



Caribbean Marine Biodiversity Program

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ACTION PLAN TO PROTECT MARINE MAMMALS IN THE MARINE MAMMAL SANCTUARIES OF ESTERO HONDO AND MARINO DEL NORTE

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EXECUTIVE SUMMARY

The USAID-sponsored Caribbean Marine Biodiversity Program (CMBP) is coordinated in the country by the Nature Conservancy (TNC). In early 2017, TNC hired the Dominican Foundation for Marine Studies (FUNDEMAR) for the consultancy “Development of Action Plans for the Protection of Coral Reefs and Marine Mammals in Samaná Bay and the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte.” In response, FUNDEMAR produced an Action Plan to protect coral reefs in Samaná Bay, as well as two Action Plans to protect marine mammals in Samaná Bay and the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte (Part 3).

The Action Plan to Protect Marine Mammals in the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte was carried out on the basis of a) an analysis of data obtained in previous studies; b) results of the assessment of marine mammal populations carried out in the present project; and c) identification and analysis of current major uses of marine mammals and anthropogenic impacts on their populations.

The Protected Areas of the Marine Mammals Sanctuaries of Estero Hondo and Marino del Norte coincide in a space that includes the coastal and marine areas of the Estero Hondo Municipal District, in the Villa Isabella Municipality, Puerto Plata Province. The North Sea Sanctuary also includes part of the coastal zone of the Municipal District of La Isabela, located to the east, as well as the marine area next to the Sanctuary of Estero Hondo. The general ecological characteristics of the study area are presented, as well as a compilation and analysis of previous studies carried out in the area.

Field assessments in the study area included three stages: a) interviews with coastal and marine users to identify areas of marine mammal sightings, particularly manatees and dolphins; b) field studies; and c) identification of potential impacts on marine mammals due to negative anthropogenic activities, mainly those related to fishing and tourism.

Field assessments in the study area included the terrestrial zone and the watercourses that reach the Caño Estero Hondo, as well as the channel and associated marine coastal zone. These evaluations were carried out from the beginning of July until the beginning of September. 15 Sampling trips were carried out using the Ministry of the Environment vessel based in Estero Hondo, starting at 6:00 am, on days with good sea conditions and visibility. An average 3 to 4 observers participated in each trip. Observers searched for manatees for 30 minutes at each of 20 stations, for a total of 90 hours of sampling. In addition, in the coastal and marine areas of the study location, a DJI MAVIC PRO drone carried out six hours of flight searching for manatees.

The section about the management of Protected Areas covers management of the area, its physical and logistical infrastructure, personnel, ecotourism use, level of visitation, and projects that have been carried out in the area. The section on the diversity and distribution of marine mammals in the study area states that on the basis of the data collected for this report, as well as the surveys carried out, eight species of marine mammals have been documented in the study region. This number includes eight cetaceans (a bearded whale and five odontocetes) a pinniped and a sirenid. Of the species recorded, six were reported as stranding events in the Puerto Plata Province, from 1917 to 2012 (Veras, 2014). These include two strandings of pilot whales (*G. macrorhynchus*), including one in Punta Rucia; a stranding of a *Kogia* sp. in Cabarete; five strandings of humpback whales (*M. novaeangliae*) between Luperon and Cabarete; four of

sperm whales (*P. macrocephalus*); one of Cuvier's beaked whale (*Z. cavirostris*) on the beach of Puerto Plata; and five events involving Antillean manatee (*T. manatus*), of which three occurred in Punta Rucia, one west of the mouth of the La Jaiba River, and one at the mouth of the Rio Bajabonico.

Betancourt et al. (2015) reports the sighting of an Atlantic spotted dolphin (*S. frontalis*) off the coast of Puerto Plata by the National Marine Fisheries Service of NOAA (NMFS, 1995) and the sighting of an individual sperm whale (*P. macrocephalus*) to the north of Mount Isabel, in 2009.

During the present study, 56 manatee sightings were obtained in 90 hours of monitoring effort, including 10 obtained during the half-hour observations at the pre-selected stations, 34 opportunistic sightings during the tours, and 12 sightings from land. Of the sightings, 91% occurred in the entrance channel area and/or in the inner zone of the channel, while 9% were of manatees feeding in the seagrass zone west of the outlet of the channel.

Anthropogenic impacts on marine mammal species in the study area include contamination from solid waste and untreated water in the incoming watercourses to the Estero Hondo and Marino del Norte Sanctuaries; boats traveling at high speed, particularly those transporting tourists to and from Cayo Arena; and illegal fishing within the protected area and/or close to manatee habitat.

The region where the Estero Hondo Marine Mammal Sanctuary is located is seldom visited by tourists, although the management of the protected area allows this type of activity, with regulations regarding conservation of the ecosystem and protection of the manatee population. Poor community involvement, poor staffing, insufficient logistical support for control and surveillance, deterioration of existing infrastructures, and the presence of land owners who do not support conservation efforts are challenges to developing the ecotourism potential of the area.

The Action Plan to protect marine mammals in the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte has the following general objective: "To contribute to the conservation of the marine mammals of the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte by adding knowledge about their species, habitats, conservation, and sustainable management." The Action Plan establishes five general strategies with specific objectives and corresponding actions: 1) increase education and awareness; 2) conduct research; 3) ensure conservation and protection; 4) establish interinstitutional and intersectoral alliances, and 5) reinforce the legal framework.

The education and awareness strategy aims to induce a change in behavior among all users of the terrestrial, coastal, and marine zones of the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte, as well as local communities, in favor of the conservation and protection of manatees and marine mammals in general. The research strategy is aimed at the development of research projects on the biology, ecology, and population dynamics of manatees and marine mammals in general, both locally and regionally, as a basis for their conservation. The third strategy aims to eliminate and/or minimize negative anthropogenic impacts on marine mammal populations caused by users of the terrestrial, coastal, and marine zones of the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte. Regarding interinstitutional and intersectoral alliances, relationships among all the users of the terrestrial, coastal, and marine zones of the Marine Mammal Sanctuaries (institutions, sectors and civil society) can coordinate the management of the areas and the protection, conservation, and sustainable use of the marine mammals and their habitats. Finally, reinforcing the legal framework enhances the regulations and level of compliance with these rules

to provide more assertive protection of marine mammals and their habitats in the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte.

To implement the plan, intersectoral and local coordination is important, and local, regional, and national actors responsible for various actions should be specified. Several public institutions that are part of the Dominican State play a basic role, either in terms of rectorship and control (Ministries and Vice Ministries) or education and research (museums and research institutes). Private institutions and non-governmental organizations also function in the implementation of the plan, as described in the Responsible Parties section.

1. INTRODUCTION

The Caribbean Marine Conservation Program (CMBP), coordinated by The Nature Conservancy (TNC) and sponsored by the U.S. Agency for International Development (USAID), hired the Dominican Foundation for Marine Studies (FUNDEMAR) for the consultancy “Development of action plans to protect coral reefs and marine mammals in Samaná Bay and the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte.”

This report presents the Action Plan regarding the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte, based on a) an analysis of the data obtained in previous studies, (b) the results of the assessment of marine mammal populations carried out during this project, and (c) the identification and analysis of the main uses of marine mammals and anthropogenic impacts on their populations.

2. METHODOLOGY

2.1. Location of the Study Area

The present report covers the protected areas of Marine Mammals Sanctuaries of Estero Hondo and Marino del Norte. The protected zones overlap in a space that includes the coastal and marine area of the Municipal District Estero Hondo, which belongs to the Municipality of Villa Isabella, Puerto Plata Province. Marino del Norte also includes part of the coastal zone of the Municipal District of La Isabela, located to the east, as well as the marine area adjacent to the Sanctuary of Estero Hondo (Fig. 1).

The Marine Mammal Sanctuary of Estero Hondo was created by Article 37 of the Sectoral Law of Protected Areas 202-04, as a Category I Area of Strict Protection, with an area of 22 km². The manatee (*Trichechus manatus*) is the most important conservation species in the area and the reason for which the sanctuary was created. This species is in the Critically Endangered category, according to the National Red List (Environment Ministry, 2011).

Law 313-14, from August 8, 2014, extended the limits of this Sanctuary to include the Marino del Norte area, occupying a total marine area of 299.56 km². This Sanctuary aims to guarantee the ecosystem integrity and conservation of the natural habitat of the main population of West Indian Manatee in the Dominican Republic, as well as the dolphins, corals, sea turtles, and whales that use the territory. The area includes the marine and coastal areas north and northeast of Montecristi Submarine National Park, off the coast of Punta Rucia, Estero Hondo, and northwest of the Hispaniola National Park. Its support of a rich assemblage of species should be in harmony with tourism development, fishing, and other productive activities compatible with the Generic Habitat/Species Management (IV-IUCN) category of the World Conservation Union (National Congress, 2014).

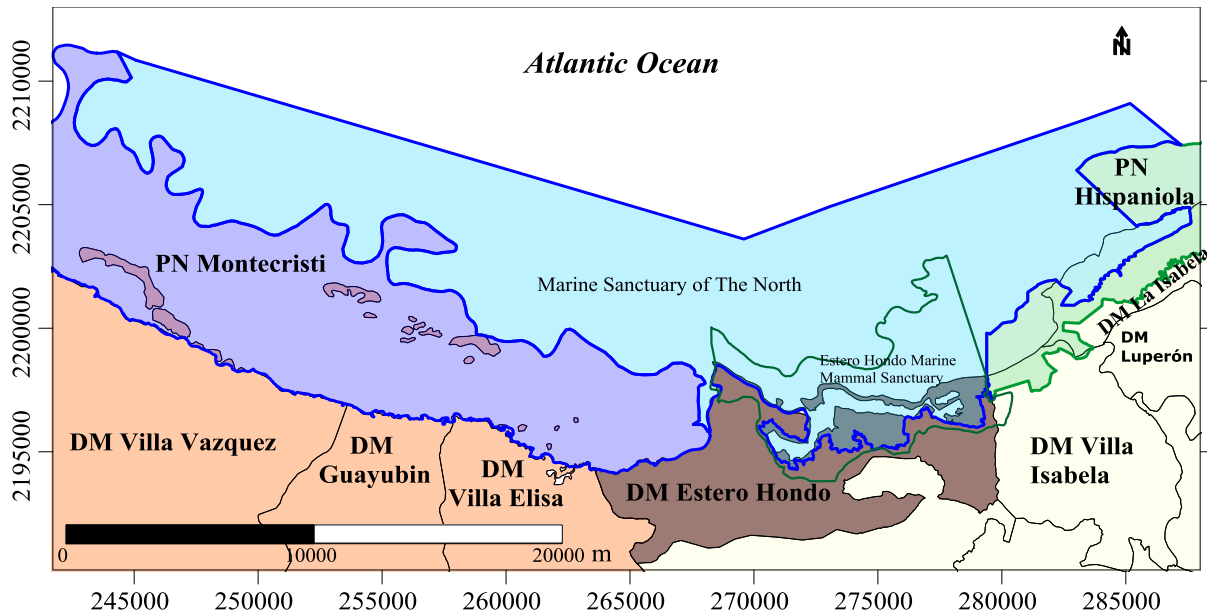


Figure 1. Map of the Marine Mammal Sanctuaries of Estero Hondo (green line) and Marino del Norte (light blue).

