



THE ECUADOR BLUEPRINT

A PLAN TO STRENGTHEN COASTAL
MARINE PROTECTED AREAS

WILDAID

CONSERVACIÓN
INTERNACIONAL
Ecuador



ASSESSMENT METHODOLOGY

This assessment represents the work of a multinational team. Research methods were developed and applied by WildAid in Ecuador over a 4-month time frame. Although there were variations in the availability of information and the willingness in collaboration among authorities, we are confident that sufficient information was collected for analysis. Interviews were carried out with the following actors: 16 protected Area Directors, Port Captains of 5 Provinces, the National Coastguard Director, and attorneys from the provincial offices of Manabí and Guayas. In addition, the protected area management plans provided valuable information.

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ABOUT WILDAID

WildAid's mission is to end the illegal wildlife trade in our lifetimes by reducing demand through public awareness campaigns and providing comprehensive marine protection. We have successfully developed a comprehensive marine enforcement model that strengthens the key elements of the law enforcement chain: surveillance, interdiction, prosecution, and sanction in several MPAs throughout the developing world. We work with governments in the design of control and vigilance strategies that use the power of technology to increase efficacy while lowering patrolling costs. Given weak judicial systems, we also work with partners to develop innovative fining mechanisms that ensure compliance.

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ACRONYMS

AIS	Automatic Identification System
AOP	Annual Operation Plan
CAPEX	Capital Expenses
CBD	Convention on Biological Diversity
CITES	Convention of the International Trade of Endangered Species
CMS	Convention on Migratory Species
COGUAR	Coastguard Command
EMS	Electronic Monitoring Systems
EEZ	Economic Exclusive Zone
FAN	National Environmental Fund
GAD	Decentralized Autonomous Governments
HA	Hectare
HP	Horse Power
KM	Kilometers
MAE	Ministry of Environment
MR	Marine Reserve
MPA	Marine Protected Area
MTOP	Ministry of Transportation and Public Works
NM	Nautical Miles
NGO	Non Governmental Organization
NTZ	No-take Zone
IMO	International Maritime Organization
OPEX	Operating Expenses
PANE	Natural Heritage Areas
PSF	Financial Sustainability Project
SENATEL	National Telecommunications Secretariat
SMCM	Undersecretary for Coastal Marine Management
SNAP	National Protected Area System
SOP	Standard Operating Protocols
SRP	Undersecretary for Fisheries
TULAS	Unified Body of Environmental Legislation
UAV	Unmanned Aerial Vehicle
VHF	Very High Frequency
VMS	Vessel Monitoring System

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EXECUTIVE SUMMARY

Ecuador's coastal and marine area is home to approximately 58% of the country's population. This population lives within 100 km of the coast and is highly dependent upon the coastal and marine ecosystems. Its coastal geography is composed of estuaries, mangroves, mountain systems, beaches, bluffs, islands, shallows, rocky and sandy seabeds and even semi-arid areas: all of which possess tremendous biodiversity and productivity. The convergence of ocean currents creates highly productive rocky seabeds, which are also ideal for the concentration and reproduction of migratory marine species (humpback whales, sea turtles, albatrosses, manta rays, sharks). Ecuador currently possesses 16 coastal marine protected areas (MPAs): nine of which are comprised of estuarine systems and mangrove forests; the other seven are coastal and have a marine protected fringe. Management of current and new protected areas poses a great challenge to the Ministry of the Environment (MAE), as mounting threats will require significant institutional, financial and technological resources.

In this report, we analyze the legal framework, competencies and jurisdictions of all marine enforcement agencies in order to design a cost effective national surveillance system for Ecuador's MPAs. We specifically assessed current MPA surveillance and control capacity at each MPA and designed a blueprint for strengthening enforcement at both the site and provincial level that accounts for factors such as human resources, systematic training, interagency standard operating protocols, vessels, surveillance and communication technology, and long-term costs. With respect to competencies and jurisdictions, we recommend three priority initiatives that would have immediate positive impacts in MPA enforcement:

1. The MAE must formalize interagency agreements with the Navy and Police as Park Rangers do not possess the power of arrest and there is ever growing security risks at-sea;
2. As the Maritime Police, the Navy must increase their involvement in matters of surveillance and control of MPAs;
3. The MPA Directors must begin to utilize their authority to administer sanctions locally in order to expedite the sanction process and ensure compliance.

As illustrated in Figure 01, the final enforcement system design provides strategic sensor coverage to MPAs, buffer zones and access ways. Our strategy combines high-power video cameras and a robust VHF marine and private radio network with the minimum number of personnel and patrol vessels to provide a constant presence and fast response capacity. All CAPEX and OPEX decisions were made in consideration of a highly limited budget, which is currently underwritten by numerous sources. More importantly, we have defined a blueprint of critical steps for the capacity building and professionalization of the Park Rangers, who truly are the core component of the MAE enforcement program. Please find a budget summary below, which highlights average costs to implement the system by MPA.

CAPEX

ITEMS	COST
10m Patrol Vessel	\$14,000
75HP O/B Motor	\$10,000
Surveillance System (Camera, tower, electric supply)	\$114,800
Telecommunications & Processing System	\$130,110
SUBTOTAL	\$268,910

Table No. 01: Capital Expenses.

ANNUAL OPEX

ITEMS	COST
Salaries	\$110,400
Fuel (75 HP O/B motor)	\$7,000
Maintenance	\$885
Repairs (motor and hull)	\$1,475
Surveillance System	\$3,444
VHF communications and Microwave links	\$3,903
SUBTOTAL	\$127,107

Table No. 02: Annual Operating Expenses.

Figure No. 01: Video Camera Surveillance Coverage of Key MPAs.





01

INTRODUCTION

THE ECUADOR BLUEPRINT: A PLAN TO STRENGTHEN COASTAL MARINE PROTECTED AREAS

The conservation of natural areas in Ecuador began in 1934 when the government promulgated an executive order to protect certain species and to control the entry of vessels to the Galapagos Islands (which officially became a national park in 1959). The management of protected areas really only began in 1976 with the elaboration of the Preliminary Strategy for the Conservation of Distinct Wildlife Areas. This strategy took a commercial approach towards forest resources and provided the foundation for the Law of Forestry and Conservation of Natural and Wildlife Areas (1981). In 1998, Ecuador's new political constitution led to the creation of the National System of Protected Natural Areas (SNAP). This body was to ensure the conservation of biodiversity and the maintenance of ecological services in accordance with international agreements and treaties (Art. 86, number 3). Ecuador's political constitution of 2008 made further advances by being the first country to recognize Rights of Nature in its Constitution and by acknowledging the importance of biodiversity for maintaining ecological systems in protected areas.

Ecuador's coastal and marine area is home to approximately 58% of the country's population. This population lives within 100 km of the coast and is fully dependent upon the coastal and marine ecosystems. Activities of national importance, such as fishing, aquaculture and tourism, thrive in this area and are dependent upon the health of these ecosystems. In 2004, threats tied to the exploitation of these coastal resources encouraged the Ecuadorian government to take protective measures by adding a marine component to SNAP. There are currently 16 coastal marine areas protected by the National Heritage of Natural Areas (PANE), each with a different category of management: National Park, Marine Reserve, Ecological Reserve, Wildlife Reserve, National Recreation Area and Wildlife Refuge.

By 2020, Ecuador aims to have 10% of its total marine surface area under some form of official management. In 2013, only 2,521 km² of its coastal marine area was under some form of management. Administration of

PROTECTED AREA MANAGEMENT CATEGORIES

Protected Area: A clearly defined geographic area, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with its associated ecosystem services and cultural values. (IUCN 2008)

National Park: Natural land or marine areas, with mid-sized or large surface areas (minimum of 10,000 ha.), which include one or more ecosystems or flora with high biodiversity in a natural state or with little alteration. This may also include historical-cultural resources that have become part of the natural environment. This category prohibits any form of occupation or exploitation.

Ecological Reserve: Natural land and/or marine areas, generally mid-sized (at least 10,000 ha.), which may include one or more ecosystems or flora in a natural state or with moderate alteration. They demonstrate national or regional conservational importance and any form of exploitation or occupation is prohibited.

National Recreation Area: Areas covering a small surface area (1,000 ha. or more) principally made up of scenic views, tourist attractions or natural recreational activities, which are easily accessible from urban centers.

Marine Reserve: Marine areas, which include the water column, sea bottom and subsoil with unmodified natural systems, that ensure long-term protection and maintenance of their biodiversity while providing a sustainable flow of natural products, services and uses to the community.

Wildlife Refuge: Land and/or marine areas usually of a small size that contain relics of original ecosystems, plant formations or natural habitats with very little alteration. The refuge ensures the presence of resident or migratory wildlife for scientific, educational and recreational purposes.

Wildlife Reserve: Natural land and/or marine areas usually of a small size with a minimum space of 1,000 ha. Communities and native groups of Ecuador rely on these areas and their highly valued species for their livelihood.

current and new protected areas poses a great challenge to the Ministry of the Environment (MAE), as mounting threats will require significant strategic, institutional, financial and technological resources.

ASSESSMENT OBJECTIVES

The main objective of this assessment is to design a comprehensive and cost effective national surveillance system for Ecuador's marine protected areas (MPAs).

The specific objectives are:

1. To assess current MPA surveillance and control efforts by identifying their weaknesses, threats and opportunities;
2. To develop a proposal to improve surveillance and control via a legal, interagency and regional perspective;
3. To design a blueprint that accounts for factors such as human resources, systematic training, interagency standard operating procedures, vessels, surveillance and communication technology, and long-term costs.

METHODOLOGY: LAW ENFORCEMENT CHAIN

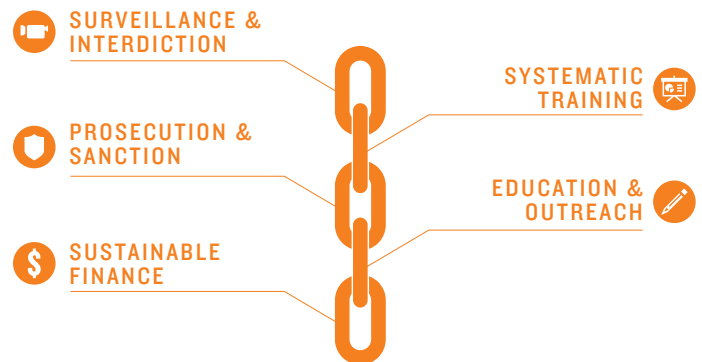
Although some of these MPAs were declared over a decade ago and considerable progress has been made in conservation, many managers identified a number of common factors that continue to limit their effectiveness:

- Illegal fishing and overexploitation of fishing resources
- Inadequately regulated tourism growth
- Contamination from waste, sewage from urban areas, industry and fuel from commercial vessels (sea transportation)
- Deterioration of habitats and changes in land use
- Introduction of invasive species

Similarly, they note challenges in enforcing the law due to the following reasons:

- Insufficient legal framework and/or little implementation
- Overlapping or interfering jurisdiction between authorities
- Lack of coordination between governmental agencies and other authorities
- Long distance between sanctioning process and violation or crime sites
- Lack of equipment and patrol assets
- Limited economic resources
- Low technical skill of staff or insufficient personnel
- Lack of political will

WildAid focuses on the law enforcement chain, which encompasses the activities of patrolling, detection of violations, detention, prosecution and the sentencing of violators by the relevant administrative or judicial body. An effective law enforcement system should dissuade potential violators from committing illegal activities as the consequences and risks of prosecution outweigh the economic interest/gain of the illegal activity. The law enforcement chain requires each link function in an effective manner, as no one link is more important than another. The chain is only as strong as its weakest link. The process also requires other forms of complementary support; such as, outreach and education, systematic training and sustainable finance.



Without a comprehensive approach, law enforcement becomes difficult or even impossible. For example, a modern fleet can patrol and intercept vessels illegally fishing in a MPA, but if there is no effective prosecution or sanction, the act will remain unpunished and there will be no future deterrence. Nor is it useful to have an effective legal system if personnel and vessels are not patrolling and intercepting poachers. We focus on the following five components:

Surveillance and Interdiction: We will examine cost effective options for improving surveillance and interdiction of violators at the MPAs. This will include analyzing the advantages of conventional methods and resources and those that entail incorporating new technology. Even when modern surveillance resources reduce operating costs, there is still a need for better-trained human resources, timely maintenance and a legal framework that considers these resources as elements of evidence.

Systematic Training: We will examine the key elements required to establish and sustain an effective law enforcement training program. The regulations, systems and assets are only as useful as those who are trained to operate and maintain them.

Prosecution & Sanction: We will examine traditional and non-traditional strategies to enforce regulations. Bottom line: Without criminal or administrative sanctions, fishers will return tomorrow.

Education and Outreach: We will explore strategies to obtain stakeholder buy-in, disseminate the benefits of conservation and ensure compliance.

Sustainable Finance: We will seek ways to reduce operating cost through the use of new technologies and/or through collaborative opportunities between agencies and MPAs.

CONTEXTUAL ANALYSIS

NATIONAL LEVEL CONSIDERATIONS

Various governmental organizations are directly responsible for the management and administration of the MPAs. In principle there should be mutual support and cooperation in surveillance activities and sanctioning processes. However, in practice there is

a lack of coordination among agencies, which undermines the rule of law. Often times, each agency acts independently and there are cases where even redundant investments take place.

AGENCY	RESPONSIBILITIES	IDEAL SITUATION	CURRENT SITUATION
Ministry of Environment of Ecuador (MAE)	<ul style="list-style-type: none"> Review and approve management plans Coordinate the work of provincial offices and protected areas Designate protected areas and regulations Planning, management, development, administration, protection and control of the national heritage of natural areas Administrative sanctions Oversee penal process Trial judge 	<ul style="list-style-type: none"> As the environmental authority, the MAE should be quick and strategic when sanctioning violations committed in protected areas Each protected area director should directly resolve environmental violations. Both fines and administrative sanctions, such as suspensions and confiscations of permits and licenses, are enforced 	<ul style="list-style-type: none"> We found that sanctions are carried out an administrative level while there is a failure to take judicial action (with some exceptions in certain MPAs while entirely absent in others) Protected area directors are not involved in the sanctioning process as it is carried out in regional offices (an unnecessary step for the type of violations). We observed significant delays The salaries of the directors and rangers are low and disproportionate Fines barely amount to US \$40.00
Undersecretary of Fishing Resources (SRP)	<ul style="list-style-type: none"> Inspection and enforcement of fishing laws related to commercial species both within and outside the MPAs Enforce fishery laws and regulations Administrative sanctions 	<ul style="list-style-type: none"> Carry out operations with the environmental authority and Navy within the purview of its responsibilities and jurisdiction Substantial control over incidental catch of sharks and other species Stricter sanctions for capturing resources during closed seasons 	<ul style="list-style-type: none"> Very little cooperation from SRP personnel in control operations Very few inspectors and resources for monitoring Very few sanctions
Navy - Harbor Master's Offices (Coast Guard)	<ul style="list-style-type: none"> Maritime Police Authority Vessel registry Authorize SOLAS and MARPOL inspections, national environmental marine regulations and fishing regulations Surveillance, monitoring and control of maritime traffic Enforcement of maritime, environmental and commerce laws at sea Authority possessing interdiction capacity and responsible for fighting crime at sea and river areas 	<ul style="list-style-type: none"> As the Navy possesses interdiction capacity, it should lead enforcement operations in the MPAs Enforce environmental, fishing and maritime laws in the MPAs 	<ul style="list-style-type: none"> It does not have the official support of the National Navy for operations in MPAs Little interagency coordination. Fails to enforce environmental laws due to little knowledge of protected area and MPA regulations
Attorney General of the State	<ul style="list-style-type: none"> Initiate and carry out criminal proceedings presented by MAE, Undersecretary of Fisheries and the Navy 	<ul style="list-style-type: none"> Personnel work together with the various institutions involved with MPA protection Prosecutors and criminal judges trained in environmental law 	<ul style="list-style-type: none"> Although there is an Attorney's office for aquatic spaces, the MAE doesn't take advantage of its services There is no prosecutor involved in the judicial trials of the MPAs Prosecutors demonstrate a lack of understanding of environmental regulations
Autonomous Decentralized Administrations (GADs)	<ul style="list-style-type: none"> Administration of ancestral areas in natural protected areas Preserve, maintain and extend natural heritage Control use of beaches 	<ul style="list-style-type: none"> GADs manage ancestral areas within natural heritage areas 	<ul style="list-style-type: none"> Limited participation of GADs in MPAs

Table No. 03: Institutional competencies within MPAs.

