	25
Mezquital North	Matamoros	54
Mezquital South	Matamoros	15
Boca Ciega North	San Fernando	5
Boca Ciega South	San Fernando	4
Boca de Catan	San Fernando	84
Enramadas-La Pesca	Soto La Marina	50
Total		250

Table 1. Municipalities of Tamaulipas Mexico, visited with its length in lineal kilometers.

METHODS

1. Information compilation – Develop a record of sightings and occurrences of piping in the study area through meetings with fishermen. Institutions include the Nuevo Leon Autonomus University's, University, the State of Tamaulipas Wildlife Department, the Texas Nature Conservancy.

2. Jointly with Texas Nature Conservancy, a database will be created to register historic information of piping plover.

3. Ecological and spatial information of the project area will be collected using satellite imagery.

4. Data collected in the field will be incorporated into a geographic information system (GIS). Data layers to be incorporated in the GIS will include vegetative cover and piping plover occurrences and movements.

5. Similar information will be obtained on piping plover wintering distribution in Texas to spatially correlate with Mexico's ecosystems and habitats.

6. Site visits will be based on potential habitat identified using GIS, and are planned to occur approximately by 4 months in winter.

7. When piping plovers are found, qualitative and quantitative sampling will be carried out to characterize the habitat utilized by individual animals. This information will be incorporated into the GIS analysis.

8. Fieldwork will take place during the three winter seasons by four months each year. The GIS development and design, and a review of existing data will be carried out during the next 8 months. Products from this phase will include a life history database, GIS maps indicating Piping plovers occurrences (points) and potential and real distribution, and analyses of threats.

Monitoring of the Piping plover was done using human and material equipment from PRONATURA NORESTE. Transects were established throughout the beach of various lineal kilometer lengths. The 150 kilometer trip was done on four-wheel motorcycles. For Boca Ciega North and South areas, the methodology was of sampling points due to its geography. Observation and monitoring of the species was done in an 8:00 am to 6:00 pm schedule.

RESULTS

Historical records of the Laguna Madre.

A winter distribution study in 1977-1978 in Texas and Tamaulipas registered Piping plover from Port Mansfield, Texas, to La Pesca, Tamaulipas. The study found a distribution of 365 in front of Laguna Madre and 374 in the Texas section (Mabee, et al, 2001).

The document The International 2001 Piping plover Winter census, reports for Mexico (it doesn't specify the evaluated area but it is believed it is the Rio Grande River mouth) a total of 27 individuals observed in 1991, 16 were

observed in 1996 and for 2001 no counts were done. Evaluation results for these same years in Texas report a higher abundance of Piping plover in winter than in other states of the U.S., registering 1,904 in 1991, 1,333 in 1996, and 1,040 in year 2001 (Ferland and Haig, 2002).

During field trips in February and October, 2002, 5 individuals were registered in the Mezquital area to the north. This count was done to determine resident and migratory shorebirds in Laguna Madre of Tamaulipas (Olalla, 2003).

Direct observations by local groups

Winter research on Piping plover ecology is scarce. Little is known on the bird's behavior during this season, and direct observations on food preference need to be understood, as its habitat use and type, abundance and diversity of organisms present at the habitat, and forage found in birds to understand the Piping plover's diet.

Based on the scarce existing studies and observation of the Piping Plover, it is known that it prefers feeding in humid plains with algae and mud, and destines approximately 75% of its time eating (Johnson and Baldassarre 1988), successive data on the Piping plover sustain a high feeding effort in mid-winter. The study has investigated their diet during hibernation of Piping Plover in Texas finding that the species prefers polychaete, *Scolelepis squamata* (Zonick 2000).

During the breeding season in Quebec it prefers organisms from the Staphylinidae family (Shaffer y Laporte 1994). However, other Piping Plovers from Nova Scotia were found eating marine worms (Cairnes 1977). There are no studies on the Atlantic coast during winter. There is a large gap on the winter ecology of the Piping plover (Patterson, 1990).

In Boca Ciega, Piping plovers were observed from 8.00 am to 6:00 pm. During this time they fed and rested, and flew a 40 meter range average to resting and feeding sites within the same area (Figure 2).

In Laguna Madre of Tamaulipas, the feeding habitat is the algae plains. They were observed eating insects in places were water was less than 3 centimeters deep. As in the Johnson study in 1998, Piping plovers spend most of the day in these feeding and resting areas in groups with an average of 15-20 individuals. Boca Ciega North and South present an ideal habitat to observe Piping plovers as these sites have no vegetation and food availability is high.

Observation of Piping plovers on the beach shores was done in the same 8:00 am to 6:00 pm schedule; however, it was found that the best time to count birds was from 4:00 pm to nightfall (Figure 3). The highest numbers in the morning was when the tides brought in seaweed (floating algae) with a large number of microscopic fauna such as larvae, marine worms and insects.

The southern region, which includes La Pesca and Enramadas, didn't present an environment where Piping plovers could arrive to eat or rest. Observations

were done through transects without observing any birds. As in other regions, the observation schedule was during the day. Mention must be made on the fact that the beach presents a layer of shells and there is high vegetation on the lagoon's shore of false mangle and saltbush; therefore, field trips and observations in this area aren't suitable for plovers.

During monitoring several plovers were observed with color bands (Figure 4), each ring color in the superior section represented the banding site (The Winter Monitor, 2007). Reading is done as follows. Describe the combinations of color bands according to the leg's position, the band type can be metal, or red, green, gray, or orange color bands. Observation of the bands was done in October and November, 2006 (Table 2).

Color	Site of Origin	Lagoon regions		
		Boca Ciega North	Boca Ciega South	Bagdad Beach
Orange	Great Lakes	X	X	X
Green	Missouri Rivers	X	X	X
White/black with metal	Alberta			
White	Saskatchewan	X	X	
Red	Northern Prairie Wildlife Service	X	X	

Table 2. Origin of observed plovers in different sites of Laguna Madre.