2.2. Ecological Characteristics of the Study Area

In the coastal zone of the Estero Hondo Municipal District, a shallow bay communicates with the sea through Caño Estero Hondo, giving way to a reef lagoon. A total of nine ecosystems or environments (Table 1) have been delineated in this terrestrial, coastal, and marine zone (Ministry of Environment, 2014). This bay receives freshwater from La Ciénaga, Los Pilones, and Solimán Rivers and Estero Hondo, La Jaiba, Encantamiento, and Caño Miguel Streams (Fig. 2). This complex of ecosystems provide habitat, shelter, and food on a temporary or permanent basis to manatees (*T. manatus*) and other marine mammals.

Table 1. Main ecosystems and environments in the terrestrial, coastal, and marine area of the Marine Mammal Sanctuary of Estero Hondo.

Zone	Ecosystems / Environments
Terrestrial	Wet forest
	Dry forest
	Riparian vegetation
Coastal	Mangroves
	Sandy beach
	Rocky coastline/low cliff
Marine	Muddy bottom
	Sea grass on muddy/sandy bottom
	Coral reefs

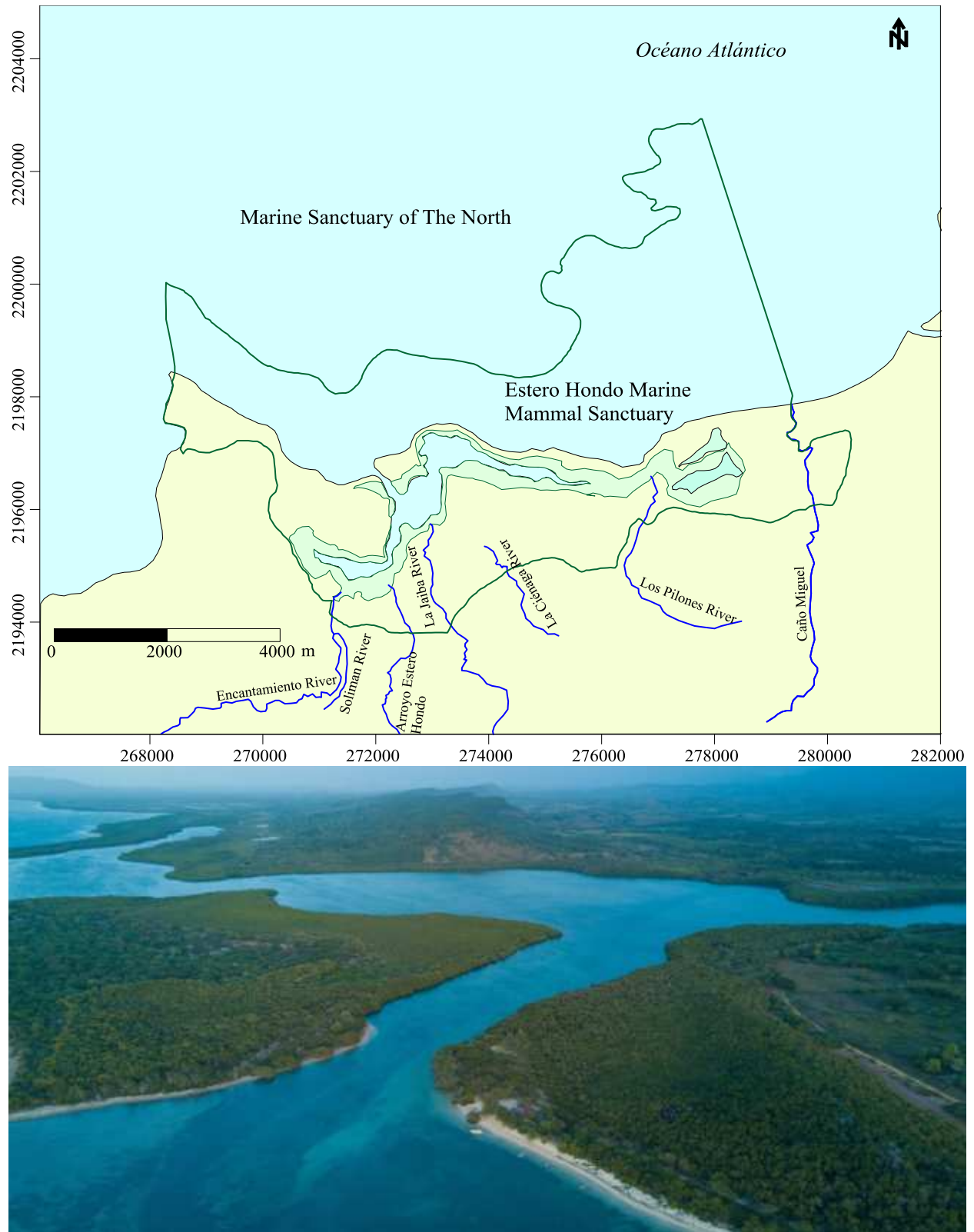


Figure 2. (top) Map of the protected area of the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte, and associated watercourses. (bottom) Aerial view of part of these protected areas.

2.3. Collection and Analysis of Information

We searched the libraries of various national institutions and websites for all unpublished or previously published information on marine mammal studies in the study area. The libraries of TNC, FUNDEMAR, and the Center for Marine Biology Research (CIBIMA) were reviewed. Previous work was conducted in the area by Domínguez-Tejo (2007, 2009) and Domínguez-Tejo and Rivas (2011).

In addition, direct contacts were made with researchers from the Vice Ministry of Protected Areas and Biodiversity of the Ministry of Environment and Natural Resources to obtain the results of their research in the study region and to obtain the Management Plans of Protected Areas. The Conservation Plan (CIBIMA/TNC, 2011) and the Management Plan (Ministry of Environment, 2014) for the Marine Mammal Sanctuary of Estero Hondo are relevant. As the Sanctuary of Marino del Norte was created recently, no specific studies about it were located, although all the previous studies did coincide with the geographic space of this Protected Area.

2.4. Map Base and Georeferencing System

The cartographic system used for the spatial presentation of the results was based on the topographic sheets of the Military Cartographic Institute corresponding to Cacao, Barrancón, and El Mamey. The contour of the study area was digitized in the Golden Surfer Program 13 using UTM (Universal Transversal of Mercator) coordinates referring to the WGS-84 datum for Zone 19N.

2.5. Field Evaluations

Field evaluations in the study area included three stages:

- Interviews with coastal and marine zone users to identify areas of marine mammal sightings, particularly manatees and dolphins.
- Terrestrial visits and marine field tours through the study area.
- Identification of potential impacts to marine mammals due to anthropogenic activities, mainly those related to fishing and tourism.

Interviews with key actors. Interviews were conducted with key stakeholders, including the most experienced fishermen at each landing site, the administrator in charge of protected areas, and/or technicians assigned to the Provincial Directorate of the Ministry of Environment. In addition, interviews were carried out with local CODOPESCA members in order to know the estimated number of fishermen and the types of fishing gear used locally. The interviews covered sightings of marine mammal species, the areas where they were sighted, the number of estimated individuals, the frequency of sightings, and other relevant information. In addition, fishermen were asked about the type of fishing gear they used, and the effects of fishing and tourist activities on marine mammals.

Field trips. Field evaluations in the study area included the terrestrial zone and the watercourses that reach the Caño Estero Hondo, as well as the channel itself and associated marine coastal zone.

These evaluations were carried out from the beginning of July until the beginning of September. Sampling trips were conducted from the Ministry of the Environment vessel based in Estero Hondo, starting at 6:00 am, on days with good sea conditions and visibility. Each of the surveys was conducted by an average 3 to 4 observers. In addition, the entire channel was surveyed by kayak, using viewpoints for sightings along the coast. At each of 20 monitoring stations (Fig. 3), observers spent 30 minutes searching for manatees, covering a 360° angle around the boat, using the methodology adopted by Self-Sullivan et al. (2003) and LaCommare et al. (2008), for a total of 90 hours of sampling. In addition, in the coastal and marine zones of the study area, a DJI MAVIC PRO drone conducted six hours of flight (16 flights of 25 minutes each) searching for manatees.

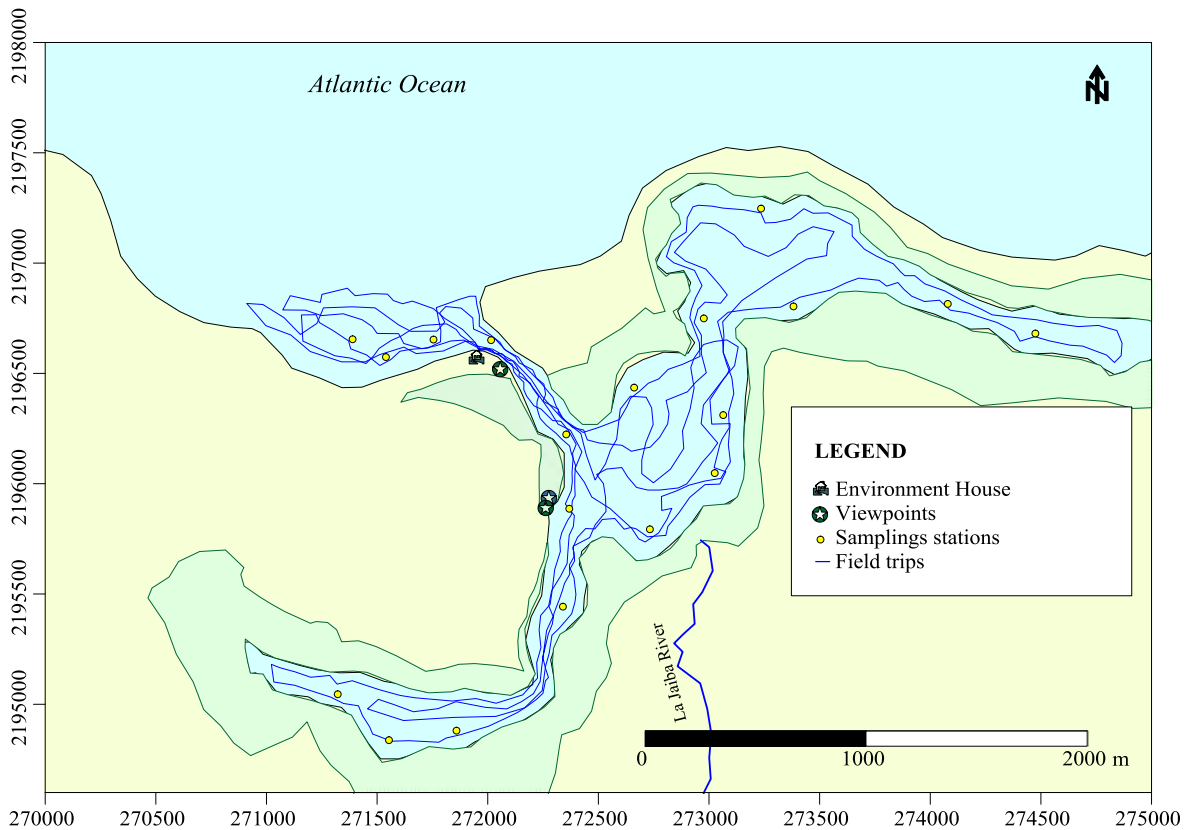


Figure 3. Manatee monitoring surveys and stations in Caño Estero Hondo.