LEGAL FRAMEWORK ANALYSIS

In Ecuador, many environmental regulations were unified via the promulgation of the Unified Body of Environmental Legislation (TULAS). Although this covers a wide range of environmental issues, grave problems remain concerning capabilities, interagency relations, timely execution of trials, decentralization of administrative cases and lack of consensus among governing bodies. The most important and frequently cited pieces of legislation affecting MPAs are the following:

- Constitution of the Republic of Ecuador
- Treaties and agreements concerning marine protected areas and marine protected species, among which: Convention on International Trade in Endangered Species (CITES), Convention on Migratory Species (CMS) and Convention on Biological Diversity (CBD)
- Law of Forestry and Conservation of Natural & Wildlife Areas
- Penal Code
- Code of Civil Procedures
- Fisheries Act

- Regulations under the Fisheries Act
- Ministerial Agreements and Executive Orders/Decrees
- Resolutions

From the above list, four pieces of legislation fundamental to surveillance and control should be noted:

1. Rangers do not possess the power of arrest (the Navy does in cases pertaining to marine-river spaces and the Police on land). Hence, there is a necessity for inter-agency collaboration for law enforcement;
2. As the Maritime Police, the Navy has a significant (though often neglected) responsibility in matters of surveillance and control of MPAs;
3. The MAE has the authority to administer sanctions and the MPA director possesses the competency to enforce them, however, this authority has been underused.
4. With respect to CITES, the MAE is the primary institution responsible for its enforcement.

INTERAGENCY COORDINATION AND DECENTRALIZATION

In Ecuador the law enforcement chain requires several entities to work together on many levels and from a common and coordinated strategy. From an operational perspective, coastal marine surveillance and control efforts and the subsequent sanctioning processes require interagency standard operating procedures that put into practice the rule of law. These procedures should include factors such as:

- Investment in surveillance technology (shared between agencies)
- Training and minimum maritime skills of personnel
- Means of communication and coordination
- Decision-making hierarchy in escalating situations
- Scheduled patrols and inspections
- Response to exceptional situations
- Links to other entities: Secretary of Risk Management, Medical Services and Attorney's Office

Interagency relations that need to be established are listed in order of priority:

- MAE – Navy
- MAE – Police
- MAE – Fisheries Authority
- MAE – Attorney General
- MAE – Local Governments

Our research revealed that these types of interagency agreements do not exist (neither on paper nor in practice). In addition to concrete interagency collaboration, marine and land enforcement efforts require control centers to manage and direct efforts. All Ecuadorian MPAs, with exception of the Galapagos Marine Reserve, lack this type of control center management model. The Navy operates control centers, however, it does not focus on MPA enforcement. In May 2014, the MAE and the Ministry of Defense (MIDENA) signed an agreement (directive SUF-001-2011) to combine efforts to conserve Ecuador's biodiversity through effective and strategic collaboration between the two state agencies. This is an important step, however, this agreement still needs to be put into practice. Based on our analysis, we believe that significant advances would be made if priority were given to increasing the Navy's involvement—over any other agency concerned—in the maritime control of the MPAs. Moreover, naval personnel should be assigned control tasks as is done in the Galapagos Marine Reserve.

PROSECUTION AND SANCTIONS

In cooperation with legal counsel, we studied the performance of the provincial offices' judicial departments in Santa Elena, Manabí and Guayas. Esmeraldas and El Oro provinces were not included due to lack of time. We normally aim to identify general trends, the amount of time from citation to case resolution, potential bottlenecks among other factors that can affect the performance of the legal system. In summary, the sanctioning process for

environmental violations in Ecuador is excessively slow. The delays and lost trials caused by systemic inefficiency is discouraging and represents an economic loss for the state, not only in wasted patrol resources, but also in loss of natural capital. In the following sections, we will examine judicial and administrative processes.

Judicial Processes: MPAs are beset by environmental violations as well as more serious maritime crimes. Environmental violations are the result of limited knowledge of the laws, intentional violations and are subject to repeat violations. It is very common for a repeat offender to belong to or have ties to more serious crimes or organized criminal groups (contraband, fuel trafficking, drug trafficking, human trafficking, etc.). Our investigation revealed that the number of tried cases is very low given the number of crimes that take place within MPAs, while the lengths of trials are extremely long.

MPAS / MAE REGIONAL ADMINISTRATIONS	NO. OF ADMINISTRATIVE TRIALS	DURATION OF PROCEEDINGS	JUDICIAL TRIALS
MAE Regional Administration-Portoviejo	11 annually	Between 2 or 3 months	None
Churute Mangrove/ MAE-Guayas Regional Administration	7 annually	Between 1 or 2 months	None

Table No. 04: Samples of Both Administrative and Penal Cases at MAE Regional Offices.

Many of the violations within MPAs are environmental crimes. Unfortunately, in the regions where we requested information (Manabí and Guayas), *there was no record for 2013* of legal actions taken or presented at criminal courts or at the attorney’s office. The absence of judicial proceedings does not mean there were no violations. In many cases rangers found violators hunting, capturing, collecting, removing or selling legally protected flora and fauna or using prohibited fishing equipment. This is sufficient reason to be tried in court, but in practice, this fails to happen.







We believe that the current situation is a result of the following:

- MPA directors do not sanction violators as cases are sent to regional directors, thereby increasing the distance between the site of the violation and that of the sentence. This situation is not practical for administrative crimes;
- Lack of knowledge of the violator’s place of residence;
- Limited training for rangers (poorly detailed reports, lack of tests, etc.);
- Lack of political will and support for judicial proceedings. There is a conflict of political interests and weaknesses within and between agencies are exploited;
- Public entities lack consistent and complementary policies;
- Absence of naval personnel in operations.

Administrative Processes: One of the greatest weaknesses of the MPAs is the inability of the area director to sanction violators in spite of the Law of Forestry and Conservation of Natural and Wildlife Areas, which states in Art. 94: “Regional District Leaders and natural area directors will be allowed to impose administrative sanctions as stated in the law within their respective areas, in accordance with the mechanism stipulated by the law. Administrative violations committed within a specific area will be sanctioned by its respective leader.” Environmental violations continue to be sanctioned by provincial directors according to Executive Decree 3516, TULAS.

Among the sanction archives we reviewed, we only found cases resolved via administrative proceedings. This was also corroborated by the payment of fines. The value of fines is extremely low and, depending on the case, there was confiscation of fishing gear and/or suspensions of licenses. Vessels involved in violations were only detained, not impounded. The severity of measures should correspond to the seriousness of the violation, however, in reality this does not take place. According to administrative sanction guidelines, the time frame for administrative cases is outlined in table 5:

ADMINISTRATIVE PROCESS	
Initial Notification	5 days to respond
Opening of probative period	4 days
Resolution of the administrative process	48 hours

Table No. 05: Time frame Guidelines for Administrative Cases

In practice, the process takes much longer and can last between 1 to 3 months. The reasons behind this include:

- Lack of personnel in the judicial departments at both the regional offices and MPAs
- Difficulty with coordination and follow-up between the area director and the regional offices (distance and location strain their ability to work together)
- No knowledge of the violator’s place of residence
- Lack of equipment and office supplies
- Lack of approval from the highest authority
- Lack of collaboration between personnel who participated in the operation
- Poorly detailed incident reports

While limited funding is clearly an impediment to the effective rule of law, other problems derive from the lack of coordination in operations among the following institutions: MAE, Navy, Police and the SRP. This institutional fragmentation frequently strains surveillance and control work and judicial proceedings often receive conflicting reports from these entities. Finally, it is clear that current legislation and the law enforcement system do not take into account the costs of recovering natural resources.

LOCATION OF THE 16 MPAS IN ECUADOR



Figure No. 02: The 16 MPAs of Ecuador

- | | | |
|--|--|--|
| 1. CAYAPAS-MATAJE ECOLOGICAL RESERVE | 8. EL PELADO MARINE RESERVE | 15. SANTA CLARA ISLAND WILDLIFE REFUGE |
| 2. RIO ESMERALDAS ESTUARY MANGROVE WILDLIFE REFUGE | 9. SANTA ELENA POINT COASTAL MARINE WILDLIFE RESERVE | 16. ARENILLA ECOLOGICAL RESERVE |
| 3. GALERA SAN FRANCISCO MARINE RESERVE | 10. VILLAMI BEACHES NATIONAL RECREATIONAL AREA | |
| 4. RIO MUISNE ESTUARY MANGROVE WILDLIFE REFUGE | 11. EL MORRO MANGROVE WILDLIFE REFUGE | |
| 5. CORAZON AND FRAGATA ISLAND WILDLIFE REFUGE | 12. CHURUTE MANGROVE ECOLOGICAL RESERVE | |
| 6. PACOCHE COASTAL MARINE WILDLIFE REFUGE | 13. EL SALADO MANGROVE WILDLIFE RESERVE | |
| 7. MACHALILLA NATIONAL PARK | 14. SANTAY ISLAND NATIONAL RECREATIONAL AREA | |

MPAS: COMMON PROBLEMS

Ecuador's 16 coastal MPAs share many similarities: they are rich in biodiversity and are highly productive. Likewise, they face similar threats. Nine of the MPAs comprise estuarine systems and mangrove forests. The other seven MPAs are coastal and have a marine protected fringe.

Below please find a summary of the most common problems encountered in MPAs with estuarine systems.

MPAS WITH ESTUARINE SYSTEMS	COMMON PROBLEMS/THREATS
<ol style="list-style-type: none"> 1. Cayapas-Mataje Ecological Reserve 2. Rio Esmeraldas Estuary Mangrove Wildlife Refuge 3. Rio Muisne Estuary Wildlife Refuge 4. Corazon and Fragata Wildlife Refuge 5. El Morro Mangrove Wildlife Refuge 6. El Salado Mangrove Wildlife Reserve 7. Churute Mangrove Ecological Reserve 8. Santay Island National Recreation Area 9. Arenilla Ecological Reserve 	<ul style="list-style-type: none"> • Cutting of mangroves for shrimp industry, urban centers and urban sprawl • Pollution in the estuary from solid wastes and sewage from urban centers, shrimp industry and fuel from shipping activities • Pollution from chemical waste and contaminants used by agroindustry and shrimp industry • Fisheries ran with poor practices (neglect of laws and measures, use of destructive equipment) • Unregulated tourism • Poor interagency cooperation between authorities responsible for surveillance and control • Conflict between the users of the fishing areas and shrimp companies as the latter refuse entry to the fishers

Table No. 06: Common Problems and Threats to Coastal MPAs with Estuarine Systems.

Similarly, we can group threats to MPAs possessing coastal marine ecosystems. In particular, these areas are impacted by an increase in tourism activities, which affect natural habitats, interfere with the natural migration of species and lead to degradation of beaches. In addition, tourism spurs urban and real estate development near visitor sites.

COASTAL MARINE MPAS	COMMON PROBLEMS/THREATS
<ol style="list-style-type: none"> 1. Pacoche Coastal Marine Wildlife Refuge 2. Santa Clara Island Wildlife Refuge 3. Galera-San Francisco Marine Reserve 4. El Pelado Marine Reserve 5. Santa Elena Point Coastal Marine Wildlife Reserve 6. Machalilla National Park 7. Villami Beaches National Recreational Area 	<ul style="list-style-type: none"> • Overexploitation and poor fishing practices (Hurtado, 2008) • Artisanal mining (sand extraction from beaches) • Solid waste generation on beaches by tourists and local population • Pollution from plastic waste and other solids transported by rivers • Conflict between industrial and artisanal fishers over use of fishing areas • Incidental capture of protected species (CITES) or migratory species (turtles, dolphins, sharks) • Unregulated tourism and disturbance of marine life • Presence of invasive species (octocoral in coral reefs) in the zones of Galera San Francisco and Isla de la Plata • Pollution from fuel waste from shipping and fishing activities • Destruction of rocky reefs and patch reefs from anchoring of vessels (fishing and tourism) and from artisanal drift nets • Destruction of coastlines due to demand in infrastructure for hotels and local population growth • Pollution from oil spills and petroleum seeps, above all at Santa Elena Point and Esmeraldas

Table No. 07: Common Problems and Threats to the Coastal and Marine Areas. Source: 2014 Annual Operating Plans



02

ESMERALDAS PROVINCE MARINE PROTECTED AREAS

LOCATION AND AREA CHARACTERISTICS

Esmeraldas province lies in the northeast of Ecuador along the Colombian border and forms part of the Panama Bay ecoregion. In its northern area is a system of estuaries and mangrove forests belonging to western Ecuador's Choco-Darien, world-renown for its biodiversity and endemic species (Borchsenius, 1997). There are four MPAs (coastal marine) in Esmeraldas: Cayapas Mataje Reserve, Rio Esmeraldas Estuary Mangrove Wildlife Refuge, Galera-San Francisco Marine Reserve and the Muisne-Cojimies Mangrove Wildlife Refuge.

The mangrove forest of the Cayapas-Mataje Ecological Reserve is one of the most prominent in the province and is considered one of the best-preserved mangrove forests in the country. Toward the south lies Galera San Francisco, the biggest Marine Reserve in continental Ecuador that possesses a highly productive rocky seabed (Luna, S. Y F. Campos; 2008). The protected areas of Rio Esmeraldas and Muisne-Cojimies are small remnant patches of mangrove zones that were created to curb the advances of the shrimp industry.

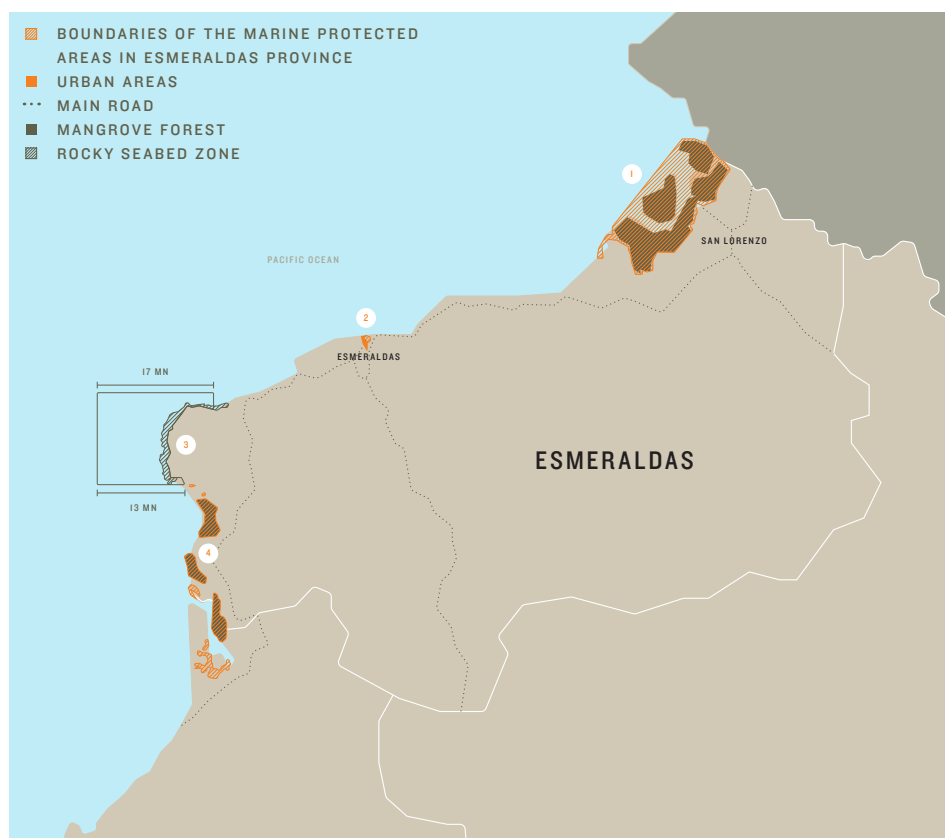


Figure No. 03: MPAs of the Esmeraldas Province.