Site description

Description of monitoring sites are divided in three regions: the Northern Region which includes from the Rio Grande river mouth to the area south of Mezquital; the Central Region which includes the sand barrier islands from the navigation channel of Puerto Mezquital to Boca de Catan to the south; and the Southern Region that includes the Soto La Marina river mouth to the Enramadas channel. The total approximate length visited was 190 lineal kilometers (Map III).

Northern Region

It is from the Rio Grande river mouth to Mezquital North zone, including beach and lagoon areas (Map III).

Rio Grande river mouth. A plain sandy area with important human presence (fishermen), and is therefore scarcely visited by the Piping Plover.

Beach. It presents a line of dunes with grasses and an area along Mar Negro lagoon. The grass vegetation is formed by bristle *Cenchurus tribuloides,* and long grasses *Districhlis spicata.* Vegetation cover is scattered, on the lagoon shoreline there is saltbush *Batis maritima.* The ground layer is formed by sand with shells and a medium vegetation density in emerging dune where *Ipomoea pescaprae* can be found (Figure 5).

The beach has a sand layer throughout the shore; all along this shore seaweed is found, a marine algae brought in by the ocean's high tide. From the Rio Grande river mouth to the first human settlements, and even though the constant flow of cars along the beach, Piping plovers can be observed feeding, generally in the afternoon. These same characteristics prevail up to Mezquital beach, even though in a lower number.

Behind the primary dune line, the ground layer is formed by dry sand and shells. There are salt water lagoons fed by the entrance of sea water through a canal coming from the Rio Grande.

Mar Negro Lagoon. Located on one side of the Rio Grande river mouth it presents flooded areas with mangle vegetation (Figure 6). It generally presents these same conditions throughout the year, and therefore isn't an adequate habitat for Piping plover, except the mud area on the bank of the Rio Grande, where occasionally a few Piping Plovers are observed.

Towards the west along the lagoon's shore predominant vegetation is saltbush *Batis maritima,* (Figure 7). During trips along the lagoon's edge enclosed water bodies were found where some birds were observed. Generally there is a scattered vegetation cover of *Batis maritima.*

Laguna del Barril. Located to the north of Mezquital where saltbush *Batis maritima* predominated in high density up to the lagoon's shoreline, with a ground layer of mud and humid sand, therefore this habitat is not adequate for the species. It is important to highlight that in the area found from the entrance to Mezquital beach to the lighthouse area to the north, there are two dune lines that form a very ample area between them with the presence of salt water lagoons in its interior fed by high tides or strong waves. In these lagoons a high abundance of Black Bellied plover was observed.

Mezquital North. It presents a line of dunes with dense vegetation of saltbush and scattered bush. The ground layer is dry sand and shells. Towards the western side there is bush vegetation (Figure 8). The beach has a sandy layer with presence of seaweed.

Central Region
Includes the navigation channel of Mezquital to the south until north of Boca de Catan (Map IV).

Sand barrier at Mezquital. It includes 23 lineal kilometers extension with important human settlements at the island's tip. It doesn't have marine algae on the beach, indicating there is no presence of plovers. There are water entrances throughout large sections of the sand barrier causing large water bodies from the ocean to the lagoon without vegetation. Around these water bodies up to the dune line there is shrub vegetation with mesquite trees (*Prosopis glandulosa*) 1 to 2 meters high (Figure 9) and sandy soil. The lagoon area has saltbush *Batis maritima* with a high density in some areas, while in others there is a layer of sand and mud.

Boca Ciega North. It includes 5 lineal kilometers and a length of approximately 1.5 kilometers from the shore to the lagoon. This is an important area as it presents flooded areas. Behind the dune lines there are small and very dynamic water bodies with a layer of algae, mud and sand used by the Plover to feed and rest. There is no vegetation cover (Map V).

Boca Ciega South. It includes approximately 4.5 lineal kilometers with similar characteristics as Boca Ciega of great importance as it presents flooded areas behind the dune lines where there is a high changing dynamism of the water bodies with a layer of algae, mud and sand used by the Plover to feed and rest. There is no vegetation cover (Map VI).

Boca de Catán. Is a 84 lineal kilometer area with a layer of shells along the shoreline, so there is no food available for the plovers; towards the lagoon there is no vegetation and has a sand layer (Figure 10).

Southern Region
It includes the Santa Isabel channel area to Soto La Marina river mouth (Map VII).

Habitat General Description. This part of the Lagoon is formed by sand plains on most of its extension, with the presence of saltbush and false mangle with a height of half a meter or more on one side of the beach edge. The shore has a narrow line of dunes with dense mangle vegetation and an abundance of shells (Figure 11). This type of habitat is not adequate for the plovers, and its presence was null in the region. The ground layer is formed by sand with shells. Along the lagoon area a dense cover of mangle vegetation is observed with an average height of one meter.

Abundance of the piping plover
The study took place from the Rio Grande river mouth to La Pesca in the municipality of Soto La Marina during February-March, 2006 and October-November, 2006. The sites with the highest abundance of Piping plover were Boca Ciega North and South. Table 3 shows survey results.

Site	Number of birds	Percentage %
Bagdad Beach North	43	13,65
Bagdad Beach South	33	10,48
Boca Ciega North	109	34.60
Boca Ciega South	130	41,27
Santa Isabel Channel-Soto La Marina River	0	0
Total	**315**	**100**

Table 3 Number of Piping Plovers observed in 2006 in monitoring sites of the Laguna Madre of Tamaulipas region.

In February and March, 2007, surveys were done in the same sites monitored in October, 2006, and the results were lower (Table 4). As the wintering season

was ending, some plovers were observed with their breeding plumage. Results are shown in the following table.