During each survey, when a manatee or dolphin was sighted, the time was recorded and the initial and final positions of the individual or groups of individuals were georeferenced, using a Garmin portable GPS. The positions indicated to the points closest to the individuals. In addition, the estimated number of individuals sighted, group composition (e.g. adults, juveniles), species, and the behavior were recorded at the time of first sighting and during the observation, following Caldwell (1993) and Wells (1992).

Identification of potential impacts on marine mammals. Based on all the literature consulted, an inventory of the anthropogenic impacts on marine mammals was conducted. Additional information about these impacts was collected during each of the field surveys, and before and after each of the sightings.

2.6. Development of the Action Plan

The Action Plan was developed using previous studies and research on marine mammals in the region, as well as the results obtained in this report, which constitute the baseline for the monitoring and tracking component for the Action Plan. It was grounded in fundamental national legal provisions, in particular the Management Plan for the Marine Mammal Sanctuary of Estero Hondo (Environment Ministry, 2014). It was also informed by other action plans, including the plan for the Conservation of Marine Mammals in the Caribbean of the United Nations Environment Program (UNEP, 2008), the NOAA International Marine Mammals Action Plan (2012), and the Strategy for the Conservation of Manatee Population and Habitat in the Caribbean by Gómez et al. (2012).

This plan consists of the following topics:

1. General objective
2. Area of action
3. Development strategies for six specific objectives:
 - Increase education and awareness
 - Conduct research
 - Ensure conservation and protection
 - Establish interinstitutional and intersectoral alliances, and
 - Reinforce the legal framework.
4. Parties responsible for achieving the objectives
5. Estimated duration

3. RESULTS AND DISCUSSION

3.1. Previous Research in the Study Region

Research on marine mammals in the area has been focused on the conservation of the population of the West Indian Manatee (*T. manatus*) in Estero Hondo. In 2007, a preliminary study on manatees in this area demonstrated the fragility of this population (Domínguez-Tejo, 2007). In 2009, an additional study evaluated the feasibility of photoidentifying manatees using aquatic video techniques in the Marine Mammal Sanctuary of Estero Hondo (Domínguez-Tejo, 2009). In 2010, a conservation plan for this sanctuary was implemented, sponsored by TNC and CIBIMA, with the support of the Ministry of Environment (Domínguez-Tejo, 2010). This plan called for a long-term research plan to ensure the survival of manatees in the area and to maintain a healthy ecosystem. In the same year, a project was implemented to build the visitor center and post signage indicating the Marine Mammal Sanctuary of Estero Hondo (Torres, 2010). Domínguez-Tejo and Rivas (2011) conducted a quantitative assessment of the use of manatee habitat in the Caño del Estero Hondo.

Recently, the Ministry of the Environment (2014) began to implement the Management Plan for the Marine Mammal Sanctuary of Estero Hondo for 2014–2019, prepared in the framework of the Reengineering Project of the National System of Protected Areas in Order to Achieve Financial Sustainability. This effort was supported by the Global Environment Facility (GEF) and the United Nations Development Program (UNDP). One of the objectives was to increase the manatee population in this protected area, through conservation and research actions.

Between 1917 and 2014, there were 39 individual manatee strandings in the country. This is the marine mammal species with the highest number of strandings in Dominican waters, and Puerto Plata is one of the provinces with the highest number of manatee stranding events (Veras, 2014).

Manatees were protected by Law 5914-62, which was overruled by Law 307-04 on Fisheries and Aquaculture. At present, they are only protected by Decrees 289-87 and 233-96 in some Protected Areas. They also fall under the protection of international treaties of which the Dominican Republic is a signatory, such as Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Annex II of the Cartagena Convention.

3.2. Management of Protected Areas

The local management of the protected area of the Marine Mammal Sanctuary of Estero Hondo (SMMEH) is carried out by an administrator, in coordination with the Provincial Director of the Environment. This administrator is also responsible for Marine Mammal Sanctuary of Marino del Norte (SMN). In terms of physical infrastructure, a guardhouse that serves as a visitor center is located in front of Estero Hondo beach, at the entrance of Caño Estero Hondo. Four park rangers carry out control and surveillance functions. None of them have received any training regarding conservation in the area, other than that gained during the performance of their duties. They have a 29-foot boat with two outboard motors in good condition and two motorcycles in poor condition. The fuel allocation is six thousand pesos per month (RD \$6,000), which is insufficient for daily patrols. The communications system is operational.

Two trails within the area offer ecotourism experiences. The first leads from the visitor center to a viewpoint of the Boquerón de Carlos and is approximately 1 km long, while the second goes from the visitor center to the entrance of El Cambrón and is approximately 800 m. Each of these trails has an observation platform. In addition, there is a viewing platform located near the visitor center (Photo 1).

The Sanctuary Guides Association controls visits to the protected area and charges RD \$250 to foreign visitors (not Dominican Republic citizens). Of this amount, RD \$100 is collected by the Ministry of the Environment and the rest is distributed as follows: commissions for guides (RD \$90), Municipal Unit for Community Heritage, UMPC (RD \$25), community (RD \$10), landowners (RD \$10), and expendable material (RD \$15). The Sanctuary Guides Association administers these funds.

Few foreign tourists visit the sanctuary, considering the ecotourism potential of the area; the monthly average was only 53 visitors between January and July in 2017 (Table 2). The Hotel Villa Rosa of Punta Rucia and Luna Tours organize sporadic excursions in kayaks in the area of Caño Estero Hondo. The number of visitors has decreased since 2014, where the Sanctuary received 650 visitors per month (Ministry of Environment, 2014). There is very little community participation in the management of the area.

In addition, the administrator manages visitors to Cayo Arena, within the Montecristi Submarine National Park, where a supervisor on the key itself collects the entrance fee of RD \$100 per visitor. Although this key belongs to the National Submarine Park of Montecristi, it is managed by this Sanctuary. Four companies handle excursions to Cayo Arena, starting from La Ensenada Beach or Punta Rucia: Paradise Tours, Penny Caribbean Sea, Valdemora Tour and Coral Island Tour. According to the SMMEH Protected Area Administrator, the average monthly number of visitors from January to July 2017 was 6,071. Collectively, the tour companies have more than 20 speedboats and about 10 catamarans, as well as 15 small boats, which they use throughout the area, including the Marino del Norte.



Poster indicating the entrance to the Sanctuary



Park rangers station in Estero Hondo



Visitor center office



Observation platform No. 1



Observation platform No. 2



Natural observation site

Photo 1. General infrastructure at the Marine Mammal Sanctuary of Estero Hondo.

Table 2. Number of visitors to the Marine Mammal Sanctuary of Estero Hondo (SMMEH) and Cayo Arena, from January to July 2017, according to data from the Protected Area Administrator.

Month	SMMEH	Cayo Arena
January	78	6,900
February	117	6,866
March	144	6,806
April	13	6,056
May	4	4,360
June	8	5,148
July	12	6,362
Total	376	42,598

Between 2009 and 2013, the Ministry of Tourism (MITUR) and the National Institute of Technical Vocational Training (INFOTEP), with financial support from the Japan International Cooperation Agency (JICA), implemented the Sustainable Tourism Project under Public–Private Partnerships in the Puerto Plata Province (TURISOPP). The objective was to promote tourist products and services under the public–private alliance scheme, using local resources, to establish sustainable tourism development with benefits to the local population. This initiative gave rise to the

Municipal Units for Community Heritage (UMPC) for the tourist management of local natural and cultural values.

As part of this project, nine local community youths were trained to provide visitor services to the Marine Mammal Sanctuary of Estero Hondo. At present, only three of them continue to do this work, on a part-time basis. Also under this project, the entrance sign to the Sanctuary was installed, and different walking paths in the area, the visitor center, and a viewing platform were created. The viewing platform allows people to contemplate the beauty of the bay from different angle, while the visitor center has a manatee skeleton on display, among other exhibits. However, there are few visitors to this center.

The Ministry of Environment and Natural Resources, together with the Estero Hondo Caseteros de la Ensenada Association/La Ensenada Beach Potters Association (ACEEH), is in the process of remodeling the houses on La Ensenada Beach, in Estero Hondo, inside the study area. This project includes new designs for the houses and three bathrooms connected to septic systems, to serve the visitors to the area.

3.3. Diversity and Distribution of Marine Mammals in Estero Hondo

Records of eight species of marine mammals have been documented in the study region (Table 3). This number includes seven cetaceans (a bearded whale and five odontocetes) and a sirenid. Of the total number of species recorded, six were reported by strandings in the Puerto Plata Province, from 1917 to 2012, according to Veras (2014). These stranding events included two of pilot whales (*Globicephala macrorhynchus*), one in Punta Rucia; one of *Kogia* sp. in Cabarete; five of humpback whales (*Megaptera novaeangliae*) between Luperon and Cabarete; four of sperm whales (*Physeter macrocephalus*); one of Cuvier’s beaked whale (*Ziphius cavirostris*) on the beach of Puerto Plata; and five of the West Indian Manatee (*T. manatus*), of which three occurred in Punta Rucia, one west of the mouth of the La Jaiba River, and one at the mouth of the Rio Bajabonico.