1. Cayapas Mataje Mangrove Ecological Reserve (REMACAM)
2. Rio Esmeraldas Estuary Mangrove Wildlife Refuge
3. Galera-San Francisco Marine Reserve (RMGSF)
4. Muisne-Cojimies Mangrove Wildlife Refuge

Due to their productivity, these four protected areas have provided a flow of goods and services for surrounding populations over many years. The Esmeraldas province, however, still possesses the highest levels of poverty among all the coastal marine areas of Ecuador. (Hurtado – MAE, 2010). This places considerable strain on existing natural resources and poses considerable challenges for their management and conservation.

MPA	SURFACE AREA IN HA		NATURAL CAPITAL	PRINCIPAL ECONOMIC ACTIVITIES	PRINCIPAL THREATS TO NATURAL CAPITAL
	LAND AREA (%)	COASTAL-MARINE AREA (%)			
Cayapas-Mataje Mangrove Ecological Reserve (REMACAM)	68,400 Ha.		<ul style="list-style-type: none"> • Estuary System • Mangrove Forest • Timber-yielding species of the forest (breadnut, jigua, Puerto Rico holly, among others) • Humid tropical forest • Wild game (deer, saino, lowland paca, Central American agouti, among others) 	<ul style="list-style-type: none"> • Artisanal fishing: Harvesting anadara tuberculosa and blue crab • Tourism 	<ul style="list-style-type: none"> • Cutting of mangroves to clear land for urban centers and agriculture • Pollution of the estuary from solid waste and sewage from urban centers, palm tree cultivation, shrimp industry and vessels • Cutting and poaching forest resources • Illegal fisheries and poor fishing practices • Unregulated tourism • Contraband and drug trafficking • Motor theft
	25%	75%			
Rio Esmeraldas Estuary Mangrove Wildlife Refuge	242,5 Ha		<ul style="list-style-type: none"> • Estuarine System • Mangrove Forest 	<ul style="list-style-type: none"> • Artisanal fishing: Harvesting anadara tuberculosa and catching big pelagic fish 	<ul style="list-style-type: none"> • Cutting of mangroves • Pollution of the estuary from solid waste, sewage and fuel waste from shipping activities • Illegal fisheries and poor fishing practices
	0%	100%			
Galera-San Francisco Marine Reserve (RMGSF)	54,604 Ha.		<ul style="list-style-type: none"> • Sandy and rocky seabeds (coral colonies) • Intertidal zones and islets • Invertebrate populations (sea cucumber, green lobster, octopus) • Migratory Species (humpback whale and sea turtles) 	<ul style="list-style-type: none"> • Artisanal fishing: coastal, deep sea and lobster fishing • Tourism: • Whale watching and beach tourism 	<ul style="list-style-type: none"> • Poor fishing practices • Destruction of seabeds (industrial and artisanal fishing) • Incidental capture of migratory species (ghost fishing) • Unregulated tourism, disturbance of marine life • Presence of invasive species (octocoral in coral reefs) • Pollution from solid waste and fuel waste from shipping and fishing activities • Presence of industrial fishing • Solid waste at the beaches • Crime and motor theft
	0%	100%			
Muisne-Cojimies Mangrove Wildlife Refuge	3,173 Ha.		<ul style="list-style-type: none"> • Estuarine System • Mangrove Forest • Bio-aquatic species 	<ul style="list-style-type: none"> • Artisanal fishing: Harvesting anadara tuberculosa and blue crab • Aquaculture: Shrimp farming 	<ul style="list-style-type: none"> • Pollution of the estuary (solid waste and sewage) from local population, chemicals from palm trees cultivation • Shrimp industry operated under poor aquatic practices • Overexploitation of aquatic resources carried out with poor fishing practices (neglect of laws, measures, equipment) • Contraband and drug trafficking
	0%	100%			

Table No. 08: Principal Threats to Natural Capital in the Coastal Marine Areas of Esmeraldas Province.

KEY STAKEHOLDERS IN THE MANAGEMENT AND ADMINISTRATION OF THE PROTECTED AREAS

Esmeraldas is characterized by its large Afro-Ecuadorian population (71.5%) and its numerous social organizations; such as communes, federations, associations and cooperatives, which are directly involved with MPA governance.

ACTORS	TYPE OF ACTOR	PRESENCE AT MPA	LEVEL OF INFLUENCE, DECISION-MAKING POWER AND STANCE REGARDING MPA MANAGEMENT
Associations and Cooperatives of artisanal fishers: shell and lobster fishers, among others (6,000 artisanal fishers)	• Social Organization	• REMACAM, Rio Esmeraldas Estuary Mangrove Wildlife Refuge, RMGSF, Rio Muisne Estuary Wildlife Refuge	• High level of influence concerning the control of resources and attitude toward MPAs is indifferent. At times cooperative and others, antagonistic
Mangrove license holders (13 Associations) Federations of Mangrove Collectors (3 Federations that unite 20 second level organizations)	• Social Organization	• REMACAM	• Little decision making power, in favor of MPAs, but suffer from poor organization
Industrial fishing fleet (541 vessels in Ecuador)	• Private	• REMACAM, RMGSF	• Moderate level of influence and against the management of MPAs
Traders in conch, lobster and other fishing resources (100 traders)	• Private	• REMACAM, RMGSF, Muisne Refuge	• Little decision making power, but promote the harvesting of resources. No clear position for or against MPAs
Shrimp Industry: (110 shrimp companies in the whole province with 3,805 ha. of mangroves and palm tree farms)	• Private	• REMACAM, Muisne Refuge	• Level of influence is moderate and attitude is generally one of indifference toward the MPAs or at times antagonistic
Local Governments: (San Lorenzo, Eloy Alfaro, Esmeraldas and Muisne). Each administration has its own Environmental Business Department	• Public	• All	• Indifferent. However, many of the MPAs' problems arise from poor management at this level (pollution, urban strain, etc.)
Management Committee	• Social Organization	• REMACAM and RMGSF	• Level of influence is moderate and decision-making power is strong. Position is cooperative with the management of MPAs, but at times can be indifferent
Navy: (Two Port Captain offices: San Lorenzo and Esmeraldas; 5 navy sailors at the MPAs). Posts at La Tola, Las Penas, San Francisco, Muisne.	• Public	• REMACAM, Rio Esmeraldas RVS, RMGSF, Muisne Refuge	• High level of influence. Hold high-level partner agreements with MAE, but need to improve operational capacity. Support is irregular
Police	• Public	• REMACAM, Rio Esmeraldas RVS, RMGSF, Muisne Refuge	• High level of influence. Hold high-level partner agreements with MAE, but need to improve their operational capacity. Support is irregular
Deputy Secretary of Fishing Resources: (13 inspectors)	• Public	• REMACAM, Rio Esmeraldas RVS, RMGSF, Muisne Refuge	• Level of influence is low. Even when capable of playing an important role its involvement has been weak. Its fishery enforcement action plans require better coordination with the MAE

Table No. 09: Local Actors Involved in the Management of MPAs located in the Esmeraldas province.

SURVEILLANCE AND DETECTION

PERSONNEL

The Department of Natural Heritage within the provincial office in Esmeraldas possesses 18 officers to manage the four MPAs. This is clearly an insufficient number to cover the four areas. We should also add that personnel are not properly trained for the work they

need to accomplish. For example, few rangers have received a higher education degree or specialized training as marine rangers. The following table shows the distribution of human resources and respective levels of education.

MPA	PERSONNEL	LEVEL OF EDUCATION
Cayapas Mataje Mangrove Ecological Reserve (REMACAM)	1 Director 1 technician 6 rangers	2 biologists 6 with high school diploma
Rio Esmeraldas Estuary Mangroves Wildlife Refuge	1 Director	1 biologist
Galera-San Francisco Marine Reserve (RMGSF)	1 Director 4 rangers	1 biologist 4 with high school diploma
Muisne-Cojimies Mangrove Wildlife Refuge	1 Director 3 rangers	1 biologist 3 with high school diploma

Table No. 10: Distribution of Human Resource and Respective Levels of Education for Esmeralda MPAs

SURVEILLANCE ASSETS AND EQUIPMENT

The province possesses four vessels for surveillance and control distributed in the following way:

MPA	VESSEL	OPERATIONAL CONDITION
Cayapas Mataje Mangrove Ecological Reserve (REMACAM)	1.8 meters long, 75HP 2 stroke motor + 2 40HP 2 stroke motors	Being serviced
Rio Esmeraldas Estuary Mangroves Wildlife Refuge	None	N.A.
Galera-San Francisco Marine Reserve (RMGSF)	1.8 meters long, covered, 75HP	Operational
Muisne-Cojimies Mangrove Wildlife Refuge	1.8 meters long, covered, 75HP (2 stroke). Lent by RMGSF 1 vessel in poor condition	Operational. The motor is 9 years old.

Table No. 11: Surveillance Assets and Equipment for the Esmeraldas Province.

In regard to electric supply and means of communication, the situation is the following:

MPA	HEADQUARTERS	ELECTRICAL SERVICES	INTERNET	PRIVATE VHF RADIO	MARINE VHF RADIO
Cayapas Mataje Mangrove Ecological Reserve (REMACAM)	Yes	Yes	Yes	No	Yes
Rio Esmeraldas Estuary Mangroves Wildlife Refuge	Yes (operates out of the provincial office)	Yes	Yes	No	No
Galera-San Francisco Marine Reserve (RMGSF)	Yes	Yes	No	No	Yes (poorly located base radio)
Muisne-Cojimies Mangrove Wildlife Refuge	Yes	Yes	Yes	No	No

Table No. 12: Electric Supply and Communication Means For MPAs in the Esmeraldas Province.

In the case of the Rio Esmeraldas Estuary Mangroves Wildlife Refuge, it is impractical to work from the provincial office, as it is located in Tonsupa, 27 kilometers away from the MPA.

BUDGET FOR MPAS

2014 MPA BUDGETS				
ACTIVITY	RMGSF	CAYAPAS MATAJE	MUISNE-COJIMIES	RIO ESMERALDAS
Surveillance and Control	\$18,479.00	\$14,143.00	\$5,891.04	\$1,000.00
Communication, Education and Environmental Outreach	\$5,812.16	\$9,295.95	\$1,830.00	\$0.00
Inspection and Monitoring	\$1,175.00	\$0.00	\$0.00	\$0.00
Management of Biodiversity	\$106.08	\$3,356.00	\$0.00	\$0.00
Public and Tourist Services	\$7,677.00	\$0.00	\$0.00	\$0.00
Organization and Planning	\$9,691.00	\$18,400.00	\$3,780.00	\$13,010.00
TOTAL	\$42,940.24	\$45,194.95	\$11,501.04	\$14,010.00

Table No. 13: MPA Budgets for the Esmeraldas Province.

In order to better gauge management capacity of the MPAs, we prepared a summary of key budget line-items. After reviewing the 2014 Annual Operating Plans (AOPs) for each MPA, we arrived at the following conclusions:

1. Budget allocation for each MPA is insufficient for operational tasks.
2. Funding gaps are partially underwritten by the National Environmental Fund (FAN), but not all MPAs have access to this funding.
3. To improve surveillance and control efforts, permanent funding needs to be secured.

PROXIMITY TO MARITIME TRAFFIC ROUTES

Esmeraldas province has an international maritime port and a fishing port, both of which are located in the city of Esmeraldas. Additionally, there are fishing cooperatives in several coastal towns. This creates a significant flow of maritime traffic near the coastline and accounts for the constant presence of vessels near or in the MPAs. Due to its proximity to these ports, the Rio Esmeraldas Protected Area suffers the greatest impact. On the north end, REMACAM lies along a bi-national maritime traffic route as it is close to Colombia. This is a contested, high-risk route due to the presence of drug trafficking and fuel contraband. Near the south in Muisne and in the Galera-San Francisco Marine Reserve, the presence of industrial fishing within the 8 mile stretch of artisanal fishing operations gives rise to conflict between the two sectors.







ORGANIZATION AND PLANNING FOR PATROLS

In the Esmeraldas province, patrols are sporadic and are coordinated with the Navy due to the number of dangerous illegal activities in the area. Further naval cooperation is required for surveillance efforts; however, the Navy indicated that a SOP was needed to improve their participation. While management plans are important tools for the conservation of protected areas, only the Cayapas-Mataje Mangrove Ecological Reserve had a management plan (2008). The Galera-San Francisco Reserve management plan was under review and that of Muisne Wildlife Refuge was now out of date. It is important to note that no MPA possessed a surveillance and control plan and often times, operations are only carried out when the authorities are tipped off by stakeholders. Overall, patrols are limited due to a lack of planning and resources and no SOPs exist for collaboration with the Navy nor the Police.

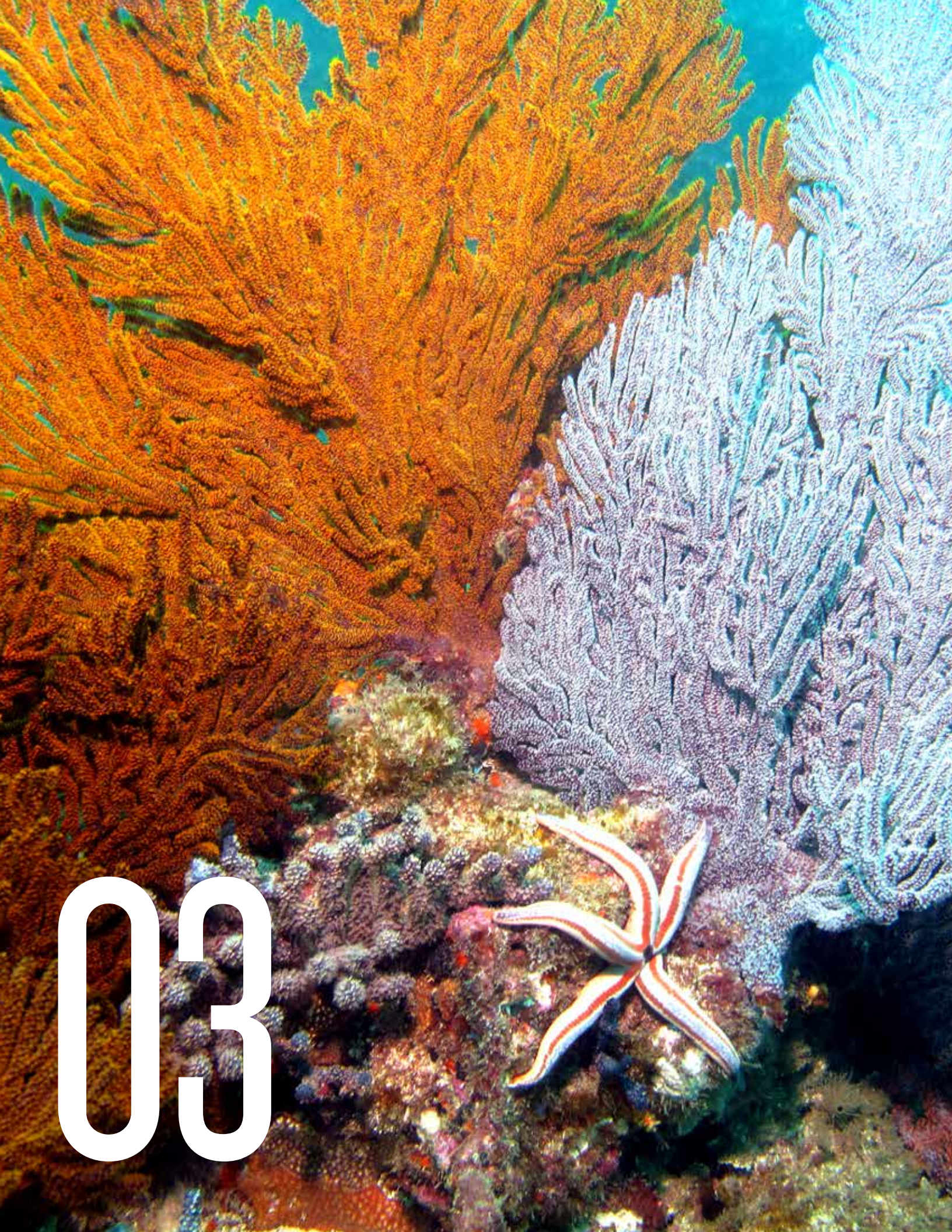
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DETECTION

All MPAs lack surveillance equipment and only RMGSF has a VHF radio network, but unfortunately its coverage is limited due to the poor location of its base radio. As such, surveillance and control operations are not carried out in real time. Cellphones are used extensively to maintain communication, however, we do not recommend the use of personal cellphones for surveillance and control operations.