Site	Number of birds	Percentage %
Bagdad Beach North	0	0
Bagdad Beach South	23	15.64
Boca Ciega North	120	81.63
Boca Ciega South	4	2.27
Santa Isabel Channel-Soto La Marina River	0	0
Total	**147**	**100**

Table 4. Number of plovers observed in February, 2007 monitoring sites of the Laguna Madre of Tamaulipas region.

Biology of the species and description

Piping plover (*Charadrius melodus)* is a small light sandy grayish color bird. During the breeding season, adults have yellow-orange feet, a black band on the forehead extending from one eye to another, and a black band around the neck. In its younger age it has grayish legs and doesn't have the black spots on its body. Shorebirds are fast runners and have the peculiar habit of running a short distance and stopping abruptly. When it is still, the plover blends with the pale background of the sandy habitat. In winter it doesn't present its characteristic band, but the color in his legs is noticeable. In Laguna Madre, some birds began showing their breeding plumage in February; as was observed in Boca Ciega North and South.

Piping plovers nest on the beaches of the Atlantic coast in North America, under the high tide line, in sandy plains, below dunes or in the areas between the dunes that are washed by the sea. The Piping plover is a migratory bird that before beginning its fall migration concentrates in groups on lonely shores from where they fly to the south of the United States. Some individual arrive in the Bahamas and Antilles. Migration south has the purpose of wintering in warmer weather, feeding and then returning to their nesting areas.

Survey data bases

At each observation site a GPS point was taken, and throughout the field trips of the sample areas. The Data Bases are shown in Table VIII.

Current and potential distribution in Laguna Madre

Distribution of Piping Plover in Laguna Madre spans from the Rio Grande to Boca de Catán. Towards the southern area (Soto La Marina river mouth) there are no registers. Even though the latter is a potential distribution, habitat conditions are not adequate for Piping plovers.

During the survey season in Laguna Madre of Tamaulipas, the highest distribution of plovers were observed on the sand barrier up to the central

region in sand and mud plains, and on the beach. These sites are considered as critical for the species' distribution. A site of special interest is Boca Ciega as it shelters a high number of Piping plovers and of other shorebird species. This area has high food availability for the Piping plover and we consider that it is a very important area in its distribution (Maps V and VI).

To the southern area (Soto La Marina river mouth) no registers were found. Even though it represents a potential distribution, habitat conditions are not those needed by the Piping plover. Other areas for potential abundance are the coastal lagoons when they present low tide levels. When the tides are high, they are inhabitable for Piping plovers because the water edge reaches the *Batis maritima* area, leaving sites not adequate for them to feed.

Threats for Conservation

Piping Plover was an abundant species along the North American Atlantic coast in the 19th century. Excessive hunting to use its plumage in pillows almost caused this species to disappear. After the Migratory Birds Treaty in 1918, its numbers increased achieving its highest population in the forties (Cairns, W.E. and I.A. McLaren. 1980).

Today, the decreasing population is attributed to development projects affecting the coast and the increase use of beaches for recreation purposes. This causes loss of habitat to nest and during its migration stage, resulting in disturbances to shorebirds resting in these areas (Figure 12). In the nesting areas on the beach sand, eggs and chicks are exposed to destruction by uncontrolled human presence, their pets and all-terrain vehicles used for fun.

Another important threat is caused by sediments resulting from lagoon dredging when they are deposited on the shorebirds feeding areas. Increase water levels caused by the piles of sandy deposits lead to changes in flooding patterns and loss of feeding areas. This can happen in Boca Ciega.

Geographic information system

See maps I to VII.

Discussion

Throughout the field trips from Rio Grande to La Pesca two habitat types were found for Piping Plovers: the algae and mud plains, and beach edge, and mostly those that present a coastal lagoon in the posterior of a sandy dune. Areas of special importance are Boca Ciega North and South, as they present important feeding and resting sites for the birds on the lagoon's edge with its algae and mud plains. Piping plovers were also observed in high percentages on the beaches in the survey.

On beach areas birds are only observed in the afternoons. This observation establishes the importance of continuing the surveys and determining these birds behavior in areas where there are no algae and mud plains, as is the case in the lagoon's northern region. This habitat is ideal for feeding, with small pools and water depth of 3 centimeters and no vegetation. This habitat can be found in the sand barriers of Boca Ciega North and Boca Ciega South.

A resting area presents a layer of dry sand, without vegetation. These habitats can be found in the same area and according to our field observations plovers can be found eating and resting in nearby areas if the habitat presents these characteristics.

The birds can arrive to eat on the edge of the beach due to the abundance of seaweed. It must be noted that they were only observed in the afternoons with a maximum of three individuals, but they were generally found alone.
This study will be of great relevance for further comparisons in these same areas, and therefore statistical data can be established for each region.

Recommendations

Human activities are scattered throughout all these areas, especially in the extreme northern and southern areas where there is tourism related human presence. The central area has a low presence because of cattle ranching activities and feral species (cats and dogs). Some recommendations are:
1. Restrict land use according to each region for tourism activities.
2. Restrict access to important feeding areas.
3. Control human settlements as they entail introduction of feral species.
4. It is very important to start a process of environmental education directed to understand the biological richness of Laguna Madre of Tamaulipas.
5. Continue monitoring the species in order to have more information on season and spatial distribution variations in the Lagoon, related to factors such as time of day, tide flow, etc.