An Atlantic spotted dolphin (*Stenella frontalis*) was sighted off the coast of Puerto Plata by the National Marine Fisheries Service of NOAA in 1995 (NMFS, 1995); in addition, Betancourt et al. (2015) documented the sighting of an individual sperm whale (*P. macrocephalus*) to the north of Mount Isabel, in 2009.

Table 3. Species of marine mammals reported for Puerto Plata Province and its immediate environment. The taxonomic order is given according to the World Marine Species Register. AV: sighting, VA: stranding.

Order	Infraorder	Family	Species	Common name	Record
Cetartiodactyla	Cetacea	Balaenopteridae	<i>Megaptera novaeangliae</i>	Humpback whale	AV/VA
Cetartiodactyla	Cetacea	Delphinidae	<i>Tursiops truncatus</i>	Bottlenose dolphin	AV
Cetartiodactyla	Cetacea	Delphinidae	<i>Stenella frontalis</i>	Atlantic spotted dolphin	AV
Cetartiodactyla	Cetacea	Delphinidae	<i>Globicephala macrorhynchus</i>	Pilot whale	VA
Cetartiodactyla	Cetacea	Kogiidae	<i>Kogia</i> sp.	Pygmy sperm whale	VA
Cetartiodactyla	Cetacea	Ziphiidae	<i>Ziphius cavirostris</i>	Cuvier’s beaked whale	VA
Cetartiodactyla	Cetacea	Physeteridae	<i>Physeter macrocephalus</i>	Sperm whale	AV/VA
Sirenid	-	Trichechidae	<i>Trichechus manatus</i>	West Indian manatee	AV

During the present study, 56 sightings were obtained in 90 hours of manatee monitoring effort, of which 10 were obtained during the half-hour observations at the pre-selected stations, 34 were opportunistic sightings during the tours, and 12 were sightings from land (Fig. 4). Of the sightings, 91% occurred in the entrance channel area and/or in the inner zone of the channel, while 9% occurred in the seagrass zone west of the exit of the channel, of manatees engaged in feeding behavior.

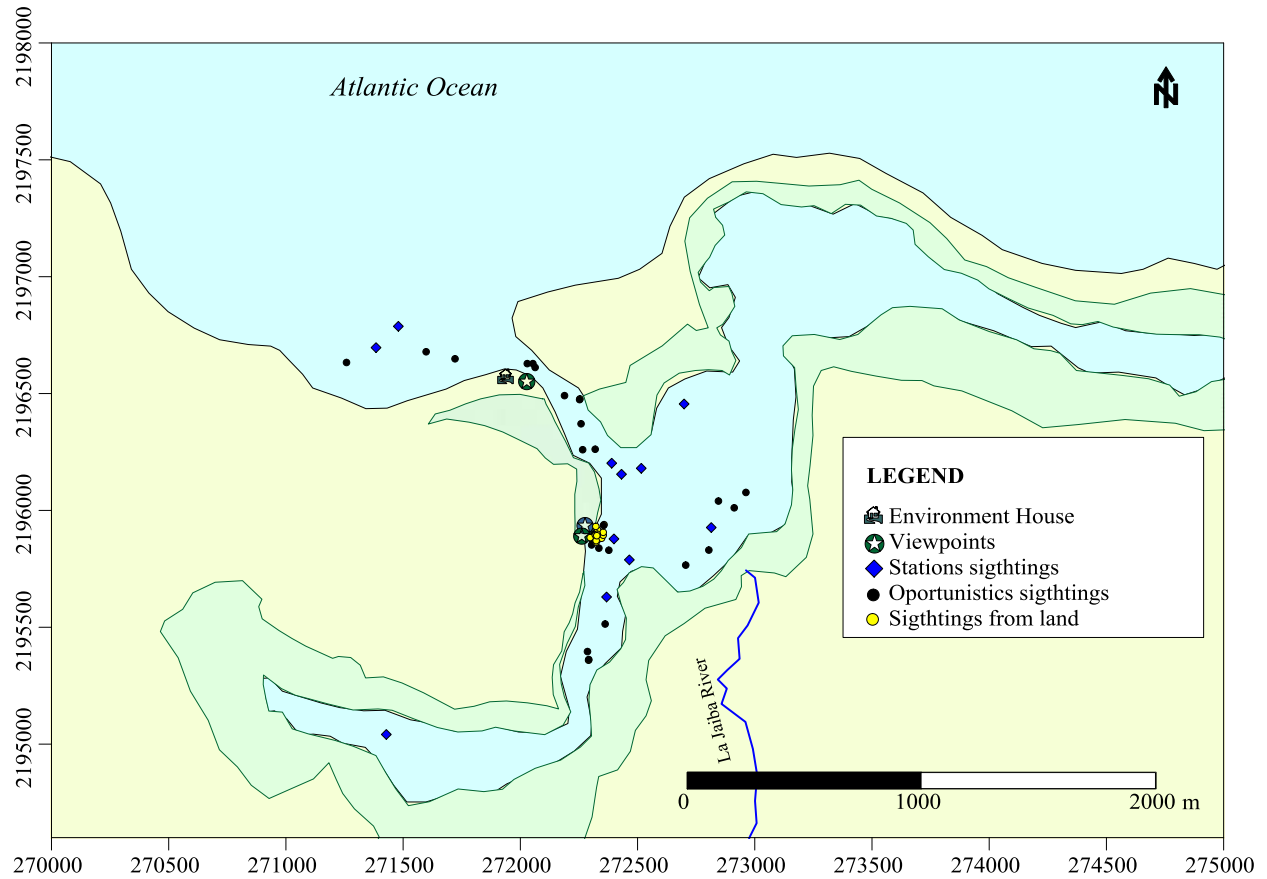


Figure 4. Sightings of manatees in Caño Estero Hondo and its associated marine zone.





Photo 2. Sightings of manatees in the Marine Mammal Sanctuary of Estero Hondo.

The evasive behavior of the animals, together with the limited visibility of the water in the Estero Hondo stream, made it impossible to capture underwater images or higher quality aerial images with the drone (Photo 2).

During the study period, two bottlenose dolphins (*Tursiops truncatus*) and *Stenella* sp. traveling through the Sanctuary of Marino del Norte (Fig. 5) were sighted. These sightings were made by fishermen on the way to their rafts or Fish Aggregating Devices (FADs), who reported that it is common to observe them. Fishermen also report sightings of sperm whales and dolphins in front of Punta Burén, although these animals were not observed during the present study (Photo 3).

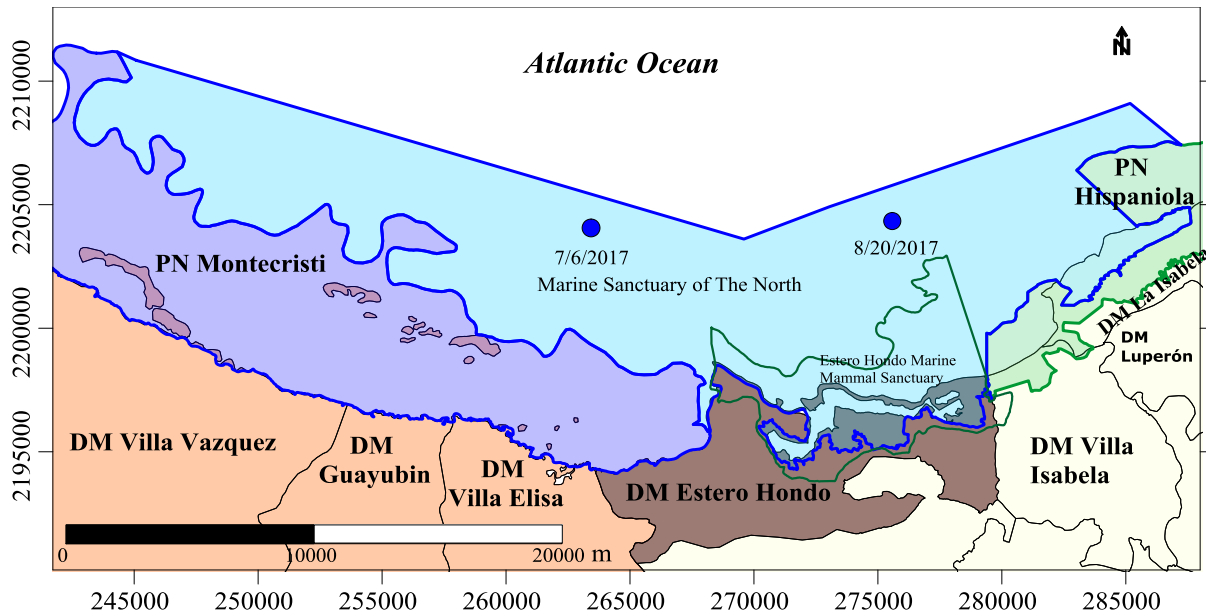


Figure 5. Sightings of groups of bottlenose dolphins (*T. truncatus*) and *Stenella* sp. in the Marino del Norte. Sanctuary



Photo 3. Sightings of groups of bottlenose dolphins, *T. truncatus*, swimming with groups of *Stenella* sp.

The International Union for Conservation of Nature (IUCN, 2017) classifies the humpback whale (*M. novaeangliae*) and Cuvier's beaked whale (*Z. cavirostris*) as species of Minor Concern, while the sperm whale (*P. macrocephalus*) and the West Indian manatee (*T. manatus*) are in the Vulnerable Category. There are insufficient data to assess the status of the other species. In the National Red List of Threatened Species (Ministry of Environment, 2011), the manatee is listed as Critically Endangered and the bottlenose dolphin (*T. truncatus*) is in the Vulnerable category.

3.4. Anthropogenic Impacts on Marine Mammal Species

All species of marine mammals in the region are threatened by a number of impacts, including pollution from solid waste and sewage entering the coasts, ship noise, the risk of collision with boats or entanglement with fishing gear, and finally the consequences of climate change. The terrestrial zone of Estero Hondo shows evidence of diverse sources of pollution by solid waste and untreated wastewater poured into the water courses and entering the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte. Boats in the area often traveled at high speed, particularly

those transporting tourists to and from Cayo Arena, and illegal fishing occurred within the protected area and/or in areas close to the manatee habitat. All of these impacts are presented in detail below.

Impacts from pollution

In the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte and in their associated watercourses, various sources of pollution were identified (Fig. 6). There are at least five improvised landfills in the coastal zone and/or on the banks of the Encantamiento and La Jaiba rivers. Likewise, the solid waste situation in Playa Maritza, which is part of the Sanctuary, is quite serious and is a consequence of tourism. A small improvised landfill was found at Playa Marigosta.