The estuaries of Esmeraldas province (REMACAMP, Esmeraldas and Muiste-Cojimies) have similar ecosystems, all of which restrict the applicability of long-range sensors. High vegetation, combined with narrow and intricate waterways, create favorable conditions for hiding single motor canoes, which are widely used in these areas. In light of this situation, and after consultation with MAE officers, we recommend controlling of river mouths by sensors and inner waters/estuaries by vessel. Again, given the rate of serious criminal activity in these areas, control must be carried out in cooperation with the Navy.

At RMGSF the situation is different as the area under surveillance is open ocean with no geographic obstacles. The majority of violations are committed by small vessels (often fiberglass vessels), while the others are committed by semi-industrial or industrial vessels entering the area. Considering its size, traditional patrolling of the RMGSF would prove to be too costly especially given current funding levels. We highly recommend implementing electronic surveillance systems located at strategic positions to ensure coverage of fishing areas and maritime traffic.



03

MANABI PROVINCE MARINE PROTECTED AREAS

LOCATION AND AREA CHARACTERISTICS

Manabi province is located in eastern Ecuador, between the provinces of Esmeraldas (north) and Santa Elena (south). Manabi is influenced in the north by the Panama Bay ecoregion and in the south by the Chongon Colonche coastal mountain range. Its coastal geography is composed of estuaries, mangroves, mountain systems, beaches, bluffs, islands, shallows, rocky and sandy seabeds and even semi-arid areas: all of which possess tremendous biodiversity and productivity. There are three coastal marine protected areas: Corazon and Fragata Wildlife Refuge, Pacoche Coastal Marine Wildlife Refuge and Machalilla National Park (PNM).

Within the Corazon and Fragata Refuge, one can observe various ecosystems, which are represented by islands, an estuary, mangroves and intertidal flatlands. These ecosystems harbor impressive amounts of coastal marine birds and aquatic species. Unfortunately, during the 1970s and 1980s, these areas were negatively impacted by the shrimp industry; the effects of which continue to be felt today via sedimentation and pollution problems from solid waste. Currently, the fishing resources of the estuary area have nearly been exhausted.

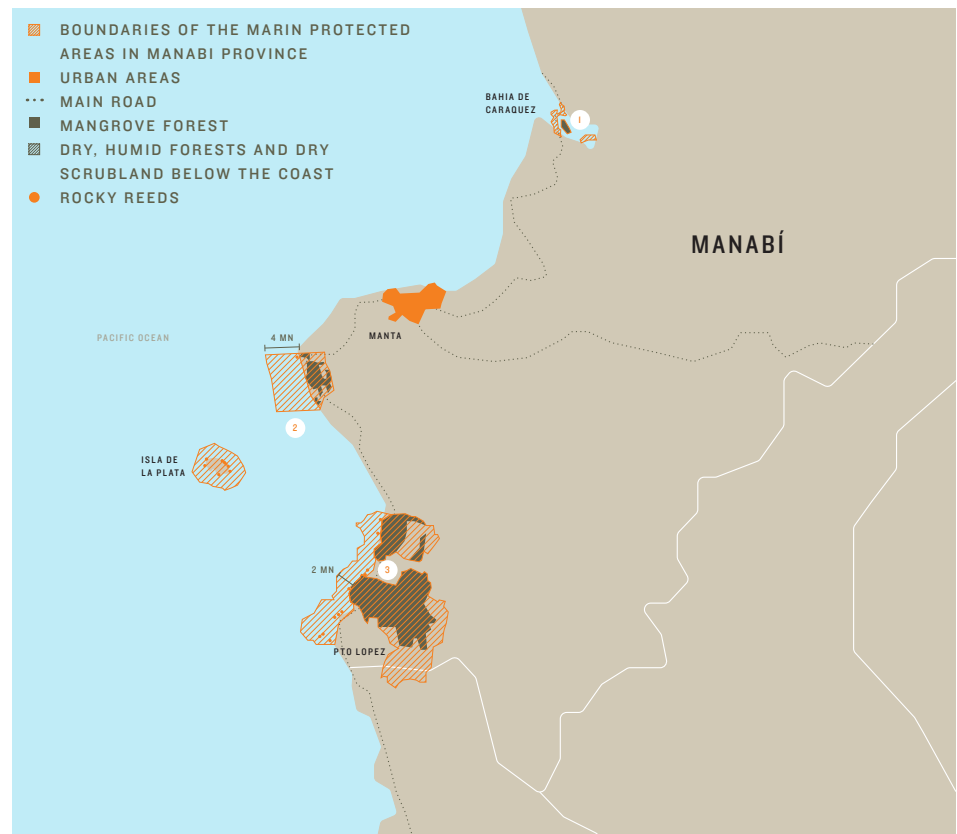


Figure No. 04: MPAs of the Manabi Province.

1. Corazon and Fragatas Wildlife Refuge
2. Pacoche Coastal Marine Wildlife Refuge
3. Machalilla National Park (PNM)

Further south in the marine areas of the Pacoche Coastal Marine Wildlife Refuge and Machalilla National Park, the convergence of ocean currents creates highly productive rocky sea beds, which are also ideal for the concentration and reproduction of migratory marine species (humpback whale, sea turtles, albatrosses, manta rays, sharks). (USAID, 2011, PNM Features).

Approximately 1,000 artisanal fishers from surrounding communities engage in extractive activities in this southern zone. In the past few years, there has been a marked decrease in the capture of iconic species, such as pink brotula, lobster, sea

cucumbers and spondylus (currently the fishing season for the spondylus is closed indefinitely). In addition, the beach at Puerto Lopez Beach has the second highest recorded level of shark and manta ray by-catch in the nation.

Tourism has increased significantly in both areas over the past two years due to the elimination of entrance fees to PANE areas. Los Frailes Beach received 40,545 tourists in 2011, and in 2012 that number rose to nearly 100,000 (source: Tourist Register, PNM). This led the MAE to increase investment in infrastructure, equipment and human resources.

MPA	SURFACE AREA IN HA		NATURAL CAPITAL	PRINCIPAL ECONOMIC ACTIVITIES	PRINCIPAL THREATS TO NATURAL CAPITAL
	LAND AREA (%)	COASTAL-MARINE AREA (%)			
Corazon and Fragata Islands Wildlife Refuge	2,811 Ha.		<ul style="list-style-type: none"> • Mangrove forest • Estuary system • Aquatic species • Frigate birds and aquatic birds • Migratory birds 	<ul style="list-style-type: none"> • Tourism • Artisanal fishing: shrimp, saw fish, sea bass, mullet and tuna • Harvesting of fish, shells and crab 	<ul style="list-style-type: none"> • Pollution of the estuary from solid waste and sewage from towns and vessel fuel • Cutting of mangroves • Unregulated tourism and disturbance to marine life • Extraction of fishing resources carried out with poor practices
	0%	100%			
Pacoche Coastal Marine Wildlife Refuge	13,545 Ha.		<ul style="list-style-type: none"> • Rocky and sandy seabeds • Sand beaches • Dry and humid forest • Migratory species (whales and sea turtles) • Aquatic species 	<ul style="list-style-type: none"> • Artisanal coastal and big-game fishing: pink brotula, mote sculpin, rock bass, shark, lobster, octopus and sea cucumber • Industrial fishing: small pelagic • Beach tourism 	<ul style="list-style-type: none"> • Capture of sea turtle species • Presence of industrial fishing • Overexploitation of aquatic and benthic resources carried out with poor practices (neglect of laws, proper equipment) • Oil pollution in marine and intertidal spaces • Illegal fishing
	37%	63%			
Machalilla National Park	56,184 Ha.		<ul style="list-style-type: none"> • Dry and cloud forest • Beaches • Seabeds • Archaeological remains • Corral colonies • Spondylus • Migratory marine species (albatross and hawksbill sea turtle) 	<ul style="list-style-type: none"> • Artisanal fishing: big pelagic fish, demersal fish, sharks, shrimp, lobster, octopus, among others • Tourism: sea life viewing, diving, beach tourism 	<ul style="list-style-type: none"> • Overexploitation of fishing resources: use of unselective equipment • Incidental capture of migratory species (sea turtles and whales) • Presence of unlicensed tourism companies in marine area • Neglect of tourism operation rules and regulations for the area • Pollution from solid waste and sewage from local population and tourists • Illegal sport fishing around the Isla de la Plata • Illegal fishing
	39%	61%			

Table No. 14: Principal Threats to Natural Capital in the Coastal Marine Areas of Manabí Province.



KEY STAKEHOLDERS IN THE MANAGEMENT AND ADMINISTRATION OF THE PROTECTED AREAS

The stakeholders involved in the three protected areas of the province are the following:

ACTORS	TYPE OF ACTOR	PRESENCE IN MPAS	LEVEL OF INFLUENCE, DECISION-MAKING POWER AND STANCE REGARDING MPA
Artisanal Fishing Associations and Cooperatives: divers, crab catchers, fishers (1,127 fishers organized in 29 organizations)	Social Organization	Corazon and Fragata Islands Wildlife Refuge, PNM	Level of influence is moderate and indifferent attitude toward the management of the area. At times they can become antagonistic, above all in the sector of Salango (PNM)
Artisanal independent fishers: compressor diving fishing, dragnet fishing, small vessel and lobster fishing (2,000 fishers working independently)	Private	Corazon and Fragata Islands Wildlife Refuge, Paoche Marine Coast and Wildlife Refuge, PNM	Level of influence is moderate. Opposed or indifferent to the management of MPAs, at times cooperative
Shrimp industry/Association of Aquaculture	Private	Corazon and Fragata Islands Wildlife Refuge	Level of influence is moderate, stance indifferent and sometimes antagonistic
Industrial fishing fleet (541 vessels in Ecuador)	Private	Paoche Marine Coast and Wildlife Refuge, PNM	Level of influence is low. Opposed to the management of MPAs
Tourism Companies (Machalilla: 11 licensed companies for Isla de la Plata and 3 diving companies)	Private	Corazon and Fragata Islands Wildlife Refuge, Paoche Marine Coast and Wildlife Refuge, PNM	Level of influence is low. In favor of the management of MPAs in the Corazon and Fragata Islands and Paoche. Indifferent toward PNM
Eco tour guides (70 guides in the MPAs)	Social Organization	PNM	Level of influence is low. Collaborative attitude toward the management of the protected area
Management Committee	Public	REMACAM, Rio Esmeraldas RVS, RMGSF, Muisne Refuge	Level of influence is high. Hold high-level partner agreements with MAE, but need to improve operational capacity. Support is irregular
Navy: (Two Port Captain's offices: Caraquez Bay and Manta and 3 Posts: San Lorenzo, Machalilla and Puerto Lopez)	Public	REMACAM, Rio Esmeraldas RVS, RMGSF, Muisne Refuge	Level of influence is high. Hold high-level partner agreements with MAE, but need to improve operational capacity. Support is irregular
Police (3 Police centers, one in each area)	Public	Corazon and Fragata Islands Wildlife Refuge, Paoche Marine Coast and Wildlife Refuge, PNM	Level of influence is low. Even when capable of playing an important role, its involvement has been weak. Its plans of actions concerning the control of species and law enforcement could benefit from better coordination with MAE
Deputy Secretary of Fishing Resources (SRP) (31 inspectors)	Public	Corazon and Fragata Islands Wildlife Refuge, Paoche Marine Coast and Wildlife Refuge, PNM	Level of influence is low. Even when capable of playing an important role, its involvement has been weak. Its plans of actions concerning the control of species and law enforcement could benefit from better coordination with MAE

Table No. 15: Local Actors Involved in the Management of MPAs Located in the Manabi Province.

SURVEILLANCE AND DETECTION

PERSONNEL

The provincial office in Manabi possesses a total of 25 officers to manage the three MPAs, however, more than 50% of them work in the PNM. There are few employees trained in MPA management. Also given limited personnel, officers are required to complete numerous job functions as assigned by the Director. The following table shows the distribution of human resources and their respective levels of education.

MPA	PERSONNEL	LEVEL OF EDUCATION
Corazon and Fragata Islands Wildlife Refuge	1 Director 5 rangers	1 biologist 1 tourism manager 1 eco-tourism manager 1 environmental engineer 1 high school diploma
Pacoche Coastal Marine Wildlife Refuge	1 Director 5 rangers	1 biologist 1 tourism manager 1 Bachelor degree 1 Bay captain license 2 high school diplomas
Machalilla National Park (PNM)	1 Director 3 technicians 9 rangers 1 administrative assistant	1 Bachelor degree 1 veterinarian 3 rangers with bay captain license

Table No. 16: Distribution of Human Resource and Respective Levels of Education for Manabi MPAs.

SURVEILLANCE ASSETS AND EQUIPMENT

Manabi province has nine vessels for patrol and surveillance distributed in the following way:

MPA	VESSEL	OPERATIONAL CONDITION
Corazon and Fragata Islands Wildlife Refuge	01 of 6.5 meters and 1 75HP motor 01 of 2 meters and 1 15HP motor 02 canoes with paddles	Operational Operational Operational
Pacoche Coastal Marine Wildlife Refuge	01 of 7.5 meters and 1 75HP motor	Operational
Machalilla National Park (PNM)	01 of 9 meters with 2 150HP motors 01 of 7.5 meters with 1 75HP motor 02 of 7.5 meters with 1 75HP c/u motor	Operational Operational Being serviced

Table No. 17: Surveillance Assets and Equipment for the Manabi Province.

The radio communication system is limited at Corazon and Fragata and Pacoche, but PNM possesses a radio-communication system with very good coverage that extends beyond its own area and can function at Corazon RVS in the north and all the way to Santa Elena RVS in the south. Cellphone coverage is rather extensive in the three protected areas. With respect to electrical services and communication equipment, the situation is as follows:

MPA	HEADQUARTERS	ELECTRICAL SERVICES	INTERNET	PRIVATE VHF RADIO	MARINE VHF RADIO
Corazon and Fragata Islands Wildlife Refuge	Yes	Yes	Yes (limited)	No	No
Pacoche Coastal Marine Wildlife Refuge	Yes (they are moving to San Lorenzo)	Yes	No	No	No (Only the vessel)
Machalilla National Park (PNM)	Yes	Yes	Yes	Yes	Yes

Table No. 18: Electric Supply and Communication Equipment For MPAs in the Manabi Province.



BUDGET FOR MPAS

2014 MPA BUDGETS			
ACTIVITY	CORAZON AND FRAGATA ISLANDS	PACOCHE	MACHALILLA
Surveillance and Control	\$67,799.68	\$24,000.00	\$143,640.46
Communication, Education and Environmental Outreach	\$9,400.30	\$5,000.00	\$29,180.00
Inspection and Monitoring	\$6,427.65	\$5,000.00	\$22,403.20
Management of Biodiversity	\$0.00	\$0.00	\$76,049.22
Public and Tourist Services	\$71,165.00	\$5,000.00	\$36,955.00
Organization and Planning	\$18,526.20	\$98,904.00	\$532,326.00
TOTAL	\$173,318.83	\$137,904.00	\$840,553.88

Table No. 19: MPA Budgets for the Manabí Province.

In order to better gauge management capacity of the MPAs, we prepared a summary of key budget line items. After reviewing the 2014 AOPs for each MPA, we arrived at the following conclusions:

1. Compared to Esmeraldas province, Manabí's three MPAs have much larger budgets.
2. KfW finances 68% (US\$120,000) of the Corazon and Fragata Wildlife annual budget.
3. The FAN and CI finance 49% of Pachoche's annual budget.
4. As for Machalla, the MAE covers 49% of its annual budget, and FAN, CI and PANE cover the rest. As CI and PANE financial support is not permanent, they should not cover recurring costs.
5. There is a disproportionate allocation of resources for surveillance and control activities. Their allocation should be consistent with the size and demands of MPAs.

PROXIMITY TO MARITIME TRAFFIC ROUTES

In the Manabi province there is an international maritime port in the city of Manta. In addition, there is south to north/north to south international and national traffic that runs parallel to the coastline. These routes are very close to the MPAs and much of the traffic comes from oil tankers (to and from Monteverde or La Libertad, Santa Elena). The Pacoche and Machalilla marine areas are most exposed to this risk and feel the impact of the traffic. In addition, there is traffic from tourist and fishing vessels (artisanal and industrial), which occasionally use this passage for unauthorized activities. It is vital to keep constant watch of vessel traffic.