AKNOWLEDGMENTS
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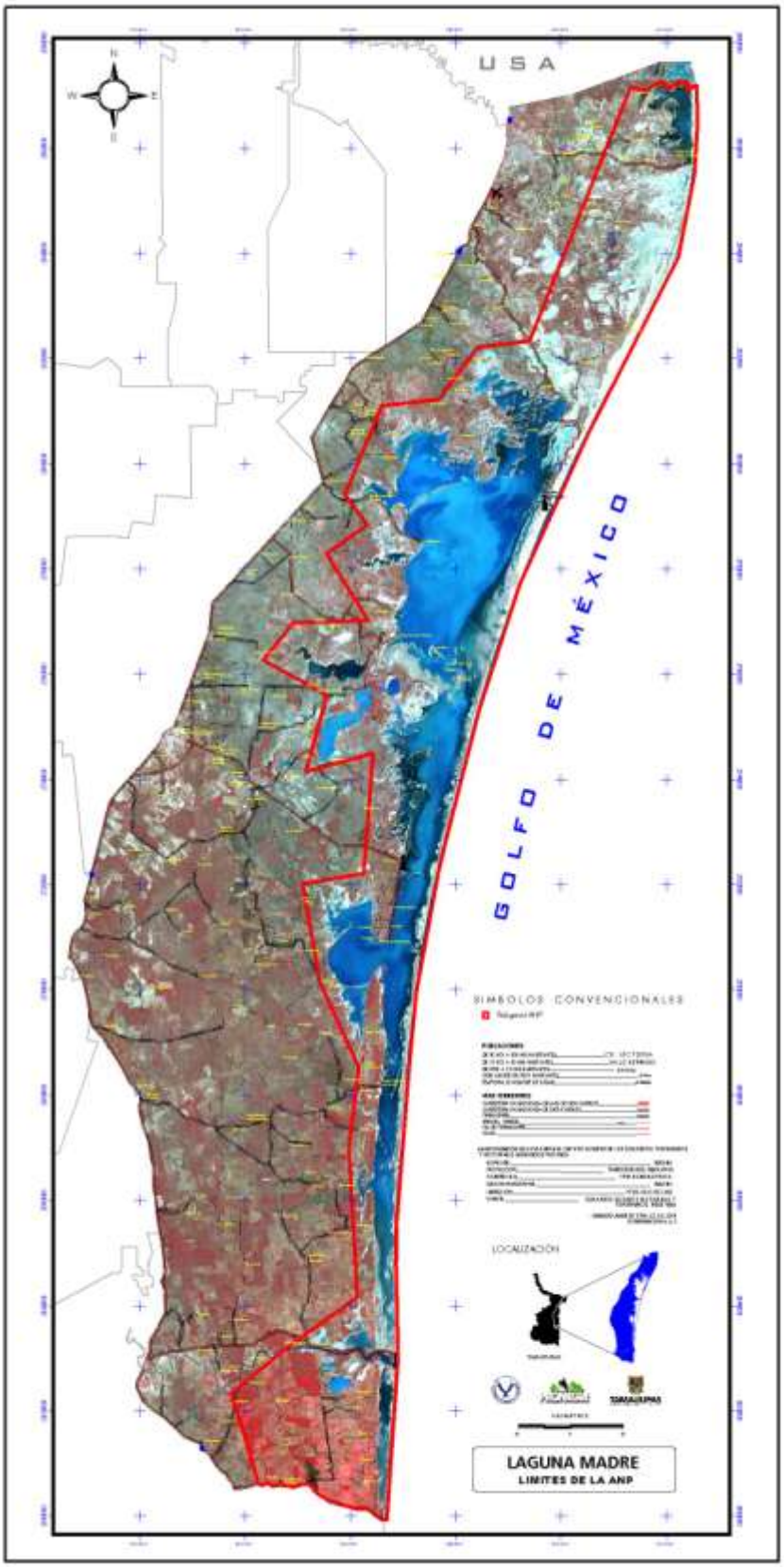
APPENDICES



Map of the Natural Protected Area of the Laguna Madre Tamaulipas.

PHOTOS

Figure 2.- Direct observations in Boca Ciega North and South algae plains, as feeding habitat for the Piping Plover.

Figure 3.- Piping plover in Bagdad North beach, with winter plumage, they weren't present in groups but individually or in pairs.

Figure 4.- Piping plover in northern Bagdad beach, observed with the color codes.

Figure 5. Dune vegetation on Bagdad beach in the municipality of Matamoros, Tamaulipas.

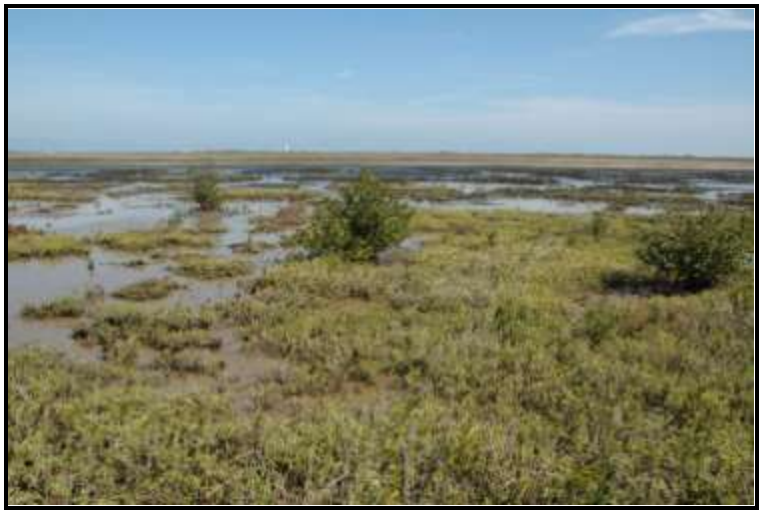


Figure 6. Small mangroves and salty vegetation on the western side of the Mar Negro lagoon.

Figure 7 Saltbush (*Batis maritima*) vegetation present in Laguna Madre with scattered vegetation cover, dense and medium dense. This area has no presence of plovers.

Figure 8 Bush vegetation towards Mezquital south, sand layer with dense cover of saltbush vegetation.

Figure 9. Dune line with shrub vegetation in the center of the sand barrier.