There is no wastewater treatment plant in the municipal district of Estero Hondo, so most of the homes have individual septic systems. Nevertheless, some wastewater is carried by drainage from rainfall to the Solimán river, which feeds the Encantamiento river, flowing into Caño Estero Hondo. The untreated waters of two car washes and a fuel pump also enter the Sanctuary waters. In addition, according to the Administrator of the protected area, there are 32 pig farms in the municipality, the waste from which flows into waterways in the municipality. The present study noted animal husbandry of pigs on the banks of La Jaiba and Encantamiento rivers (Photo 4).

In addition, La Jaiba Municipal District operates a cheese factory (275473 E / 2190421 N), whose solid waste and untreated wastewater are discharged into the La Jaiba River, with environmental and public health consequences. A banana production facility, whose trees are fumigated weekly from airplanes, also pours its processing waters into the Encantamiento River. All sources of pollution, whether from solid waste or untreated wastewater, reach the Caño Estero Hondo through the waterways, which are the sources of fresh water for the manatee population.

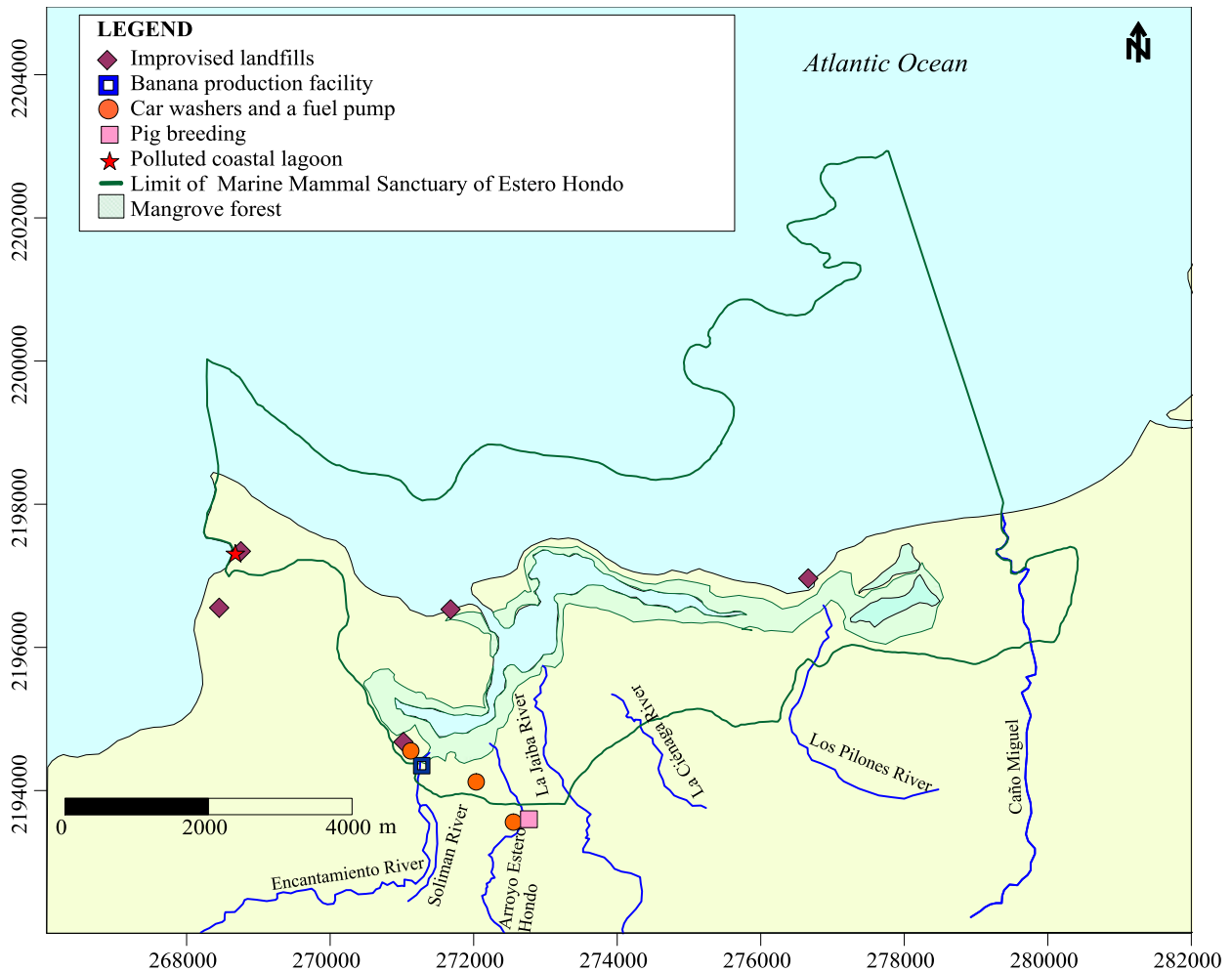


Figure 6. Some sources of pollution entering the Marine Mammal Sanctuary of Estero Hondo.

Finally, there is serious contamination from septic waters and solid waste in an inland lagoon at La Ensenada Beach, which empties into the coastal zone during periods of rain (Photo 4). The Ministry of the Environment is working with the ACEEH to solve the problem of solid waste and wastewater management.

Impacts of boat speed

The four companies that offer excursions to Cayo Arena from La Ensenada Beach or Punta Rucia own more than 40 large and small boats and mobilize about 6,000 visitors per year (Photo 5). Their high speed is a serious concern for the marine mammals in the region, due to the risk of collisions or disturbances from noise and water movements. This is a particular concern in the mangrove area that is included in the route of some of the excursions as they return from Cayo Arena and where manatees are frequently observed. The captains report that they have sporadic sightings of groups of dolphins, as well as manatees, on their journeys to the cay.



Water entering Solimán River



Water from the cheese factory in La Jaiba River



Waste from the cheese factory entering La Jaiba River



Lagoon of La Ensenada Beach

Photo 4. Various sources of pollution affecting the coastal and marine area of the Marine Mammal Sanctuary of Estero Hondo.



Photo 5. Tourist boats traveling to Cayo Arena, departing from the beach of La Ensenada.

Impacts from fishing

In the study area, Punta Rucia, La Ensenada Beach, and Estero Hondo were identified as the main ports for fishermen. Fishing activity is poorly organized in the region. The Association of Fishermen of Punta Rucia is in the process of becoming organized and legally integrated, and has about 15 members that fish in the area from Ensenada to Cayo Arena. In La Ensenada and Estero Hondo, the fishermen are not organized in an association.

According to the representative of the Fishing Station of Puerto Plata, CODOPESCA, from Estero Hondo to Punta Rucia there are about 360 fishermen. At present, this institution has a single enumerator in Estero Hondo. The Ministry of Environment and Natural Resources Resolution 23/2017, which prohibits the capture of herbivorous reef fish for a period of two years, was passed in response to a decline in fish in the region. The main types of fishing gear used in the region are handline, set net, trammel net, and cast net. Diving (with snorkel or compressor), traps for lobsters, and rafts with FADs are also used, more than 8 miles off the coast. The main threat to manatees from fishing is the illegal use of set nets within the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte. It is necessary to strengthen control and surveillance mechanisms to end their use in these sites.

About land tenure and use

Since the creation of the Marine Mammal Sanctuary of Estero Hondo, there have been numerous conflicts regarding land use, as there are landowners within the protected area who have title deeds and/or titles from the Dominican Agrarian Institute; long-time occupants of land within the protected area, and homes and restaurants built and operating within the protected area (Ministry of Environment, 2014). This situation continues to threaten the conservation objectives of the protected area.

4. CONCLUSIONS

The region in which the Marine Mammal Sanctuary of Estero Hondo is located attracts few tourists, although the category of management of the protected area allows tourism, as long as the corresponding regulations are followed to ensure the conservation of the ecosystem and the safety of the manatee population. Poor community involvement, poor staffing, insufficient logistical support for control and surveillance, deterioration of existing infrastructures, and the presence of landowners within the protected area are challenges to sustainable ecotourism here.

The marine mammals in the study area is distributed along coastal and marine areas, revealing the importance of Caño Estero Hondo and the surrounding marine area as important habitat for manatees. As a result, these animals are vulnerable to various negative anthropogenic activities. These threats include the contamination of water by contaminated river water and/or solid wastes entering Caño Estero Hondo; noise pollution and the risk of collision from boats; and the illegal use of set nets in the protected area.

5. ACTION PLAN

5.1. Introduction

This Action Plan is part of the efforts of the CMBP coordinated in the country by TNC and sponsored by USAID, together with FUNDEMAR, as part of the consultancy “Development of action plans to protect coral reefs and marine mammals in Samaná Bay and the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte.” These efforts are covered by various legal provisions related to the protection of the coastal and marine area and their living resources.

Law 64 of 2000, in Chapter IV on Biological Diversity, Article 136, states that “the conservation of native and endemic species of flora and fauna, the promotion of their reproduction and multiplication, as well as the preservation of the natural ecosystems that serve as habitats” are of national interest and will be the object of rigorous mechanisms of protection in situ. The law protects all coastal and marine flora and fauna and generally applies to all the biotic resources of the national territory.

This Plan is in line with Biodiversity Law 333-15, Article 1 of which establishes as objectives:

- the legal framework necessary to promote the recovery and maintenance of the viability, natural evolution, and sustainable use of biodiversity in the national territory as part of the Natural Heritage of the Dominican Nation,
- regulation of the conservation and sustainable use of habitats and ecosystems associated with biodiversity,
- control of access and use of genetic and biochemical derived resources, and
- development and application of the principles and provisions on biodiversity contained in the Law on Environment and Natural Resources (National Congress, 2015).

This Plan is framed within the vision and objectives defined in the Management Plan of the Marine Mammal Sanctuary of Estero Hondo (Ministry of Environment, 2014).

At the international level, the country has signed conventions that directly concern biodiversity in general and marine mammals in particular. These include the Convention on Biological Diversity (CBD), CITES, the Convention on the Conservation of Migratory Species (CMS), the Cartagena Convention (Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region), and the SPAW (Specially Protected Areas and Wildlife) Protocol under the agreement on the Biological Corridor in the Caribbean (CBC).

The Action Plan establishes general strategies for the conservation of marine mammals in the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte, presented below. It also establishes the national and local key players responsible for their operation. This plan has an estimated duration of 5 years, at which time it should be reviewed and updated, according to the cultural, socioeconomic and political conditions of the moment.