ORGANIZATION AND PLANNING FOR PATROLS

The three MPAs have either up-to-date management plans or are updating their current plans. Moreover, the MPAs have systematized their patrol operations, with only PNM having a more sophisticated surveillance and control plan. Limited surveillance operating costs continues to be the primary obstacle in all three MPAs. With their current resources, the following operations are being undertaken:

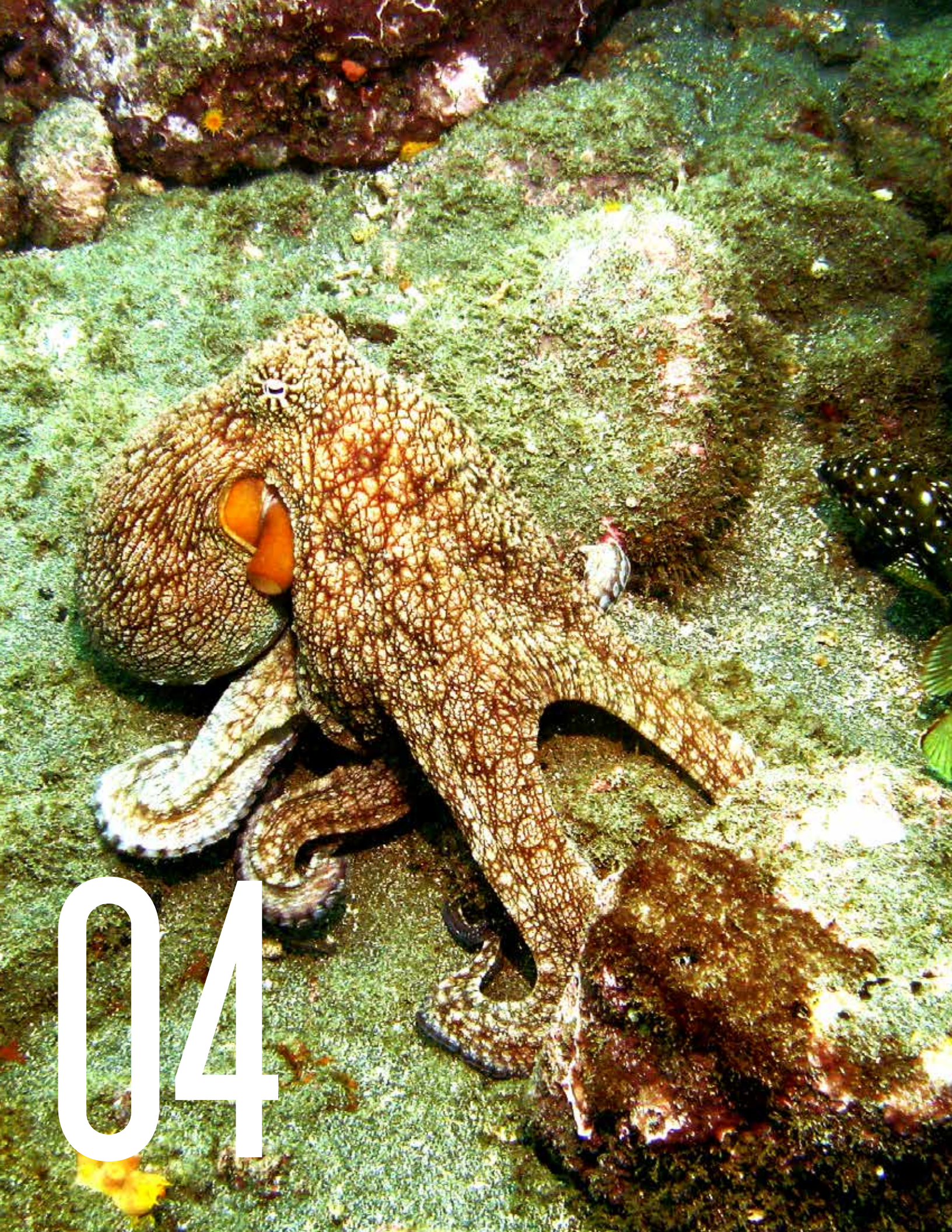
- 4 weekly patrols at the Corazon and Fragata Islands Wildlife Refuge.
- 2 or 3 weekly operations at Pacoche. No operations are undertaken without Coastguard support, which limits the frequency of this activity.
- The PNM has weekly-scheduled patrols for fishery control. Tourist control at the Isla de la Plata is daily at the diving and snorkeling sites.

DETECTION

Detection strategies at the MPAs are carried out in a variety of ways. At the Corazon-Fragata Reserve in the north, surveillance consists of periodic patrols. Although the area is relatively small and its coverage feasible, the infrequent patrols leave the area unprotected at times thereby revealing vulnerabilities. This situation is exacerbated by a lack of portable devices for surveillance and communication. For example, neither the rangers nor the vessels have radio equipment, binoculars or any other visual or electronic surveillance equipment.

At Pacoche, the situation is more complicated due to a limited budget (fuel) and its larger geographic area. Its patrol vessel is adequate for control operations, but patrols are limited in number. Rangers possess binoculars and one marine VHF radio, however, it does not function and there is no corresponding radio at headquarters.

The PNM is the best equipped among the three MPAs. This park has a small control center, a private VHF network, marine VHF radios, four vessels, remote control posts at Frailes and Isla de la Plata, two AIS stations (currently not operating) and data links from Isla de la Plata to Puerto Lopez. This is a sufficient amount of resources for surveillance operations. However, given its size, four vessels exceed the needs of this MPA, especially since there are only five marine rangers. The PNM should consider replacing at least one of its patrol vessels with a long-range surveillance video camera.



04

SANTA ELENA PROVINCE MARINE PROTECTED AREAS

LOCATION AND AREA CHARACTERISTICS

Santa Elena province lies south of Manabi province and west of Guayas. This coastal province of Ecuador is located at the border of the ecoregion of Panama Bay, which extends toward the north, and the ecoregion of Guayaquil, which extends toward the south. Santa Elena has two MPAs: Pelado Marine Reserve (RMP) and Santa Elena Point Coastal Marine Wildlife Reserve (REMACOPSE).

The MPAs of Santa Elena Point and Pelado share similar ecosystems, which facilitates a joint analysis. Likewise, they face similar administrative problems. The rocky seabeds, shallows, reefs and the Pelado islet account for the area's rich biodiversity. The high level of productivity also owes to the meeting of the dominant Humboldt current with the warm Panama current. REMACOPSE and RMP also possess a great diversity of beach ecosystems (sand, mixed, shingle) and a partially dry climate, which serve as critical habitat for various turtle species and coastal marine birds.

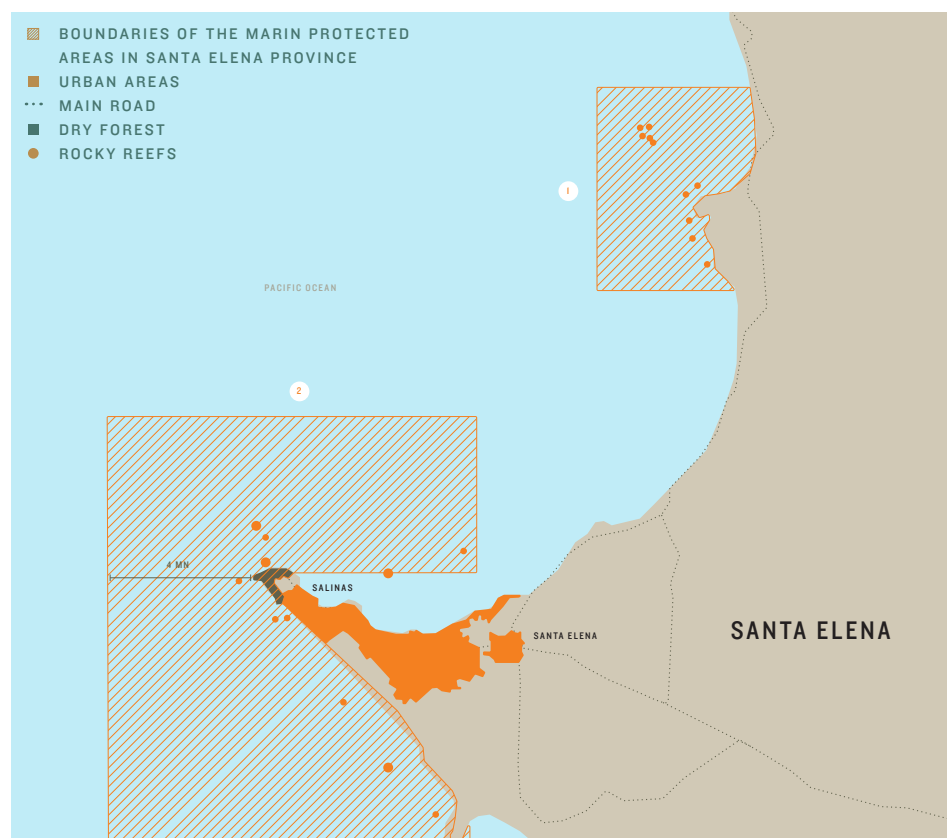


Figure No. 05: The MPAs of the Santa Elena Province.

1. El Pelado Marine Reserve
2. Santa Elena Point Coastal Marine and Wildlife Refuge (REMACOPSE)

Fishing pressure has increased in recent years (2009-2013) on account of fishing modernization incentives and growth in both artisanal and industrial fishing efforts. This growth poses challenges to MPA management and also gives rise to conflicts between artisanal and industrial fishers. Similarly, these areas possess tremendous tourist potential, which is being exploited by different operators. Activities include: recreational diving, beach tourism, whale watching, aquatic sports, coastal tours and sport fishing, among others. Tourist activities also pose particular threats to the ecosystems through pollution, destruction of habitats and the introduction of invasive species. The RMP currently has to manage approximately 50,000 tourists a year.

MPA	SURFACE AREA IN HA		NATURAL CAPITAL	PRINCIPAL ECONOMIC ACTIVITIES	PRINCIPAL THREATS TO NATURAL CAPITAL
	LAND AREA (%)	COASTAL AND MARINE AREA (%)			
El Pelado Marine Reserve	13,101 Ha.		<ul style="list-style-type: none"> Mangrove forest Rocky reefs and shallows Sand and mixed beaches Migratory species (sea turtle, humpback whale and manta rays) 	<ul style="list-style-type: none"> Tourism: recreational diving, whale watching, beach tourism Artisanal fishing: dive fishing, mechanical trawl net fishing and seine fishing Industrial fishing: seine fishing 	<ul style="list-style-type: none"> Overexploitation of fishing resources: use of unselective equipment Incidental capture of migratory species (sea turtles and manta rays) Presence of unlicensed tourism companies Neglect from tourism companies of the rules and regulations of the area
	0.74%	99.26%			
Santa Elena Point Coastal Marine Wildlife Reserve	47,447 Ha.		<ul style="list-style-type: none"> Rocky reefs Patch reefs Beaches (mixed, shingle) Dry forest Migratory species (sea turtle, humpback whale and manta rays, flamingos and sharks) 	<ul style="list-style-type: none"> Artisanal fishing Fishing equipment: dragnet, fishing line and mechanical dragnet Industrial fishing Tourism: whale watching, beach hikes, and recreational diving 	<ul style="list-style-type: none"> Overexploitation of fishing resources: use of unselective equipment Incidental capture of migratory species (sea turtles, sharks) Pollution from oil, solid domestic waste and sewage and dumping by fishing industries Altering and destroying habitats and nests of animal species along the coastline
	0.37%	99.63%			

Table No. 20: Principal Threats to Natural Capital in the Coastal Marine Areas of Santa Elena Province.

KEY STAKEHOLDERS IN THE MANAGEMENT AND ADMINISTRATION OF THE PROTECTED AREAS

The two MPAs in Santa Elena province possess strong traditional fishing and tourism sectors, which accounts for the dominant involvement of these actors in the management of the protected areas.

ACTORS	TYPE OF ACTOR	PRESENCE IN MPAS	LEVEL OF INFLUENCE, DECISION-MAKING POWER AND STANCE REGARDING MPA
Associations of artisanal and independent fishers (4,298 fishers)	Social Organization	RMP and REMACOPSE	Level of influence is moderate and cooperative attitude toward the management of MPAs
Tourism companies (REMACOPSE: 10 tourist companies and 2 tourist associations)	Private	RMP and REMACOPSE	Level of influence is moderate and in favor of MPAs
Industrial fishing fleet (541 vessels in Ecuador)	Private	RMP and REMACOPSE	Level of influence is moderate and opposed to the management of MPAs or at times indifferent
Business Committee	Social Organization	REMACOPSE	Level of influence is high and cooperative attitude toward the management of MPAs
Navy: (1 Port Captain's office at Salinas)	Public	REMACOPSE	Level of influence is high. Hold high-level partner agreements with MAE, but need to improve operational capacity. Support is irregular.
Police	Public	RMP and REMACOPSE	Level of influence is high. Hold high-level partner agreements with MAE, but need to improve operational capacity. Support is irregular.

ACTORS	TYPE OF ACTOR	PRESENCE IN MPAS	LEVEL OF INFLUENCE, DECISION-MAKING POWER AND STANCE REGARDING MPA
Deputy Secretary of Fishing Resources (16 fish inspectors for 31 fishing coves)	Public	REMACOPSE	Level of influence is low. Even when capable of playing an important role its involvement has been weak. Its plans of actions concerning the control of species and law enforcement could benefit from better coordination with MAE

Table No. 21: Local Actors Involved in the Management of MPAs Located in the Santa Elena Province.

SURVEILLANCE AND DETECTION

PERSONNEL

The MAE provincial office in Santa Elena has a total of 12 officers to manage the two MPAs. However, the RMP has only one officer to fill the positions of both Director and ranger. Although the officer receives support from the provincial office and REMACOPSE, the MAE cannot run this new MPA (created in August 2012) without more staff. The following table shows the distribution of human resources and their respective levels of education.

MPA	PERSONNEL	SPECIALIZATION
RMP	1 Director	1 biologist
REMACOPSE	1 Director 4 technicians 2 collectors 4 rangers	2 biologists

Table No. 22: Distribution of Human Resource and Respective Levels of Education for Santa Elena MPAs



SURVEILLANCE ASSETS AND EQUIPMENT

Santa Elena province possesses only one vessel for patrol and surveillance of the MPAs.

MPA	VESSEL	OPERATING CONDITION
El Pelado Marine Reserve	No vessel	NA
Santa Elena Point Coastal Marine Wildlife Reserve	01 of 8 meters and 1 100HP motor (has cabin)	Operating

Table No. 23: Surveillance Assets and Equipment for the Santa Elena Province.

With respect to electrical services and communication equipment, the situation is as follows:

MPA	CELLPHONE	HEADQUARTERS	ELECTRICAL SERVICES	INTERNET	PRIVATE VHF RADIO	MARINE VHF RADIO
RMG	Yes	No (uses the provincial office)	No (uses the provincial office)	No (uses the provincial office)	No (uses the provincial office)	No
REMACOPSE	Yes	Yes	No	No	No	Yes (on board and VHF)

Table No. 24: Electric Supply and Communication Equipment For MPAs in the Santa Elena Province.

BUDGET FOR MPAS

2014 MPA BUDGETS		
ACTIVITY	RMP	REMACOPSE
Surveillance and Control	\$0.00	\$8,232.32
Communication, Education and Environmental Outreach	\$0.00	\$11,580.00
Inspection and Monitoring	\$0.00	\$36,963.00
Management of Biodiversity	\$0.00	\$6,134.24
Public and Tourist Services	\$0.00	\$83,583.00
Organization and Planning	\$14,118.00	\$20,054.20
TOTAL	\$14,118.00	\$166,546.76

Table No. 25: MPA Budgets for the Santa Elena Province.

In order to better gauge management capacity of the MPAs, we prepared a summary of key budget line-times. After reviewing the 2014 AOPs for each MPA, we arrived at the following conclusions:

1. The RMP budget is greatly insufficient, as one officer alone cannot manage the area. Moreover, there are no funds to cover operating expenses. As a new MPA, the MAE must allocate resources in the short term in order to continue building its institutional capacity.
2. The REMACOPSE budget has serious limitations given that the MAE only covers 2% of its annual spending. FAN covers 17% of the total budget and the rest is financed by CI and the Financial Sustainability Project (PSF) for SNAP.