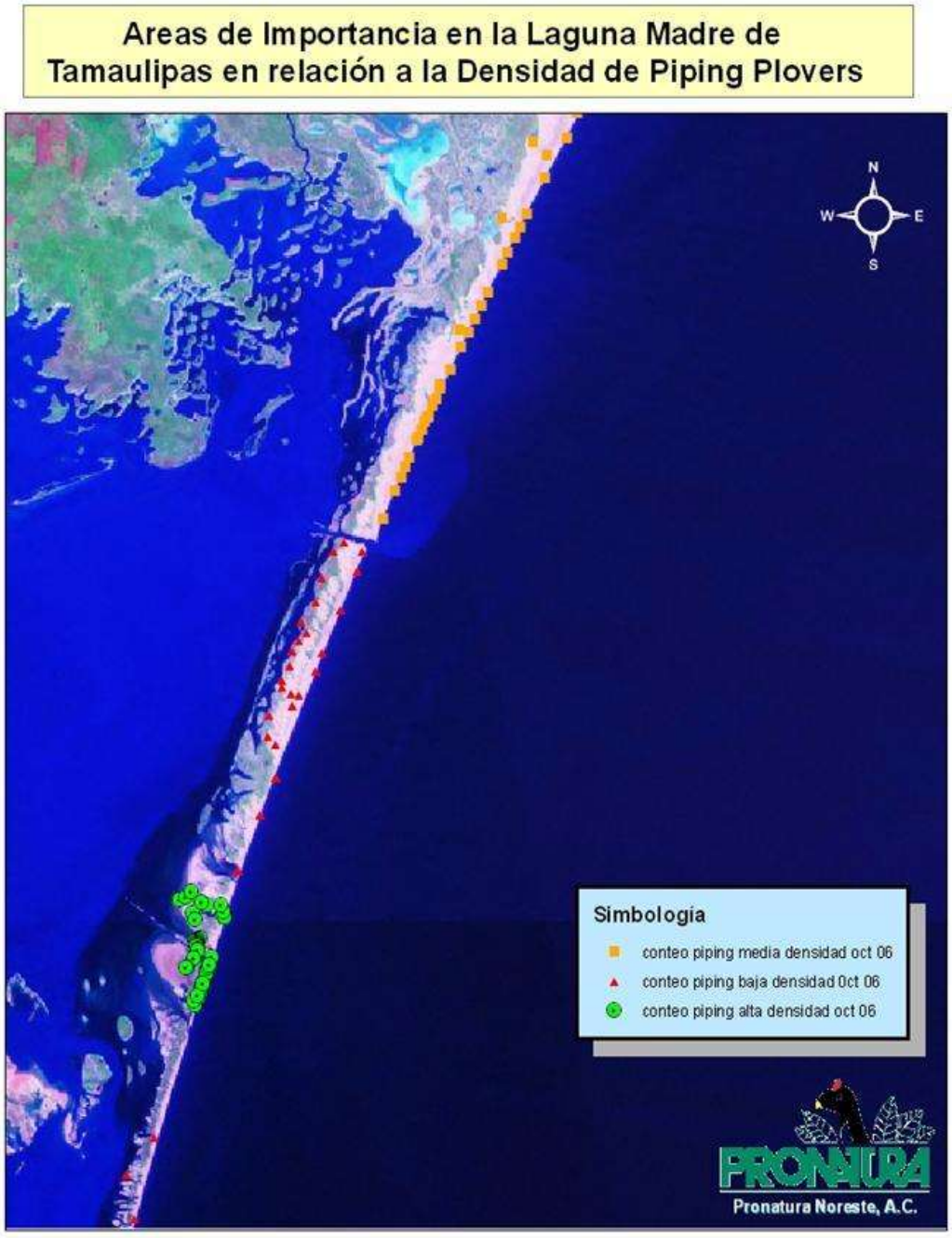
Figure 10. Boca de Catán area, shell layer along the beach, in the lagoon area the layer is formed by sand with no vegetation.

Figure 11. Layer of sand and shells on the ocean's shoreline; towards the lagoon area it presents sand plains with a dense cover of high saltbush and mangle vegetation, not an adequate habitat for Plovers.

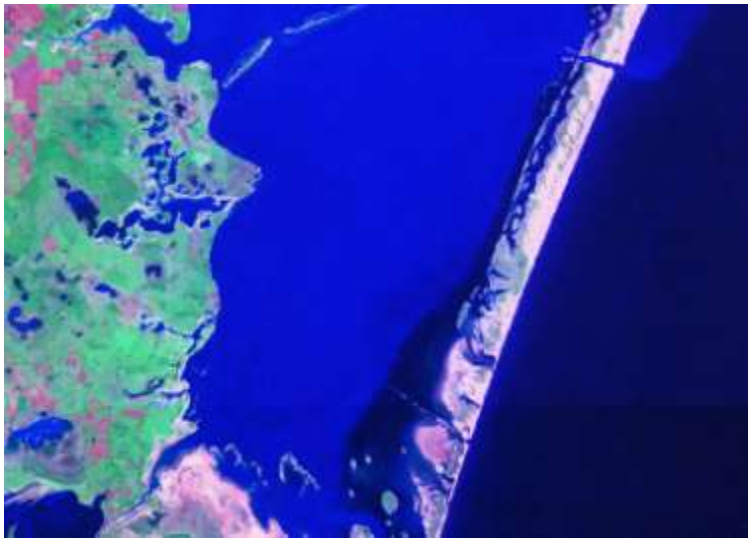
Figure 12 Uncontrolled areas for human recreation on the beaches.