5.2. Strategic Objective of the Plan

Contribute to the conservation of marine mammals of the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte, based on knowledge of their species and their habitats, for their conservation and sustainable management.

5.3. Strategies

The present Action Plan establishes five general strategies with specific objectives and their corresponding actions for the protection and conservation of marine mammals:

- Increase education and awareness
- Conduct research
- Ensure conservation and protection
- Establish interinstitutional and intersectoral alliances
- Reinforce the legal framework

Table 4 presents the specific objectives of each of the strategies, as well as relevant factors that affect them. Each of these strategies and its corresponding actions are described. All actions are aimed at supporting the presence of the marine mammal species in the study area, considering their importance and role in the ecosystem, as well as the socioeconomic and cultural services they offer. A summary of the present action plan is presented in Annex 2.

Table 4. Strategies, specific objectives, and factors for the conservation of marine mammals in the Marine Mammal Sanctuaries of Estero Hondo (SMMEH) and Marino del Norte (SMN).

Strategy	Specific Objective	Factors
Increase education and awareness	Users of the land, coastal, and marine areas of the Sanctuaries and local communities show a change in behavior in favor of the conservation and protection of manatees and marine mammals in general.	Users and the local population have little knowledge about the protected area, its limits, its conservation objects, or the importance of manatees and marine mammals in general.
Conduct research	Research projects on the biology, ecology, and population dynamics of manatees and other marine mammals, both locally and regionally, provide a basis for their conservation.	Research projects on manatee populations in the Sanctuaries lack continuity. There is insufficient scientific knowledge regarding the status of most marine mammals in the region, <u>impeding effective conservation.</u>
Ensure conservation and protection	Negative anthropogenic impacts on marine mammal populations caused by land, coastal, and marine users of the SMMEH and SMN are eliminated and/or minimized.	Diverse actions of the communities, the tourism sector, and the fishing sector impact marine mammals: <ul style="list-style-type: none"> ▪ Illegal fishing within the protected area and/or use of fishing gear near manatee habitat. ▪ Contamination of watercourses by solid waste and wastewater. ▪ High-speed boat traffic.
Establish interinstitutional and intersectoral alliances	Collaboration and exchange mechanisms are strengthened among all the users of the land, coastal, and marine areas of the Sanctuaries (institutions, economic sectors, and civil society) to manage the area sustainably and protect marine mammals and their habitats.	Institutions and sectors are not coordinated regarding the conservation of marine mammals, but work independently according to their interests. Economic resources are not channeled into research and conservation of marine mammals.
Reinforce the legal framework	Compliance with regulations is improved to provide more assertive protection of marine mammals and their habitats in SMMEH and SMN.	The two Sanctuaries overlap spatially. There are no effective mechanisms to enforce existing regulations. There are conflicts of land use and tenure within the boundaries of the SMMEH protected area.

5.3.1. Strategy 1: Increase education and awareness

Objective

Users of the land, coastal, and marine areas of the Sanctuaries and local communities show a change in behavior in favor of the conservation and protection of manatees and marine mammals in general.

Actions

1. Design and implement an Education Program to encourage a more responsible and protective attitude toward manatees and marine mammals in general, among all users of the terrestrial, coastal, and marine areas of the study region and among nearby populations, emphasizing the need for conservation. This program should include the following actors:
 - Communities close to protected areas (members of associations and/or social and community organizations, municipal authorities, educational and student sectors, etc.)
 - The local and regional tourism sector (hotels and restaurants, tourist associations, and tourists)
 - The fishing sector through its associations and the tourist transport sector, including Paradise Tours, Penny Caribbean Sea, Valdemora Tour, and Coral Island Tour

The program shall include:

- National and international regulations and/or legal provisions related to protected areas, the use of the coastal zone, and the protection of its biota, with emphasis on marine mammals
 - Ecological and environmental aspects of the terrestrial, coastal, and marine zones of the Sanctuaries of Estero Hondo and Marino del Norte, and
 - Ecology and population dynamics of marine mammal species with an emphasis on manatees.
2. Promote campaigns through local and regional media, such as the local and regional press, radio, and television, covering the municipal districts of Estero Hondo and Villa Isabella, on regional biodiversity, environmental values and services, and especially knowledge and protection of marine mammals and their habitats.
 3. Train tourist guides on the care of visitors to the Marine Mammal Sanctuary of Estero Hondo and seek to engage more local youth in this activity, with the endorsement of the corresponding authorities, such as the Ministries of Environment and Tourism. Fulfilling this goal would help local youth be successful and improve the image of ecotourism in the region.
 4. Encourage educational and awareness-raising activities among local youth groups, teachers, and students at all educational levels on coastal and marine ecosystems in the region, the associated biota (with emphasis on marine mammals), and their values and environmental

services. These activities may include environmental talks, meetings, and film screenings; cleaning of watercourses, beaches, and coastal and marine areas close to the communities to reduce the contribution of solid wastes to the water; and recycling campaigns, among others.

5. Develop ecotourism materials (brochures, posters) aimed at the tourist population in general and in several languages, for distribution in all the dining rooms of the ACEEH, in restaurants and hotels in the region, and in the visitor center of the Sanctuaries. These materials should provide ecological and conservation information on manatees and marine mammals in general in the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte, and efforts to protect them.
6. Elaborate and impart a training module for Sanctuaries staff (the Administrator and park rangers) on legal dispositions of these protected areas and their categories of uses, environmental and biodiversity aspects, and the ecology of manatees and marine mammal populations in the region. This will promote better management of these protected areas.
7. Identify technical improvement courses focused on manatees for the Administrator of both Sanctuaries, complementing his training as a veterinarian. This training could form the basis for the creation of a primary care center for the manatees living in the area and could be extended to other professionals in the Estero Hondo area.
8. Provide marine navigation courses, using nautical charts and GPS, to boat captains and crews operating in the Sanctuaries, emphasizing the need to take precautions in the areas where marine mammals have been sighted.

5.3.2. Strategy 2: Conduct research

Objective

Research projects on the biology, ecology, and population dynamics of manatees and other marine mammals, both locally and regionally, provide a basis for their conservation.

Actions

1. Elaborate and implement new scientific research projects, with noninvasive approaches, to monitor the population of manatees in the Caño Estero Hondo and its surroundings, to build on previous studies, and to serve as a basis for the protection and conservation of this species.
2. Develop and implement a program of veterinary recognition and/or monitoring of manatees that use the area as habitat.
3. Carry out population studies of marine mammals identified in the region, recording indicators of abundance and density, use of habitats, and identification of impacts through aerial and boat censuses.

4. Involve local fishermen in collecting information from opportunistic sightings of marine mammals in the region, documenting these sightings with coordinates and photos or videos, to serve as basic information on distribution and habitat use of the species.
5. Promote the exchange of knowledge of marine mammal specialists, either through regional courses and/or participation in international scientific forums, to integrate marine mammal conservation strategies, particularly for the Caribbean region.

5.3.4. Strategy 3: Ensure conservation and protection

Objective

Negative anthropogenic impacts on marine mammal populations caused by land, coastal, and marine users of the Sanctuaries are eliminated and/or minimized.

General actions

1. Promote technical, economic, and logistic support to the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte by the Ministry of the Environment, considering the marine mammal populations identified in the region and as a basis for ecotourism and conservation development of these areas. Based on existing human and logistical resources, the following actions are proposed:
 - Increase staff in the area (park rangers and supervisors). The current staff is insufficient to control and monitor these Sanctuaries.
 - Remodel and/or recondition the observation platform, the visitor center, the viewpoints, the entrance sign to the Sanctuary, and all signposts on the trails.
 - Acquire a small boat with oars (preferably without a propeller), a pick-up truck, and two new motorcycles to facilitate protection and surveillance.
 - Improve signage at the entrance to the Sanctuaries.
 - Place educational posters on solid waste management in the sandy beach area that belongs to the coastal zone of the protected areas, as well as placing litter bins for trash collection, to eliminate waste on the coast.
 - Equip the Administrator of the protected areas with equipment to monitor and track the manatee populations in Caño Estero Hondo and in the associated coastal zone, as well as other marine mammals present in the area. This equipment includes GPS, binoculars, and camera with a 300-mm lens.
 - Train the Administrator of protected areas and associated personnel in techniques for locating and identifying marine mammals and collecting habitat and environmental data. Data collection should be performed as part of their monitoring and control responsibilities, and the data should be added to a database of sightings of the species, to inform the research strategy of the Action Plan.
 - Promote increased vigilance and control in Sanctuaries regarding the use of fishing gear in these areas, especially of types of gear that are legally prohibited.
 - Have the Provincial Director inspect the car wash and pig farm businesses, which are contaminating water in the municipal districts of Estero Hondo and Villa Isabella.

- Monitor the water quality in the watercourses that reach Caño Estero Hondo, such as the La Jaiba, Solimán, and Encantamiento Rivers and Caño Miguel, as well as at defined stations within the associated marine coastal zone. Such monitoring should be coordinated through the Environmental Quality Directorate of the Vice-Ministry of Environmental Management and with the Vice-Ministry of Coastal and Marine Resources.

- Encourage companies based in Estero Hondo that produce waste and operate close to the water courses that reach the channel to follow the guidelines of the Environmental Management System of the Ministry of the Environment and Natural Resources. These companies include the Guinean Production Plant in Estero Hondo and the cheese production factory in La Jaiba. This activity should be carried out in coordination with the Provincial Director of the Environment.

- Make key users aware of zoning in the Marine Mammal Sanctuary of Estero Hondo (buffer zone, strict conservation, special management and public use), according to the Management Plan of this area (Environment Ministry, 2014).

2. Implement in the short term the Remodeling Plan of the Ministry of Environment and Natural Resources, working with the ACEEH, to provide better ecotourism services, as well as adequate management of solid wastes and wastewater.
3. Publicize speed restrictions for the tourist and fishing boats in the area of the Sanctuaries, as well as in excursions to Cayo Arena.
4. Promote kayak excursions in the Caño Estero Hondo and its associated marine coastal zone through collaboration agreements and/or ecotourism concessions with the Ministry of Environment and Natural Resources.

Remodeling and reaconditioning of the infrastructure of the Marine Mammal Sanctuary of Estero Hondo should be addressed immediately, as many structures were seriously affected by the passage of Hurricane Irma along the northern coast of the country (Photo 6).





Photo 6. Damage from Hurricane Irma to infrastructure of the Marine Mammal Sanctuary of Estero Hondo, September 7, 2017.