PROXIMITY TO MARITIME TRAFFIC ROUTES

REMACOPSE is located in the western most region of the Santa Elena Peninsula, which is also the site of the country's principal maritime traffic route. The heavy traffic is composed of large oil tankers that dock at La Libertad and commercial traffic entering Guayaquil and Puerto Bolivar. Fishing traffic consists of

artisanal and industrial vessels operating in the Gulf of Guayaquil or in the zones adjacent to the MPAs. During fishing seasons, numerous vessels enter the area, making it difficult to monitor.

ORGANIZATION AND PLANNING FOR PATROLS

REMACOPSE has a current management plan (2012), which includes a surveillance and control plan with weekly scheduled patrols for fisheries control. Moreover, the rangers carry out weekly inspections of vessels at ports. Patrol operations at sea and on land (port control) are carried out together with the Navy, however, there are still no SOPs to guide the type of work, priorities, incident detail, communication lines, assessments, etc.

The RMP management plan is currently under review by the Undersecretary for Coastal Marine Management (SMCM). The RMP does not have a scheduled patrol plan and currently lacks both human and economic resources to develop a practical surveillance system.

DETECTION

REMACOPSE is located at the base of the hills of the Santa Elena Peninsula. With a height of 80 meters and close to 360° visibility over the sea and the MPA, the hill holds great potential to serve as a strategic vigilance post. Currently, the facilities are in disrepair and are not suitable for operating a full-time surveillance and control center. However, infrastructure and personnel can be obtained through an agreement with the naval post bordering REMACOPSE. According to our inquiries with the Navy, the MAE should submit a formal request for the use of their facilities.

Given its recent inception, the RMP does not have the infrastructure nor equipment for detection and interdiction. As a priority, funds must be allocated to the RMP in order to hire and train rangers. Next, the RMP should acquire a patrol vessel and basic surveillance equipment; such as, binoculars, VHF marine radios and video cameras, GPS, safety equipment, among other equipment.



05

GUAYAS PROVINCE MARINE PROTECTED AREAS

LOCATION AND AREA CHARACTERISTICS

Guayas province is characterized by the Gulf of Guayaquil, which is considered the most complex estuary in the country and the most productive on the western coast of South America. The Gulf represents 81% of the total mangrove ecosystem in Ecuador (ca. 122,437 ha.). As such, the MAE designated it a priority conservation area by focusing on ecosystem recovery and designating it a protected area within the National Heritage of Natural Areas. There are four coastal marine areas: the El Morro Mangrove Wildlife Refuge, Churute Mangrove Ecological Reserve, El Salado Mangrove Wildlife Reserve, Santay Island National Recreation Area, and along the coast there is also the Villamil Beaches National Recreation Area.

The four MPAs have very similar ecosystems, which are dominated by mangrove forests, saltpetre beds and islands. These ecosystems harbor tremendous biodiversity and productivity, which the local population exploits as a principal source of income. During the 1970s and 1980s, the mangroves of the Gulf of Guayaquil were indiscriminately razed to make room for the country's growing shrimp industry. This destruction put direct pressure on the mangrove forests, which began to recover only after the year 2000 due to

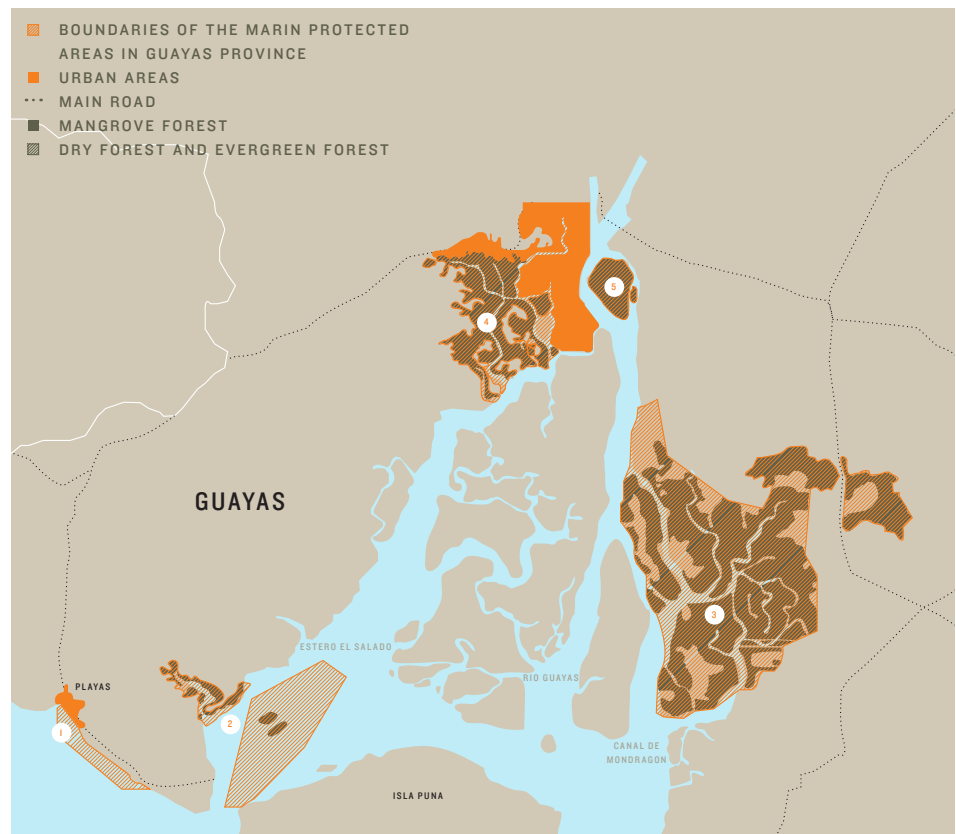


Figure No. 06: The MPAs of the Guayas Province.

- | | |
|---|---|
| 1. Villami Beaches National Recreation Area | 4. El Salado Mangrove Wildlife Reserve |
| 2. El Morro Mangrove Wildlife Refuge | 5. Santay Island National Recreation Area |
| 3. Churute Mangrove Ecological Reserve | |

government intervention. Beginning in 2007, these restrictions expanded (developing, demarcating and expanding the MPAs, regulating access, use and authorizations). Currently, the shrimp operations located within protected areas have been or are in the process of being returned to the state. Others with licensed operations are now required to meet strict environmental standards set by the MAE. Nonetheless, the process is still ongoing and authorities should persist in taking the appropriate steps.

In the mangroves of Churute, the capture and commercialization of red crabs is the principal economic activity. This crustacean has a high market value and is in high demand, which in turns causes substantial socio-economic pressure and management difficulties. At the time of this report, there were approximately 1,500 crab fishers registered from different towns, including Guayaquil. This number is significant, as it not only strains environmental resources, but also leads to conflicts between fishers, to the adoption of predatory practices and to the arrival of non-registered fishers.

In the sector of Puerto El Morro, there has been a significant increase in tourism activities such as bird and dolphin watching. As these tourist services are growing at a fast rate, environmental authorities should waste no time in regulating them.

In the areas of El Morro and El Salado, pollution is a serious problem. Industrial and urban activities are abundant along the border of these protected areas. In El Morro, we observed a vessel yard servicing 15 vessels on the day of our visit. In the El Salado sector, surrounding urban centers account for an increase of solid waste and sewage (organic and inorganic) in the estuaries. Lastly, the zones are beset by frequent criminal activity. In the sector of El Morro, contraband, fuel and drug trafficking and fish and motor theft have been reported, while in El Salado barges transporting shrimp have frequently been robbed.

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MPA	SURFACE AREA IN HA		NATURAL CAPITAL	PRINCIPAL ECONOMIC ACTIVITIES	PRINCIPAL THREATS TO NATURAL CAPITAL
	LAND AREA (%)	COASTAL-MARINE AREA (%)			
El Morro Mangrove Wildlife Refuge	10,130 Ha.		<ul style="list-style-type: none"> Mangrove forest Estuary System Rocky shallows Dolphins 	<ul style="list-style-type: none"> Aquaculture Artisanal fishing: harvesting red crab and anadara tuberculosa, shrimp fishing Industrial fishing: shrimp trawling Tourism: sea life viewing, dolphins and birds (frigate birds, pelicans, roseate spoonbill) 	<ul style="list-style-type: none"> Overexploitation of fishing resources: neglect of fishing seasons, illegal extraction of jellyfish Pollution of the estuary from solid waste and sewage from nearby towns and industries, oil, and shrimp industry activity Dredging of the Gulf canal Illegal fishing and presence of industrial fishing Incidental dolphin catching Unregulated tourism
	18%	82%			
Churute Mangrove Ecological Reserve	50,068 Ha.		<ul style="list-style-type: none"> Mangrove forest Estuary system Dry and cloud forest Canclon Lagoon Hunting game Wild game (lowland paca, Central American agouti, among others) 	<ul style="list-style-type: none"> Artisanal fishing: harvesting crabs and mollusks, shrimp fishing, general fishing (use of dragnet, tangle net, cast net) Shrimp Industry Tourism: Viewing fauna and flora 	<ul style="list-style-type: none"> Artisanal fishing with poor practices: use of illegal equipment, enlarging capture zones Cutting and illegal hunting of forest resources Presence of invasive species (tilapia) Pollution of the estuary from agrochemicals, oil, and solid waste from nearby towns Sediment bypassing for flood control
	11%	89%			
El Salado Mangrove Wildlife Reserve	10,635 Ha.		<ul style="list-style-type: none"> Mangrove forest Estuary system Dry forest Coastal crocodile Red mangrove Migratory birds (osprey) 	<ul style="list-style-type: none"> Shrimp industries Artisanal fishing: shrimp fishing, harvesting of mollusks Tourism: sport fishing, bird watching, Puerto Hondo recreation center 	<ul style="list-style-type: none"> Pollution of the estuary from solid waste, oil, sewage, industries outside the city of Guayaquil Shrimp industry waste (poor processing practices) Clearing land for urban development near the city of Guayaquil
	2.7%	97.3%			
Santay Island National Recreation Area	2,214 Ha.		<ul style="list-style-type: none"> Mangrove forest Dry forest Wetland Crocodiles 	<ul style="list-style-type: none"> Artisanal fishing (sea bass, catfish, among others) Tourism: viewing natural resources, beach hikes 	<ul style="list-style-type: none"> Dumping of solid waste and sewage from the cities of Duran, the canton citadels Samborondon and Guayaquil Fuel waste from shipping activities Massive, short term presence of tourists
	77.4%	22.6%			

Table No. 26: Principal Threats to Natural Capital in the Coastal Marine Areas of Guayas Province.

KEY STAKEHOLDERS IN THE MANAGEMENT AND ADMINISTRATION OF THE PROTECTED AREAS

The four MPAs are impacted by the following sectors: artisanal fishing, shrimp and naval industries and a growing tourism sector.

ACTORS	TYPE OF ACTORS	PRESENCE IN MPAS	LEVEL OF INFLUENCE, DECISION-MAKING POWER AND STANCE REGARDING MPA
Associations of fishers and crab industries: (5,500 artisanal fishers, of which 1,626 are organized into 21 associations. Churute is the only MPA where all the fishers are unionized)	Social Organization	El Morro Mangrove Wildlife Refuge, Churute Mangrove Ecological Reserve, El Salado Mangrove Wildlife Reserve	Level of influence is moderate and cooperative attitude toward the management of MPAs. Need to develop mechanisms to curb unregulated fishers
Communities	Social Organization	Churute Mangrove Ecological Reserve, Santay Island National Recreation Area	Level of influence is low and in favor of MPAs
Shrimp industry: (110 shrimping companies in the whole province occupying 3,805 ha of mangroves)	Private	El Morro Mangrove Wildlife Refuge, Churute Mangrove Ecological Reserve El Salado Mangrove Wildlife Reserve	Level of influence is high and indifferent or opposed to MPAs. On rare occasions some have been cooperative
Naval Industry	Private	El Morro Mangrove Wildlife Refuge	Level of influence is moderate. Opposed to MPA. High risk of pollution from chemicals, lead and oil. The industry can easily be regulated with the intervention of the city and MTOPT
Tourism Companies: (15 unlicensed companies in Guayas and Beaches)	Private	El Morro Mangrove Wildlife Refuge, El Salado Mangrove Wildlife Reserve	Level of influence is moderate and in favor of MPAs
Local environmental organization: (Dolphins Ecoclub, Puerto Hondo Ecological club)	Social Organization	El Morro Mangrove Wildlife Refuge, El Salado Mangrove Wildlife Reserve	Level of influence is moderate in El Morro and low in El Salado, with a cooperative attitude toward MPAs
Project for Sustainable Coasts and Forests (USAID)	NGO	El Morro Mangrove Wildlife Refuge, Churute Mangrove Ecological Reserve	Level of influence is low and favorable to MPAs. Its involvement in the two areas ended in June 2014
Public Park Company	Public	Santay Island National Recreation Area	Level of influence is low and in favor of the management of the protected area
Navy: (Port Captain's Office at Playas and Guayaquil). Posts at Posorja and Puna.	Public	El Morro Mangrove Wildlife Refuge, Churute Mangrove Ecological Reserve, El Salado Mangrove Wildlife Reserve	Level of influence is high. Hold high-level partner agreements with MAE, but need to improve operational capacity. Support is irregular
Police: (2 police offices for Churute mangrove)	Public	El Morro Mangrove Wildlife Refuge, Churute Mangrove Ecological Reserve, El Salado Mangrove Wildlife Reserve	Level of influence is high. Hold high-level partner agreements with MAE, but need to improve operational capacity. Support is irregular
Deputy Secretary of Fishing Resources: (12 inspectors)	Public	El Morro Mangrove Wildlife Refuge, Churute Mangrove Ecological Reserve, El Salado Mangrove Wildlife Reserve	Level of influence is low. Even when capable of playing an important role its involvement has been weak. Its plans of actions concerning the control of species and law enforcement could benefit from better coordination with MAE

Table No. 27: Local Actors Involved in the Management of MPAs Located in the Guayas Province.

SURVEILLANCE AND DETECTION

PERSONNEL

The provincial office in Guayas has 27 officers to manage the four MPAs. While Churute has a greater number of personnel, no MPA possesses specialized personnel to run the different management programs. The following table shows the distribution of human resources and their respective levels of education.

MPA	PERSONNEL	SPECIALIZATION
El Morro Mangrove Wildlife Refuge DATA protection zone	1 Director 5 rangers	1 biologist 5 with high school diploma
Churute Mangrove Ecological Reserve	1 Director 9 rangers	1 biologist 1 expert in forestry 1 tourism manager 7 with high-school diploma, 3 with IMO basic training
El Salado Mangrove Wildlife Reserve	1 Director 1 technician 4 rangers	2 biologists 4 with high-school diploma
Santay Island National Recreation Area	1 Director 5 rangers	1 biologist 5 with high school diploma

Table No. 28: Distribution of Human Resource and Respective Levels of Education for Guayas MPAs.

SURVEILLANCE ASSETS AND EQUIPMENT

Guayas Province has five vessels for patrol and surveillance distributed in the following way:

MPA	VESSEL	OPERATING CONDITION
El Morro Mangrove Wildlife Refuge DATA protection zone	01 7 meter vessel with 100HP (4 stroke) motor and cabin	Operating
Churute Mangrove Ecological Reserve	01 7.5 meter vessel with 115HP (4 stroke) motor 01 5 meter canoe with 40HP (2 stroke) motor	Operating Operating
El Salado Mangrove Wildlife Reserve	01 6 meter vessel with 48HP motor 01 4 meter vessel with 40HP motor	Operating Operating
Santay Island National Recreation Area	No vessel	NA

Table No. 29: Surveillance Assets and Equipment for the Guayas Province.

The four MPA offices possess electricity, fixed phone lines and Internet access. Only Churute has a private radio communication system (a base radio and ten portable radios) and two marine VHF radio bases. However, due to the poor location of the antenna, radio coverage does not extend over the entire reserve. The antenna should be relocated to the hill directly behind the office. Cellphone coverage is minimal throughout the four MPAs.

With respect to electrical services and communication equipment, the situation is as follows:

MPA	HEAD- QUARTERS	ELECTRIC SERVICES	INTERNET	PRIVATE VHF RADIO	MARINE VHF RADIO
El Morro Mangrove Wildlife Refuge DATA protection zone	Yes No (depends on El Morro)	Yes No	No	No	No
Churute Mangrove Ecological Reserve	Yes	Yes	Limited	Yes	Yes
El Salado Mangrove Wildlife Reserve	Yes	Yes	No	No	No
Santay Island National Recreation Area	Yes	Yes	Yes	No	No

Table No. 30: Electric Supply and Communication Equipment For MPAs in the Guayas Province.