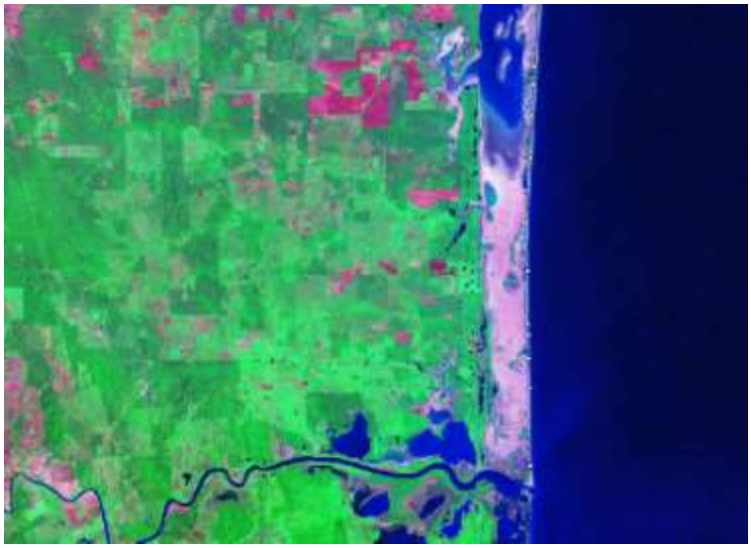
MAPS

I.- Abundance and winter distribution of the Piping Plover in Laguna Madre of Tamaulipas, Mexico.



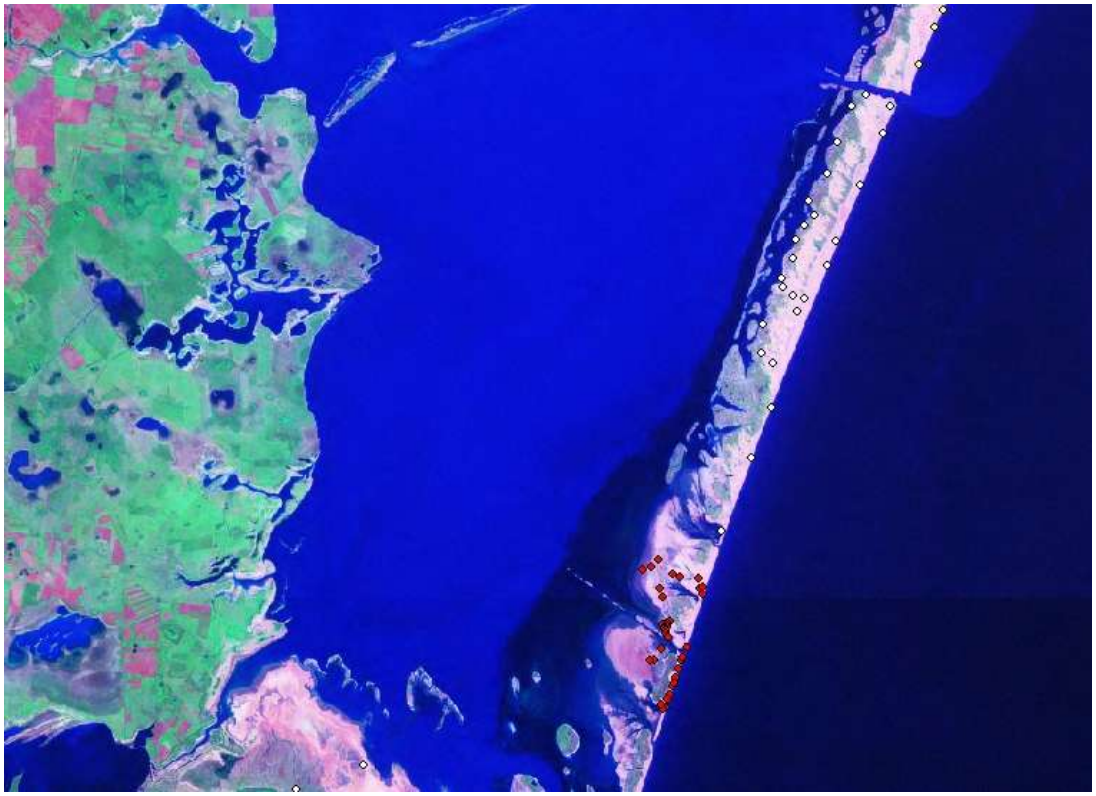
II. Map of study area, Region North, Center and South