5.3.4. Strategy 4: Establish interinstitutional and intersectoral alliances

Multiple actors are spatially or temporally involved with the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte, mainly as users. They can potentially be engaged in protection and conservation actions, with the objective of achieving sustainable use of these areas. For this reason, alliances should be formed between public and private sectors and community organizations, with established collaboration agreements, among users such as

1. Tour operators
2. The shipping associations working in Cayo Arena
3. Hotels and restaurants in the coastal area of Estero Hondo to Punta Rucia
4. Local associations, such as
 - Destination Management Committee of Punta Rucia,
 - Estero Hondo's Environmental Management Committee,
 - Association of Guides of the Marine Mammals Sanctuary of Estero Hondo,
 - UMPC,
 - ACEEH, and
 - fishermen's associations.
5. Public institutions with local impact, such as the Ministries of Environment and Natural Resources, Tourism, Agriculture, Dominican Navy, city councils, and NGOs.

Objective

Collaboration and exchange mechanisms are strengthened among all the users of the land, coastal, and marine areas of the Sanctuaries (institutions, economic sectors, and civil society) to manage the area sustainably and protect marine mammals and their habitats.

Actions

1. Develop a collaborative strategy with the participation of communities, key institutional actors, and the private sector to achieve effective management and funding to implement education, research, conservation, and protection actions. Visitors to these protected areas should pay a fee to a local fund that will be used for the benefit of all. This collaborative strategy would improve local residents' knowledge about the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte and help them feel a sense of pride and identity regarding these resources.
2. Request the Ministry of the Environment to identify a mechanism that allocates a percentage of the profits obtained, as in the entries to Cayo Arena, to the education, research, and conservation and protection actions proposed in the present Action Plan.
3. Identify strategies for financial collaboration with the Ministry of Tourism to support education, research, and monitoring projects in the region.
4. Identify international donors interested in funding education and research projects related to marine mammals and/or local resources, and submit local and/or regional project proposals.

5.3.5. Strategy 5: Reinforce the legal framework

Objective

Compliance with regulations is improved to provide more assertive protection of marine mammals and their habitats in SMMEH and SMN.

Actions

1. Update and implement the Management Plan for the Marine Mammal Sanctuary of Estero Hondo, using the current operational instrument approved by the Ministry of Environment and Natural Resources.
2. Develop a legal instrument to protect manatees. This species was protected by Law 5914-62, which was repealed by Law 307-04 on Fisheries and Aquaculture, so that at present it is protected only by Decrees 289-87 and 233-96 in some Protected Areas. It is also under the protection of international treaties to which the Dominican Republic is a signatory, such as Appendix I of CITES and Annex II of the Cartagena Convention, as described below. Given the delicate state of the populations of the West Indian Manatee, which is in danger of extinction, it is advisable to adopt legislation that addresses the specific requirements of the species, its range, and the threats and impacts to which it is subjected.
3. Review the legal provisions of the creation of the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte with respect to their current limits and overlap. Within the Sanctuary of Estero Hondo, there are pressures and threats with regard to land use that must be solved in order to apply conservation-oriented management.

5.4. Responsible Parties

The implementation of this Action Plan requires the responsibilities for its execution to be assigned to different institutions, in order to provide financing, management, independent audits, and advisory services for the different tasks. Cross-sectoral and local coordination with local, regional, and national actors is important in order to achieve greater effectiveness in results. Several public institutions that are part of the Dominican State play a basic role, either in terms of rectorship and control (Ministries and Vice Ministries) or education and research (museums and research institutes), as well as private institutions and nongovernmental organizations.

5.4.1. Public institutions

A number of Dominican public institutions are involved in orientation, strategies, rectorship, control, and research relevant to the Action Plan for the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte (Table 5).

Table 5. Main Dominican public institutions relevant to the Action Plan, according to their involvement in different areas.

Institution	Areas			
	Coastal	Marine	Aerial	Port
Ministry of Environment and Natural Resources	X	X		
Vice Ministry of Protected Areas and Biodiversity	X	X		
Vice Ministry of Environmental Management	X	X		
Vice Ministry of Coastal and Marine Resources	X	X		
Ministry of Tourism	X	X		
National Museum of Natural History (MNHNSD)	X	X		
Dominican Council for the Promotion of Fisheries and Aquaculture (CODOPESCA)	X	X		
Marine Biology Research Center (CIBIMA/UASD)	X	X		
National Aquarium of Santo Domingo	X	X		
National Maritime Affairs Authority (ANAMAR)	X	X		
Dominican Navy	X	X		X

Ministry of Environment and Natural Resources

This is the agency responsible for developing, executing, and monitoring national policies on the environment and natural resources, promoting and stimulating their preservation, protection, restoration, and sustainable use. It is, therefore, the guiding institution for biodiversity issues in all its areas. It governs the management of the environment, ecosystems, and natural resources, and contributes to sustainable development by virtue of the powers conferred by the General Law on Environment and Natural Resources 64-00 (MARENA, 2015). At least three of its vice-ministries are directly related to the conservation of marine mammals: Protected Areas and Biodiversity, Environmental Management, and Coastal and Marine Resources. This institution works in Estero Hondo through the Provincial Direction of Environment of Puerto Plata and the Administrator of the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte.

Ministry of Tourism

The Ministry of Tourism of the Dominican Republic was created by Decree 56-10 in 2010, with the purpose of catalyzing the tourism sector of the Dominican Republic. Among its functions are authorizing, regulating, supervising, and controlling the operation of tourist services provided by travel agencies, tour guides, hotels and restaurants, bars, and other companies that provide services to tourists (MITUR, 2017).

National Museum of Natural History (Contact: professor Eugenio de Jesús Marcano)

This institution is oriented to the study and conservation of the biodiversity of The Hispaniola and the Caribbean region, as well as education and environmental disclosure, and opened its doors in 1982. It is an autonomous institution attached to the Ministry of Environment and Natural Resources through General Environmental Law 64-00. Its objective is to maintain scientific collections representative of the natural heritage of the Dominican Republic, to carry out research that contributes to the conservation of the biodiversity of the Hispaniola and the insular Caribbean, and to educate the local community about the natural world. The museum has a giant marine mammals exhibit room that includes the skeleton of a sei whale (*Balaenoptera borealis*) stranded on the coast of Buen Hombre, Montecristi, in 1974; a humpback whale (*M. navaeangliae*) skeleton; and the upper jaw of a sperm whale (*P. macrocephalus*). At present, a manatee skeleton is being prepared for exhibition (MNHN, 2017).

Dominican Fisheries and Aquaculture Council (CODOPESCA)

CODOPESCA is responsible for regulating, developing, promoting, and monitoring research on fishery and aquaculture and/or extraction of the biotic resources of the Dominican Republic. The agency establishes policies, strategies, norms, regulations, and other instruments related to the use of fishery resources, in a way that leads to sustainable and responsible development. It has regional stations in Miches, Hato Mayor, and Samaná. It is responsible for granting fishing/aquaculture and marketing licenses and non-objection certificates for the import and export of fishery products (CODOPESCA, 2017).

Marine Biology Research Center (CIBIMA)

CIBIMA is a university institute of scientific research founded in 1962, dedicated mainly to the study and knowledge of the biodiversity of coastal, marine, and aquatic ecosystems of the Dominican Republic. CIBIMA has supported research on taxonomy, fisheries, aquaculture, quality control of fishery products, marine pollution, animal physiology, and the use of marine species as pharmaceutical resources. In addition to research, it also provides postgraduate programs and technical workshops. Its staff is composed of research professors, research assistants, and administrative staff (UASD, 2017). It has developed research projects on the population of manatees in Caño Estero Hondo with the support of the Ministry of Higher Education, Science and Technology, and the Brugal Foundation.

National Aquarium

The National Aquarium of the Dominican Republic, created in 1990, aims to be an educational, scientific, cultural, and recreational institution whose mission is to protect and conserve the coastal, marine, and freshwater biodiversity of the country by promoting educational activities and permanent and temporary exhibitions. The main functions of the National Aquarium of the Dominican Republic are conservation, research, education, aquariology, and veterinary medicine. The Center of Rescue and Rehabilitation of Aquatic Species within the National Aquarium provides the rehabilitation of manatees (National Aquarium, 2017).

National Maritime Affairs Authority (ANAMAR)

Law 66-07, declaring the Dominican Republic as an Archipelagic State, created ANAMAR, whose main function is to ensure the research, conservation, and use of living and non-living resources from the sea, from the bottom of the sea, and from the subsoil of the sea floor. The institution is in charge of representing the Dominican State internally and externally in relation to the sea, uses, and rights (ANAMAR, 2017).

Dominican Navy

This institution's mission is to defend and protect the maritime interests of the Dominican State, through the effective use of naval power and the exercise of maritime authority, in order to safeguard the independence and sovereignty of the nation and the integrity of geographical spaces, constitution, and the institutions of the Republic. It is based on the Law of Police of Ports and Coasts (3003-51) and its amendments and is an integral part of the Memorandum of Understanding (Dominican Navy, 2017).

5.4.2. Non-governmental organizations

Additional organizations play key roles in the development and implementation of the strategies presented at the national, regional, and local levels in the conservation of coastal marine resources of Samaná Bay (Table 7), as described below.

Municipal Unit for Community Heritage (UMPC)

UMPC-Villa Isabela emerged in 2011 as part of a project supported by the Japan International Cooperation Agency (JICA) through TURISOPP, the Ministry of Tourism, INFOTEP, and the Ministry of the Environment to create a pilot project that could promote the natural conservation of resources. This project established the Sanctuary's visitor center, paths, and viewpoints. The UMPC operates in Estero Hondo and has 15 members, including the Evangelical Church, tourism guides, representatives of the Ministries of Public Health and Education, and Estero Hondo Town Hall. They provide educational and operative talks about cleaning beaches.

Estero Hondo Marine Mammals Sanctuary Guides Association

This association emerged in 2013 within the framework of the UMPC, of which it forms part. Its creation was supported by INFOTEP, the Ministry of Environment, and TURISOPP. It was founded with nine young members but at present only three of them remain active, as well as a coordinator, Fermin Garcia. These young people were trained in tourism services and welcoming visitors, as well as in the ecology of the manatee, in order to serve as guides and/or hosts for visitors to the Sanctuary. At present, guides charge foreign visitors RD \$250, which is distributed between the entrance fee to the protected area charged by the Ministry of the Environment (RD \$100), commissions of the hosts (RD \$90), UMPC (RD \$25), the community (RD \$10), landowners (RD \$10), and expendable material (RD \$15).