2014 MPA BUDGETS				
ACTIVITY	SANTAY ISLAND	EL MORRO	CHURUTE	EL SALADO
Surveillance and Control	\$4,000.00	\$13,190.00	\$22,900.93	\$7,315.55
Communication, Education and Environmental Outreach	\$0.00	\$1,050.00	\$3,685.00	\$1,649.19
Inspection and Monitoring	\$0.00	\$50.00	\$4,637.00	\$42.00
Management of Biodiversity	\$0.00	\$0.00	\$0.00	\$3,957.00
Public and Tourist Services	\$0.00	\$840.00	\$68,319.16	\$0.00
Organization and Planning	\$21,120.00	\$68,940.00	\$164,288.00	\$11,950.00
TOTAL	\$25,120.00	\$84,070.00	\$263,830.09	\$24,913.74

Table No. 31: MPA Budgets for the Guayas Province.

In order to better gauge management capacity of the MPAs, we prepared a summary of key budget line-items. After reviewing the 2014 AOPs for each MPA, we arrived at the following conclusions:

1. Santay possesses sufficient funding, which is completely funded by the MAE.
2. The surveillance budget for El Morro is not sufficient for the size of the marine area.
3. The Churute budget is underwritten by more than seven funding sources, which poses administrative challenges.
4. Similar to El Morro, El Salado requires additional funding to fully cover its operational needs.



PROXIMITY TO MARITIME TRAFFIC ROUTES

The four MPAs experience heavy maritime traffic due to their location within the Gulf of Guayaquil and the region's riverine and marine productivity. El Morro Refuge lies at the mouth of the gulf, the country's most important entryway for commercial and industrial vessels as well as bulk oil tankers. The route continues toward the northeast of Rio Guayas and is bordered by Churute Mangrove

reserve. Within the gulf in the El Salado Mangrove zone, maritime traffic is heavy due to the presence of the oil terminal "Tres Bocas". All four MPAs support a high level of maritime traffic from artisanal, semi-industrial and industrial fishers living around the Gulf of Guayaquil.

ORGANIZATION AND PLANNING FOR PATROLS

46 Both Salado and Churute Reserves rangers carry out weekly surveillance patrols. During February and March, rangers perform daily patrols (day and night) to detect violators in the sector of the Salado Estuary. The rest of the year there are four patrols a week. During the closed season for red crabs, security is increased. Patrols require the support of the police or navy due to the danger of the area, but their help is sporadic.

The Churute Mangrove Ecological Reserve has scheduled weekly surveillance patrols for fishery control. Rangers increase both day and night patrols during the closed season for red crabs. These patrols are performed together with the Environmental Police Unit of Naranjal, but the Navy offers no personnel for support.

El Morro Refuge and Santay Island Recreation Area do not have a surveillance schedule. However, control checks are performed when there are stakeholder complaints, but patrols are limited due to lack of operational resources (fuel). Support from Posorja's naval post is sporadic as there is no formal agreement for support personnel.

DETECTION

Apart from the Churute Reserve, the other areas do not have surveillance and detection equipment. The complexity of the estuaries and mangrove zones complicate surveillance tasks performed with conventional detection means. Patrols are highly recommended, but officers should prioritize the estuaries or vessel entryways and exits in the area. Use of personal and portable equipment is the best option. While illegal fishing activities are apparently rare, poachers, drug and contraband traffickers frequent the area primarily at night. We highly recommend carrying out more night patrols.

Posorja's DATA zone does not possess any surveillance equipment, however, this could be easily resolved as its unobstructed linear coastline is ideal for the placement of a high power video camera, especially for the monitoring of artisanal trawlers that are common in the area. The Ministry of Transportation and Public Works (MTO) has a well-placed facility known as "Casa de Prácticos" in the area, which possesses a control center, primary and backup electric generation, a security fence and two 48-meter towers. The implementation of a surveillance system would be both affordable and feasible.

As the area of El Salado is beset by illegal solid waste disposal and illegal activities primarily occurring at night, appropriate surveillance and control equipment should be procured for the area. Authorities should establish a vigilance post at the site known as "Tres Bocas", which is in direct line of sight to the human settlements along the Salado Estuary and the Guayaquil access canal, which is widely used by criminals to escape after attacking vessels in the estuary.

At Churute Mangrove Reserve there are three water entryways (Rio Guayas). Poachers use the north entryway most frequently as it leads directly to the route to Guayaquil - a marketplace for illegal fish commercialization. Midway through the route of this branch lies the town of *Santo Domingo*. The biologist Diego Rosado indicated that the MAE plans to establish a vigilance post in this town, thereby controlling the north exit. There is also a central and south exit, the latter being the least used by poachers. On the Rio Guayas and across from Churute Reserve is the naval post "*Punta de Piedra*". With an elevation of 31 meters, the post overlooks the Reserve's north and central estuaries. As its location and height are ideal for a vigilance post, we highly recommend that the MAE approach the Navy to share facilities.





06

EL ORO PROVINCE MARINE PROTECTED AREAS

LOCATION AND AREA CHARACTERISTICS

El Oro province is located in the south of Ecuador along the Peruvian border. It is bordered in the north by the Gulf of Guayaquil and Guayas province and in the south by Loja province. Its coastal geography is defined by estuaries, mangroves, beaches, islands, rocky shallows and reefs. The province has two conservation areas: Santa Clara Island and Arenillas Military Ecological Reserve.

Both areas have distinct ecosystems and harbor a large amount of important conservation species. The area of Santa Clara is influenced by the meeting of three marine currents: the fresh water flow of the Rio Guayas basin and the currents of Humboldt and Panama (seasonally). This gives rise to a high concentration of marine birds and creates an ideal site for harboring migratory species such as whales, dolphins and sea turtles. Effective MPA management has reduced the impact from artisanal fishing and tourism. However, ecosystem equilibrium is at risk due to two natural gas extraction off-shore platforms between 8 and 10 NM southwest of the

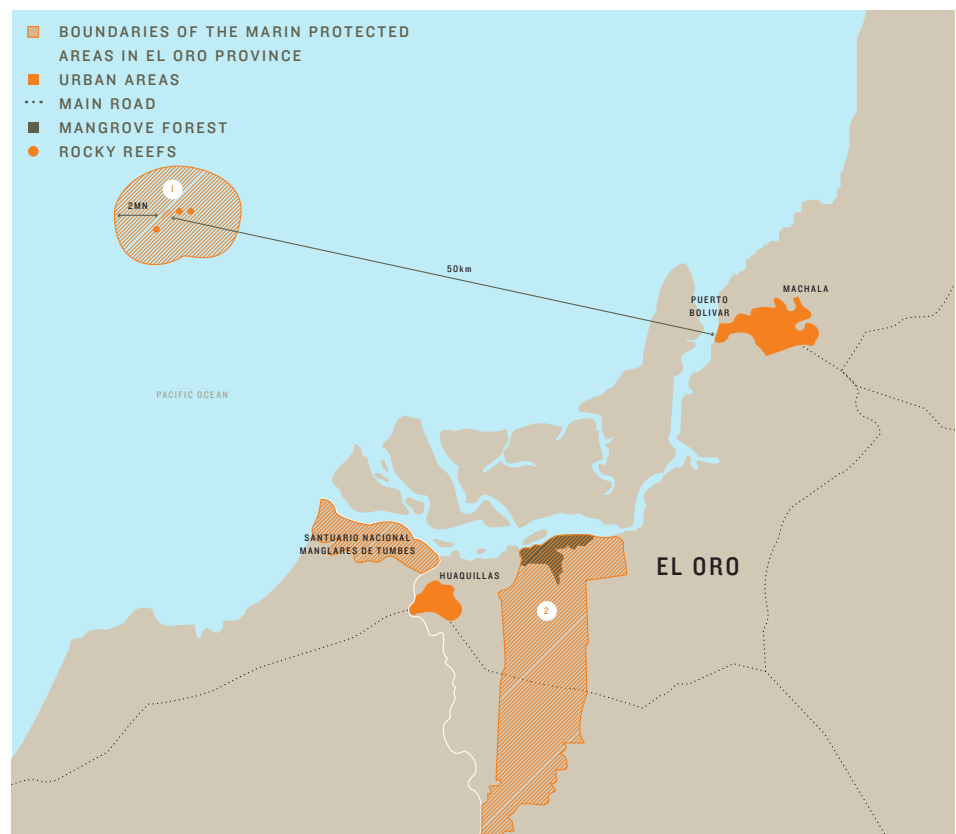


Figure No. 07: The MPAs of the El Oro Province.

1. Santa Clara Island Wildlife Refuge
2. Militar Arenillas Ecological Reserve

Santa Clara MPA. Similarly, the Gulf of Guayaquil's rich fishing resources attract artisanal and industrial fleets to the area. There are also frequent criminal activities in the Gulf of Guayaquil, including motor and fish theft and trafficking of fuel and drugs.

The Arenillas Military Ecological Reserve possesses a marine area that is much smaller than the land area. Its primary ecosystems are made up of estuaries and mangroves that extend 8 to 10

kilometers along the coastline. This area harbors a great variety of bio-aquatic species (crabs, shells, mollusks) and marine life. One of the principle activities of the zone is shrimp farming. The system of estuaries and mangrove forests is greatly impacted by the large number of shrimp farms, many of which are plagued by poor production practices.

MPA	SURFACE AREA IN HA		NATURAL CAPITAL	PRINCIPAL ECO-NOMIC ACTIVITIES	PRINCIPAL THREATS TO NATURAL CAPITAL
	LAND AREA (%)	COASTAL-MA-RINE AREA (%)			
Santa Clara Island Wildlife Refuge	7,414 Ha.		<ul style="list-style-type: none"> Island system Rocky reefs Shingle and sand beaches Marine birds (frigate birds and blue-footed boobies) Migratory species (dolphins, turtles and whales) 	<ul style="list-style-type: none"> Artisanal fishing: coastal fishing, big game fishing, lobster fishing and octopus catching Industrial fishing: shrimp and small pelagic fishing Tourism: whale watching 	<ul style="list-style-type: none"> Presence of Peruvian fishers Industrial fishing Fisheries with poor practices (neglect of laws and misuse of fishing equipment) Unregulated tourism
	0,97%	99,03%			
Arenillas Military Ecological Reserve	17,083 Ha.		<ul style="list-style-type: none"> Estuary system Mangrove forest Semi-deciduous forest Pampas fox Red crab 	<ul style="list-style-type: none"> Artisanal fishing using bottom gillnets, purse seines, cast nets, harvesting mollusks and crabs. Aquaculture 	<ul style="list-style-type: none"> Presence of Peruvian fishers Cutting of mangroves for shrimp pools Illegal hunting of forest species (armadillos, oncilla, deer) Pollution of the estuaries from solid waste, sewage from urban centers, shrimp companies, and fuel from shipping activities Illegal cutting (guayaca) and hunting of forest resources Overexploitation of natural resources: neglect of closed seasons
	92%	8%			

Table No. 32: Principal Threats to Natural Capital in the Coastal Marine Areas of El Oro Province.

KEY STAKEHOLDERS IN THE MANAGEMENT AND ADMINISTRATION OF THE PROTECTED AREAS

The two MPAs of the El Oro province do not have a significant number of stakeholders, as there has been little development of traditional economic activities like fishing and tourism.

ACTOR	TYPE OF ACTOR	PRESENCE IN MPAS	LEVEL OF INFLUENCE, DECISION-MAKING POWER AND STANCE REGARDING MPA
Union of Artisanal Fishery Organizations of El Oro (3,000 artisanal fishers) Unión de Organizaciones Pesqueras Artesanales del Oro or UOPAO	Social Organization	Santa Clara Island Wildlife Refuge and Arenillas Military Ecological Reserve	Level of influence is high and cooperative attitude toward the management of MPAs
Collectors of mangrove species	Social Organization	Arenillas Military Ecological Reserve	Level of influence is low and indifferent to the management of the area
Petro Ecuador	Public	Santa Clara Island Wildlife Refuge	Level of influence is moderate and cooperative attitude toward the protected area
Navy: (1 Port Captain's Office at Bolivar and Posts at Pitahaya and Hualtaco)	Public	Santa Clara Island Wildlife Refuge	Level of influence is high. Permanent presence at Santa Clara Island. Need to improve their operating capabilities
Deputy Secretary of Fishing Resources: (6 inspectors)	Public	Arenillas Military Ecological Reserve	Level of influence is high. Hold high-level partner agreements with MAE, but need to improve operational capacity. Support is irregular

Table No. 33: Local Actors Involved in the Management of MPAs Located in the El Oro Province.



SURVEILLANCE AND DETECTION

PERSONNEL

The provincial office in El Oro has seven officers to manage the two MPAs. Both areas lack staff and specialists to carry out the key management activities for monitoring of fauna and flora,

environmental outreach to communities and schools, etc. The following table shows the distribution of human resources and their respective levels of education.

MPA	PERSONNEL	SPECIALIZATION
Santa Clara Island Wildlife Refuge	1 Director, 2 rangers	2 biologists, 1 with high-school diploma
Militar Arenillas Ecological Reserve	1 Director, 3 rangers	1 biologist, 3 with high-school diploma

Table No. 34: Distribution of Human Resource and Respective Levels of Education for El Oro MPAs.

SURVEILLANCE ASSETS AND EQUIPMENT

The province does not have vessels for surveillance and control. With respect to electrical services and communication equipment, the situation is as follows:

MPA	HEADQUARTERS	ELECTRIC SERVICE	INTERNET	PRIVATE VHF RADIO	MARINE VHF RADIO
Santa Clara Island Wildlife Refuge	Yes (Machala) Yes (on the island)	Yes (generator) Solar panels in need of repair	Yes (Machala) No (on the island)	Yes 1 base radio 1 portable	No
Militar Arenillas Ecological Reserve	Yes	Yes	Yes	Yes 1 base radio 1 portable	No need

Table No. 35: Electric Supply and Communication Equipment For MPAs in the El Oro Province.

The Santa Clara Island Refuge office is located in the El Oro provincial building located in Machala. On Santa Clara island, the MAE officer shares a vigilance post belonging to the Navy with two full-time officers. The vigilance post is in need of repair as the structure has not been maintained in decades. There is an electric generator and an old solar power system belonging to the Naval Oceanographic Institute, which can be reactivated with a small investment.

The Arenillas main office is located in the town of Pintag Nuevo within the MPA. With respect to communication systems, both MPAs share a VHF radio network with a base radio at the El Oro provincial office in Machala and one portable radio for each Director. Both MPAs have limited cell coverage.

BUDGET FOR MPAS

2014 MPA BUDGETS

ACTIVITY	SANTA CLARA ISLAND	ARENILLAS
Surveillance and Control	\$4,000.00	\$4,000.00
Communication, Education and Environmental Outreach	\$0.00	\$0.00
Inspection and Monitoring	\$0.00	\$0.00
Management of Biodiversity	\$0.00	\$0.00
Public and Tourist Services	\$0.00	\$0.00
Organization and Planning	\$21,120.00	\$44,690.00
TOTAL	\$25,120.00	\$48,690.00

Table No. 36: MPA Budgets for the El Oro Province.

In order to better gauge management capacity of the MPAs, we prepared a summary of key budget line-items. After reviewing the 2014 AOPs for each MPA, we arrived at the following conclusions:

- Both MPAs are in need of a significant and permanent budget increase.

PROXIMITY TO MARITIME TRAFFIC ROUTES

Due to its location at the entrance to the Gulf of Guayaquil and its proximity to the off shore platforms, Santa Clara Island Refuge experiences heavy maritime vessel traffic. In addition, small

industrial fishing vessels transit the areas as well as artisanal fishing vessels, which travel near the Santa Clara Island. At Arenillas, there is only artisanal traffic.

ORGANIZATION AND PLANNING FOR PATROLS

Neither MPA has a surveillance and control patrol schedule. At Arenillas there are no patrols and at Santa Clara they are only performed when there are stakeholder notifications. As the Santa Clara officer does not possess a patrol vessel, he requests

assistance from artisanal fishers when illegal fishing situations arise. We highly recommend the procurement of a small patrol vessel to complement the island's control center, MAE ranger and two naval officers.