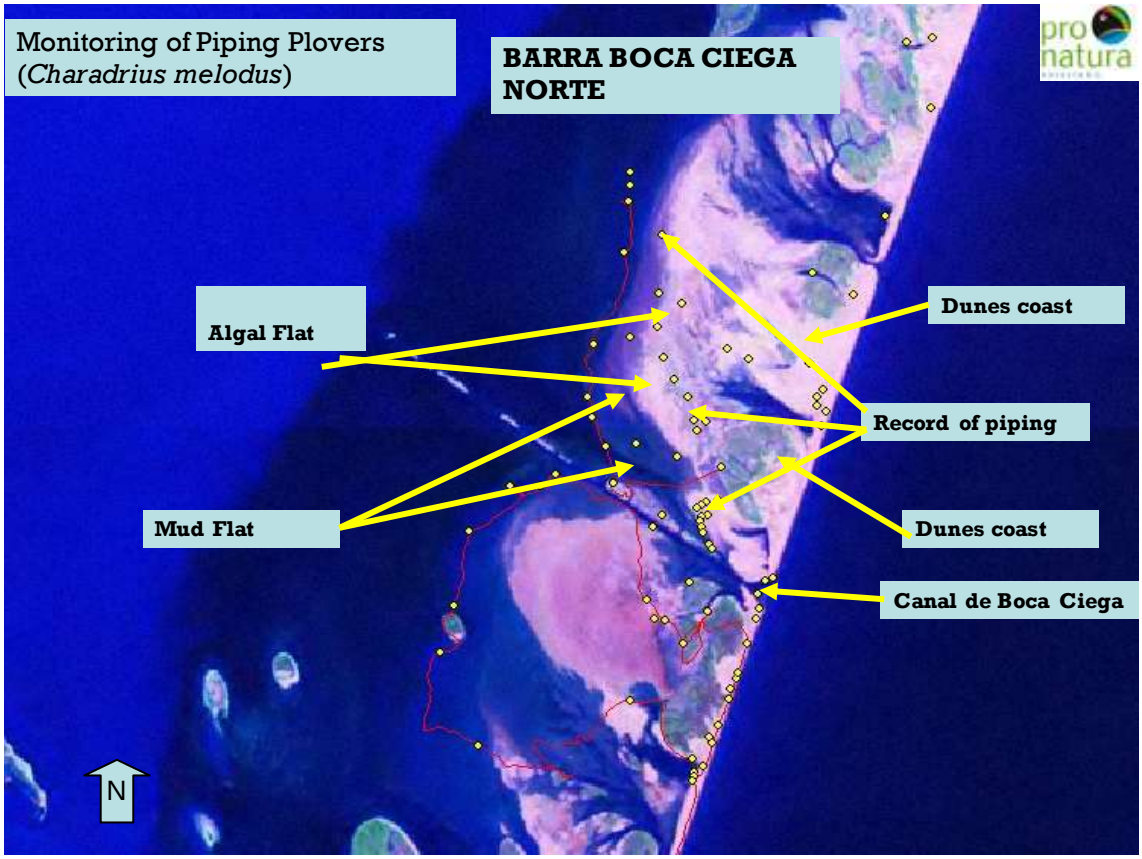


III. Map of Northern Region of the Laguna Madre of Tamaulipas

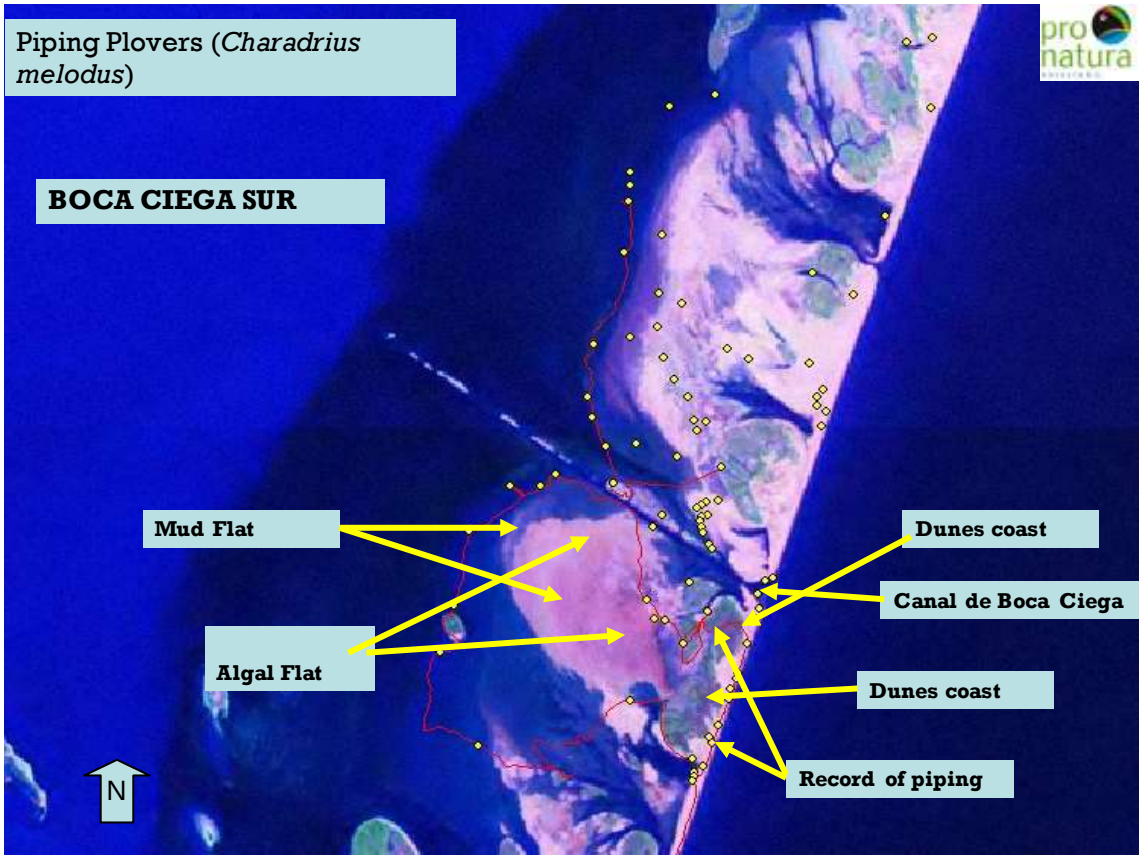
IV. Map of Central Region of the Laguna Madre of Tamaulipas



V. Areas of importance in Boca Ciega North.



VI. Areas of importance in Boca Ciega South.



VII Map of Southern Region of Laguna Madre of Tamaulipas.

TABLE VIII. **Databases**

Lugar	No. GPS	Coordenadas UTM		PP	SNWP	WIWP	BBPL	Tipo de hábitat
Boca Ciega Norte	23	0647052	2769093	*	*			Algal flats
"	24	0647489	2767537	*	*			Algal flats
"	25	0647343	2767316	*	*			Algal flats
"	26	0647321	2767503					Algal flats
"	27	0647255	2767457					Algal flats
"	28	0647185	2767415					Algal flats
"	29	0647247	2767282					Algal flats
"	30	0647243	2767235					Algal flats
"	31	0647260	2767150					Algal flats
"	32	0647270	2767044					Algal flats
"	33	0647359	2766872					Algal flats
"	34	0647397	2766804					"
"	35	0648908	2769087					Mud flats
"	36	0649050	2768859					"
"	37	0649012	2769198					"
"	38	0648806	2769594	*	*			"
"	39	0647936	2769654	*				"
"	40	0648276	2766385					"
"	41	0647153	2768727		*			"
"	42	0646234	2769976		*			"
"	43	0646629	2770142	*				"
"	44	0646968	2770475	*	*			"
"	45	0647633	2769798					"