Destination Management Committee of Punta Rucia

The Destination Management Committee of Punta Rucia was created in 2015 to provide private–public coordination for the development of Punta Rucia. Its mission is to provide the sustainable development of the community of Punta Rucia through education and conservation of the marine resources for tourism and fishing. The committee is made up of representatives of the public sector (Ministry of Environment and Natural Resources, Estero Hondo Town Hall, and Punta Rucia City Hall) and the private sector (fishermen’s cooperatives, companies that offer diving and marine excursions, services hoteliers, and restaurants).

This committee has 10 members; its current President is Silvia Tena and its Vice President is Quilvio Pérez. They have conducted community-based first aid training, dog sterilization workshops, and environmental education workshops in schools and are implementing a coral nursery project with the Punta Cana Ecological Foundation.

Environmental Management Committee of Estero Hondo

This committee, created in 2017, has about 15 members, and its president is Luis Antonio.

Association of Fishermen of Punta Rucia

This association is in the process of legal organization and integration. It has 15 members who operate in the area from Ensenada to Cayo Arena. Its current president is William Gomez.

Estero Hondo Caseteros de la Ensenada Association/La Ensenada Beach Potters Association (ACEEH)

ACEEH was created in 1969 and has been active since the end of 1990. It has 55 members, of whom 50 are active. Together with the Ministry of Environment and Natural Resources, they are remodeling the houses on the beach, based on new designs and the incorporation of three new bathrooms with corresponding septic systems. Its current president is Enrique Soliber.

Dominican Agribusiness Board (JAD)

The objective of the JAD is to support, promote, and defend national agricultural production by providing direct technical assistance, training, information, and services that contribute to technological innovation among agricultural producers. Its mission is to improve their competitiveness in national and international markets. At present it is implementing a reforestation project in Estero Hondo (JAD, 2017).

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ANNEX 1. Summary of the Action Plan

Strategy	Activity/Actions	Term*	Responsible Parties
<p>Increase education and awareness.</p> <p>Users of the land, coastal, and marine areas of the Sanctuaries and local communities show a change in behavior in favor of the conservation and protection of manatees and marine mammals in general.</p>	<ol style="list-style-type: none"> 1. Design and implement an Education Program to encourage a more responsible and protective attitude toward manatees and marine mammals in general, among all users of the terrestrial, coastal, and marine areas of the study location and nearby populations, emphasizing the need for conservation. 2. Promote communication and dissemination campaigns through local and regional media, such as the local and regional press, radio, and television, covering municipal districts Estero Hondo and Villa Isabella. Campaigns should cover regional biodiversity, environmental values, and services, with a particular focus on knowledge and protection of marine mammals and their habitats. 3. Train tourist guides to guide visitors at the Marine Mammal Sanctuary of Estero Hondo and engage more local youth in this activity, with the endorsement of the corresponding authorities, such as the Ministries of Environment and Tourism. 4. Encourage educational and awareness-raising activities among local youth groups, teachers, and students in primary and high schools on issues of coastal and marine ecosystems in the region, the associated biota (with emphasis on marine mammals), and their values and environmental services. These activities may include environmental talks, meetings, and film screenings; clean-ups of watercourses, beaches, and coastal and marine areas; recycling campaigns, and more. 5. Develop ecotourism materials (brochures, posters) aimed at tourists in general and in several languages, for distribution in the dining rooms of the ACEEH, in restaurants and hotels, and in the Sanctuary's visitor center. The materials should present ecological and conservation information on manatees and marine mammals in general within the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte. 6. Create and impart training for personnel who guard and monitor the Marine Mammal Sanctuaries. 7. Identify courses of technical improvement focused on manatees for the Administrator of both Sanctuaries, taking advantage of his training as a veterinarian. The courses could form the basis for a primary care center for the manatees in the area and could be offered to other professionals who live in Estero Hondo. 8. Provide navigation courses, using nautical charts and GPS, to captains and crews of boats operating in the Sanctuaries, emphasizing the precautions to be taken in areas where marine mammals have been sighted. 	<p>C</p>	<p>Ministry of Environment, Ministry of Tourism, CIBIMA, CODOPESCA, ANAMAR, National Aquarium, local and national NGOs</p>

<p>Conduct research.</p> <p>Research projects on the biology, ecology, and population dynamics of manatees and other marine mammals, both locally and regionally, provide a basis for their conservation.</p>	<ol style="list-style-type: none"> 1. Carry out new scientific research projects, with non-invasive techniques, to monitor the population of manatees in the Caño Estero Hondo and its surroundings, building on previous studies, to serve as a basis for the protection and conservation of this species. 2. Develop and implement a program of veterinary recognition and/or monitoring of manatees that use the area as habitat. 3. Carry out population studies of marine mammals in the region, recording indicators of abundance and density, use of habitats, and impacts, through aerial censuses as well as surveys from boats. 4. Involve local fishermen in collecting information during opportunistic sightings of marine mammals in the region, documenting them with coordinates and photos or videos, to serve as a base of information on distribution and habitat use of the species. 5. Promote the exchange of knowledge among specialists in marine mammals, through regional courses and/or participation in international scientific forums, to integrate conservation strategies for marine mammals, particularly in the Caribbean region. 	M	<p>Ministry of the Environment, CIBIMA, ANAMAR, National Aquarium, national NGOs</p>
<p>Ensure conservation and protection.</p> <p>Negative anthropogenic impacts on marine mammal populations caused by land, coastal, and marine users of the SMMEH and SMN are eliminated and/or minimized.</p>	<ol style="list-style-type: none"> 1. Promote technical, economic, and logistic support to the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte by the Ministry of the Environment, as part of a sustainable ecotourism program. <ul style="list-style-type: none"> • Increase staff in the area (park rangers and supervisors) to control and monitor these Sanctuaries. • Remodel and/or recondition the viewing area, visitor center, entrance poster for the Sanctuary, and all signposts on the trails. • Acquire a small boat with oars (preferably without a propeller), a van, and two new motorcycles to facilitate the work of protection and surveillance. • Mark the entrance to the Sanctuaries to make it more obvious to visitors. • Post educational information on solid waste management in the sandy beach area of the protected area coastal zone, and place litter bins to collect trash, to reduce solid waste on the coast. • Give the Administrator of protected areas equipment for monitoring and tracking manatees and other marine mammals in Caño Estero Hondo and the associated coastal zone: GPS, binoculars, and camera with 300-mm lens. • Train the Administrator of protected areas and associated personnel in techniques to locate and identify marine mammals. Have them collect habitat and environmental data during Sanctuary monitoring and add them to a database of sightings of marine mammal species, to provide feedback on the research strategy of this plan. • Promote increased vigilance in Sanctuaries to discourage the use of fishing gear in these areas, especially legally prohibited types of gear. 	C	<p>Ministry of the Environment, CIBIMA, ANAMAR, National Aquarium, national NGOs</p>

	<ul style="list-style-type: none"> • Have the Provincial Director inspect private businesses, such as the car wash and pig farms, that are contaminating water in the municipal districts of Estero Hondo and Villa Isabella. • Monitor water quality of the watercourses that reach Caño Estero Hondo, such as La Jaiba, Solimán, and Encantamiento Rivers and Caño Miguel, as well as at defined stations within the marine and coastal zone. Such monitoring should be coordinated with the Environmental Quality Directorate of the Vice Ministry of Environmental Management and with the Vice Ministry of Coastal and Marine Resources. • Encourage productive companies based in Estero Hondo and operating close to water courses that reach the channel, such as the Guinean production plant in Estero Hondo and the cheese factory in La Jaiba, to incorporate the Environmental Management System of the Ministry of the Environment and Natural Resources into their operations. This activity should be carried out in coordination with the Provincial Director of the Environment. • Encourage key users to follow zoning guidelines in the Marine Mammal Sanctuary of Estero Hondo (buffer zone, strict conservation, special management and public use), according to the Management Plan of this area. <p>2. Implement the Remodeling Plan of the Ministry of Environment and Natural Resources, working with the ACEEH, to provide better services to tourists, as well as to improve management of solid wastes and wastewater.</p> <p>3. Post speed limits for the tourist and fishing boats in the Sanctuaries, as well as for the excursions to Cayo Arena. Such measures shall be known to all vessels.</p> <p>4. Promote kayak excursions in the Caño Estero Hondo and its associated marine coastal zone through collaboration agreements and/or ecotourism concessions with the Ministry of Environment and Natural Resources.</p>		
<p>Establish interinstitutional and intersectoral alliances.</p> <p>Collaboration and exchange mechanisms are strengthened among all the users of the land, coastal, and marine areas of the Sanctuaries (institutions, economic sectors, and civil society) to manage the area sustainably and protect marine mammals and their habitats..</p>	<p>1. Develop a collaborative strategy with the participation of communities, key institutional actors, and the private sector to achieve effective management and fundraising for the implementation of education, research, conservation, and protection actions. Collect a fee from visitors to these protected areas to create a local fund to benefit all. Encourage local people to have greater knowledge of the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte and to feel pride in them and a sense of identity with them.</p> <p>2. Request the Ministry of the Environment to allocate a percentage of the profits obtained from entrance fees to Cayo Arena to education, research, and conservation and protection actions for marine mammals.</p> <p>3. Identify strategies for the Ministry of Tourism to finance education, research, and monitoring projects in the region.</p>	C	<p>Tour operators, maritime transport associations to Cayo Arena, hotels and restaurants from Estero Hondo to Punta Rucia, local associations, public institutions with local impact such as Ministries of Environment and Natural Resources, Tourism, and Agriculture; Dominican Navy, city councils, NGOs</p>

	4. Identify international donors interested in funding education and research projects on marine mammals and/or local resources, and submit local and/or regional project proposals.		
<p>Reinforce the legal framework.</p> <p>Compliance with regulations is improved to provide more assertive protection of marine mammals and their habitats in SMMEH and SMN.</p>	<p>1. Review and implement the Management Plan for the Marine Mammal Sanctuary of Estero Hondo, the current operational instrument approved by the Ministry of Environment and Natural Resources.</p> <p>2. Develop a legal instrument to protect the manatee. At present, it is protected only by Decrees 289-87 and 233-96 in some protected areas, as well as international treaties, such as Appendix I of CITES and Annex II of the Cartagena Convention. Adopt legislation more specifically directed to the requirements of the species, its range, and the threats and impacts it is facing.</p> <p>3. Review the legal provisions of the creation of the Marine Mammal Sanctuaries of Estero Hondo and Marino del Norte with respect to current limits and overlap of areas. Solve the pressures and threats in relation to tenure and land use in order to manage the land for conservation interests.</p>	M	Ministry of Environment and Natural Resources

* C: Short-term (less than 2 years), M: Mid-term (2 to 5 years), L: Long-term (more than 5 years).