Lugar	No. GPS	Coordenadas UTM		PP	SNWP	WIWP	BBPL	Tipo de hábitat
Boca Ciega Sur	46	0647073	2766313					Beach
"	47	0646723	2765740	*	*			
"	48	0646584	2765753	*	*			
"	49	0647270	2763562	*				
"	50	0647154	2763467					
"	51	0647408	2763911	*				
"	52	0647497	2764172	*	*			
"	53	0647638	2764560	*				
"	54	0647749	2764860	*				
"	55	0647777	2764962	*				
"	56	0647916	2765385	*				
"	57	0648045	2765765	*				
"	58	0647115	2763670	*	*		*	
"	59	0647357	2763983	*				
"	60	0647680	2764715					
"	61	0648092	2765909	*	*		*	

Lugar	No. GPS	Coordenadas UTM		PP	SNWP	WIWP	BBPL	Tipo de hábitat
Bagdad sur – faro	64	0683959	2848246					
"	65	0683115	2848010		*	*		Beach
"	66	0682241	2847715					"
"	67	0683207	2847075					"
"	68	0683600	2846350	*				"
"	69	0683463	2845762	*				"
"	70	0682828	2842928	*				"
"	71	0682432	2841660	*				"
"	72	0681906	2840010	*	*			"
"	73	0681557	2839066	*				"
"	74	0681378	2838451		*			"
"	75	0680500	2836000					"
"	76	0684594	2852647					"
"	77	0685086	2856809					

Lugar	No. GPS	Coordenadas UTM		PP	SNWP	WIWP	BBPL	Tipo de hábitat
Entrada playa Mezquital 5.3 kilómetros al Norte	78	0660552	2796824	*	*			Beach
"	79	0660854	2797376	*	*	*		
"	80	0661317	2798448	*	*			
"	81	0661378	2798607	*	*			
"	82	0661615	2799126	*	*			
"	83	0661829	2799563	*				
"	84	0661964	2799850	*				
"	85	0662019	2799950	*	*			
"	86	0662300	2800549	*	*			
"	87	0662526	2800962					
"	88	0662805	2801618					

Lugar	No. GPS	Coordenadas UTM		PP	SNWP	WIWP	BBPL	Tipo de hábitat
Mezquital sur	89	0662817	2801880	*				Beach
“	90	0663452	2802841	*				“
“	91	0664111	2804192	*				“
“	92	0664023	2805286					“
“	93	0664575	2805106	*				“
“	94	0665015	2805969	*	*			“
“	95	0665405	2806770	*	*		*	“
“	96	0665840	2807618	*	*		*	“
“	97	0666718	2809331	*	*		*	“
“	98	0667102	2810101	*	*		*	“
“	99	0667554	2810989					“
“	100	0666789	2812186					“
“	101	0667888	2811626					“
”	102	0668338	2812455	*	*			“
“	103	0669485	2814683					“
“	104	0670863	2817197	*	*			Washover
“	105	0671561	2818761					Beach
“	106	0672678	2820609	*	*			“
“	107	0674405	2823807					“
“	108	0675877	2826787					“
“	109	0677595	2830130					“
“	110	0679285	2833670					“
“	111	0677597	2831103					Sand pond
“	112	0676849	2828622					Washover
“	113	0673572	2822314					“
“	114	0669638	2816066				*	“
”	115	0668705	2816956					Dunes
“	116	0660297	2796131	*				Beach
“	117	0659901	2795287					“
“	118	0659171	2793537					“

Lugar	No. GPS	Coordenadas UTM		PP	SNWP	WIWP	BBPL	Tipo de hábitat
Isla de Mezquital	119	0656677	2792186					Lagoon
"	120	0655991	2791588					"
"	121	0655310	2789913				*	"
"	122	0654863	2788481				*	"
"	123	0653987	2787181				*	"
"	124	0654261	2786515					"
"	125	0653782	2786075				*	"
"	126	0653355	2785383					
"	127	0653253	2784505					
"	128	0652735	2783594					
"	129	0652758	2783175					Washover
"	130	0653275	2782770					"
"	131	0651871	2781437					"
"	132	0651792	2780094					"
"	133	0652331	2779597					"
"	134	0649903	2771783					"
"	135	0651326	2775203					Beach
"	136	0652275	2777564					"
"	137	0653419	2782014					"
"	134	0649903	2771783					"
"	135	0651326	2775203					Washover
"	136	0652275	2777564					
"	137	0653419	2782014					
"	138	0653818	2782655					
"	139	0654850	2784168					
"	140	0655259	2785310					
"	141	0656419	2787943					
"	142	0657478	2790323					
"	143	0657819	2791604					

Lugar	No. GPS	Coordenadas UTM		PP	SNWP	WIWP	BBPL	Tipo de hábitat
La Pesca - Enramadas	144	0628725	2631484					Beach
"	145	0628127	2635518					"
"	146	0628623	2637636					"
"	147	0628601	2640023					
"	148	0628585	2641850					
"	149	0628465	2642744					Mangle
"	150	0628451	2646992					
"	151	0628283	2649019		*		*	Beach
"	152	0628289	2650944					
"	153	0628731	2656020					
"	154	0628825	2659379					Scrub
"	155	0628847	2661879					
"	156	0629034	2663287					

Lugar	No. GPS	Coordenadas UTM		PP	SNWP	WIWP	BBPL	Tipo de hábitat
Boca de Catan	End	0644562	2755260					
“	167	0642814	2752950					Beach
“	168	0643351	2750189					“
“	169	0640233	2739333					“
“	170	0637029	2726298					Washover
“	171	0634928	2717413					Lagoon
“	Inicio	0632916	2707828					Boca de catan Norte
Delta de San Fernando	172	0630009	2759762					Mud
“	175	0633123	2760864					