DETECTION

Surveillance and control resources are currently non-existent. The principal threat within the MPAs are from small vessels with 75HP outboard motors. Outside the Gulf of Guayaquil, in addition to incidents of illegal fishing, vessels are attacked and robbed of motors and fish. The zone is fraught with security issues and we agree with both the MAE and the Navy that strengthening detection and coordination capacity on Santa Clara Island is fundamental for the management of the protected area and for improving its

general security. Also present are semi-industrial vessels that fish for sardines, hake and horse mackerel, among others. In the zone of Arenillas, the principal threat comes from illegal fishing of crabs. Nonetheless, the estuary and mangrove zone needs additional patrols, which is currently limited due to a lack of vessels and fuel.





07

SURVEILLANCE & CONTROL SYSTEM DESIGN FOR MARINE PROTECTED AREA NETWORK

SUMMARY

The surveillance and control plan has been prepared according to the following criteria:

1. Reduce capital investment spending (CAPEX) through the use of existing infrastructure and equipment.
2. Minimize operating costs (OPEX) by improving communication systems (marine and personal VHF network), fostering interagency surveillance and control efforts, increasing cost effectiveness of patrols by establishing vigilance posts equipped with long-range video cameras and by limiting the size of outboard motors
3. Incorporate local fishing communities into the surveillance and control system to assist in management activities and to serve as “surveillance agents”.

COMPONENT	ACTIVITIES
SURVEILLANCE	<ol style="list-style-type: none"> 1. Vessels and motors required for each MPA 2. Human resources (minimum requirements) 3. Establishing control centers and a VHF radio network 4. Training/SOP: <ul style="list-style-type: none"> • IMO basic training • Marine control operations (Surveillance and control plan per MPA) • Interagency strategic planning 5. Regulations and awareness campaign: <ul style="list-style-type: none"> • Define policies for resource use and zoning • Develop awareness campaign 6. Provision of basic security equipment 7. Installing surveillance cameras and microwave transmission system 8. Establishing interagency agreements between MAE and the Navy for each site and region (assign more personnel for the operations)
INTERDICTION	<ol style="list-style-type: none"> 1. Developing SOPs for the control centers, patrolling and boarding 2. Establishing basic formats for reports 3. Establishing a list of critical spare parts and maintenance SOP
PROSECUTION AND SANCTION	<ol style="list-style-type: none"> 1. Creating a database with a record of violators (profiles) 2. Establishing interagency agreements with the Attorney’s office for judicial cases 3. Granting MPAs or local environmental authorities jurisdictional independence, thereby allowing them to act as trial court judges; alternatively, delegate authority closer to the operating level to expedite the process of sanctioning violations

Table No. 37: Summary Design for Surveillance and Control for the MPA Network.

SURVEILLANCE

I. VESSELS

As patrol vessels and outboard motors are a fundamental component of any surveillance and control system, we carried out an exhaustive inventory of these assets. Fortunately, most MPAs

already possess adequate and/or new patrol vessels with operational outboard motors. Our findings and recommendations are presented in the two tables below.

AREA	CURRENT VESSELS		OBSERVATIONS	NEW VESSELS		TOTAL VESSELS
	5 TO 8M	8 TO 10M		5 TO 8M	8 TO 10M	
Cayapas-Mataje Ecological Reserve	1	0		0	0	1
Rio Esmeraldas Estuary Mangroves Wildlife Refuge	0	0		1	0	1
Galera-San Francisco Marine Reserve	0	0		0	1	1
Rio Muisne Estuary Wildlife Refuge	2	0	1 motorvessel in poor condition	0	0	2
Corazon and Fragata Islands Wildlife Refuge	4	0	2 are 2 meter canoes	0	0	4
Pacoche Coastal Marine Wildlife Refuge	1	0		0	0	1
Machalilla National Park	3	1	Too many vessels	0	0	4
El Pelado Marine Reserve	0	0		1	0	1
Santa Elena Point Coastal Marine Wildlife Reserve	1	0		0	0	1
El Morro-DATA Mangrove Wildlife Refuge	1	0		1	0	2
El Salado Mangrove Wildlife Reserve	2	0	Both vessels are in poor condition	2	0	2
Santay Island National Recreation Area	0	0	No need	0	0	0
Churute Mangrove Ecological Reserve	2	0	One vessel in poor condition	1	0	2
Santa Clara Island Wildlife Refuge	0	0	Needs a vessel for the open sea	0	1	1
Arenillas Military/Ecological Reserve	0	0		1	0	1
TOTAL REQUIRED				7	2	24

Table No. 38: Inventory of Patrol Vessels by MPA and Recommendations for Additional Vessels

With respect to outboard motors, the MAE should replace obsolete motors as well as provide new outboard motors for new patrol vessels. Note that similar manufacturer and motor size would

facilitate the establishment of critical spare part inventories and maintenance systems.

AREA	NEW MOTORS		OBSERVATIONS
	75HP	100HP	
Cayapas-Mataje Ecological Reserve	0	0	
Rio Esmeraldas Estuary Mangroves Wildlife Refuge	1	0	
Galera-San Francisco Marine Reserve	0	1	
Rio Muisne Estuary Wildlife Refuge	1	0	Replace the current motor in poor condition
Corazon and Fragata Islands Wildlife Refuge	0	0	2 are 2-meter canoes
Pacoche Coastal Marine Wildlife Refuge	0	0	
Machalilla National Park	0	0	
El Pelado Marine Reserve	1	0	
Santa Elena Point Coastal Marine Wildlife Reserve	0	0	

AREA	NEW MOTORS		OBSERVATIONS
	75HP	100HP	
El Morro-DATA Mangrove Wildlife Refuge	1	0	
El Salado Mangrove Wildlife Reserve	1	0	Both vessels are in poor condition
Santay Island National Recreation Area	0	0	No need
Churute Mangrove Ecological Reserve	1	0	One vessel in poor condition
Santa Clara Island Wildlife Refuge	0	1	Needs a vessel for the open sea
Militar Arenillas Ecological Reserve	1	0	
TOTAL	7	2	

Table No. 39: Inventory of Outboard Motors by MPA and Upgrade Requirements.

2. HUMAN RESOURCES

Next we analyzed the human resource requirements for each MPA taking into consideration its total area, complexity, and infrastructure. The following table summarizes our investigation and recommendations:

AREA	CURRENT MARINE RANGERS	TOTAL REQUIRED	INCREASE
Cayapas-Mataje Ecological Reserve	8	8	0
Rio Esmeraldas Estuary Mangrove Wildlife Refuge	1	4	3
Galera-San Francisco Marine Reserve	5	7	2
Rio Muisne Estuary Wildlife Refuge	4	6	2
Corazon and Fragata Wildlife Refuge	6	6	0
Pacocha Coastal Marine Wildlife Refuge	6	7	1
Machalilla National Park	5	9	4
El Pelado Marine Reserve	1	5	4
Santa Elena Point Coastal Marine Wildlife Reserve	11	11	0
El Morro-DATA Mangrove Wildlife Refuge	6	6	0
El Salado Mangrove Wildlife Reserve	6	6	0
Santay Island National Recreation Area	6	6	0
Churute Mangrove Ecological Reserve	10	10	0
Santa Clara Island Wildlife Refuge	3	8	5
Militar Arenillas Ecological Reserve	4	5	1
TOTAL	82	104	22

Table No. 40: Inventory of personnel by MPA and Recommendations for Additional Hires.

In summary, a minimum of 3 Rangers must be on duty at any given moment. Each patrol vessel should be staffed with at least 2 Rangers: the Vessel Captain and one Ranger who is responsible to perform interdiction and boarding activities. We also recommend the addition of naval officer to supplement patrols as they possess the power of arrest and bear firearms. The patrol vessel should be in contact with the control center officer every hour to report location and situation. The Rangers should be trained to operate both vessels and control center activities thereby allowing greater flexibility in scheduling. As most illegal

fishing takes place at night, we highly recommend scheduling night patrols and the monitoring of key ports. Given the variation in compensation among directors and rangers, we also recommend raising and standardizing salary levels for MAE positions so that they correspond with levels of responsibility and risk.

3. CONTROL CENTERS AND VHF RADIO NETWORK

The planning and execution of patrols will be led from seven control centers. For the remaining areas, patrols will be planned locally or in cooperation with their respective provincial office. The control centers do not require substantial CAPEX, but as a minimum should include a desktop computer, monitors, digital storage, lock and key filing cabinets, and a safe among basic office furniture. It is important the control center allow Rangers to carry out their operations and planning with privacy. In view of limitations of personnel, space and resources, we recommend the following enforcement management structure:

CONTROL CENTER LOCATION	RESPONSIBILITIES
Guayaquil Deputy Secretary of Marine and Coastal Administration	MPAs General Control and Admin
(COGUAR) Guayaquil Coastguard Unit	Maritime Police General Control
PN Machalilla – Paoche (Puerto López) CC	PNM and Paoche Operations
REMACOPSE (Santa Elena Point) CC	REMACOPSE and El Pelado Operations
Santa Clara (Santa Clara Island) CC	Santa Clara Island Operations (extending response to Guayaquil)
El Morro-Data (El Morro Port) CC	El Morro and General Villamil Operations
Churute CC	Churute Operations

Table No. 41: The Location and MPA Coverage of the Seven Control Centers.

In addition to VHF communication systems, the control centers will have long-range cameras in order to increase surveillance coverage while reducing patrol costs. The video feed from the cameras installed in the Gulf of Guayaquil will be relayed in real time to the SGMC and COGUAR control centers in Guayaquil allowing them to dispatch patrol vessels when a situation arises. As for the REMACOPSE and PNM control centers, the video feed will remain local (it will not be relayed to other centers).

VHF COMMUNICATION NETWORK

The core of enforcement operations is the VHF radio network. The network will not only link the control center with patrol vessels and Rangers at ports, but it will link the Undersecretary for Marine Control and Management (SGMC) to all provincial and MPA offices. The frequencies of this network should naturally be private (exclusive use), for which permission and guidance should be sought from the National Secretary of Telecommunications (*SENATEL*). Additional VHF frequencies (marine) will be required for communication with vessels. The marine frequencies are public, but the base stations should be registered with the Port Authorities.

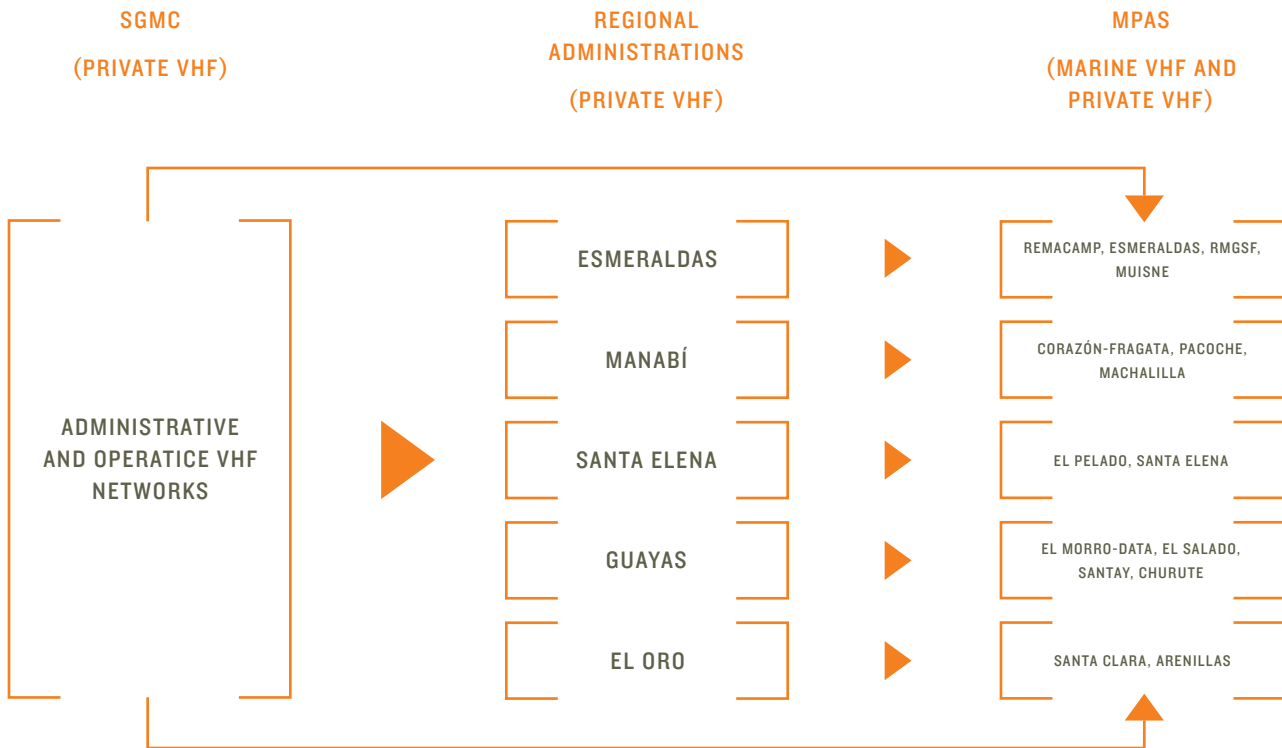


Figure No. 08: VHF Network Coverage

It is important to differentiate between communication lines required for administration and those used for enforcement operations, as the provincial offices do not carry out field operations. However, since the SGMC intends to create a regional unit that will provide direct surveillance support to the MPAs, direct lines of communication will be established with all the MPAs from Guayaquil.

STRUCTURE OF THE VHF COMMUNICATION NETWORK

TRANSPORT NETWORK AND COVERAGE

The communication network consists of a series of primary stations and repeaters located at elevated sites (to ensure maximum coverage) that act as controllers, commuting nodes, user registrations and control/monitoring centers. MPAs network repeaters will be installed at the following sites:

NAME OF SITE	LATITUDE	LONGITUDE
Bola de Oro	01.60355S	080.70180W
Cerro de Hojas	01.04463S	080.54467W
Faro Punta Coquitos	00.98357N	079.66667W
Cerro Azul	02.15209S	079.98360W
Puerto Bolívar	03.25217S	079.94897W

Table No. 42: Repeater Location for the MPA Communication Network.

Given the aforementioned locations, available service coverage is illustrated on page 60.



Figure No. 09: Coverage of the VHF Network.

NETWORK ACCESS

The network consists of a series of base stations, mobile and portable radio devices, which allows all MAE officers and entities pertaining to the network to communicate freely. The network consists of the following components:

Base Stations: These will be set up at the National MPA Control Centers, regional and local administrations. They are 25W radios with long-range antennas.

Mobile Devices: These will be placed in vessels and land vehicles. The transmission equipment is the same as that of the base stations, but its antenna is smaller and therefore its reach is less extensive than that of the base stations.

Portable Devices: These are portable radios for rangers performing work in the field or maritime patrols. They have limited range as they are 2W–5W radios and meant to maintain contact with the closest control centers.

The VHF Radio requirements for each MPA are the following:

MPA	PERSONNEL	VESSELS	MOBILE RADIOS		PORTABLE RADIOS		BASE RADIOS	
			MARINE VHF / PRIVATE VHF	MARINE VHF / PRIVATE VHF	MARINE VHF / PRIVATE VHF	MARINE VHF / PRIVATE VHF		
Cayaps Mataje Mangrove Ecological Reserve (REMACAM)	8	1	01 Marine 01 Private	00 Marine 03 Private	01 Marine 01 Private			
Rio Esmeraldas Estuary Mangroves Wildlife Refuge (Provincial administrative headquarters)	4	1	00 Marine 01 Private	00 Marine 01 Private	00 Marine 01 Private			
Galera-San Francisco Marine Reserve (RMGSF)	7	1	00 Marine 01 Private	01 Marine 01 Private	01 Marine 01 Private			
Muisne-Cojimies Mangrove Wildlife Refuge	6	2	02 Marine 01 Private	02 Private 02 Marine	01 Marine 01 Private			
Corazon and Fragata Islands Wildlife Refuge	6	4	00 Marine 01 Private	00 Marine 03 Private	00 Marine 01 Private			
Pacocha Coastal Marine Wildlife Refuge	7	1	01 Marine 01 Private	00 Marine 03 Private	01 Marine 01 Private			
Machalilla National Park (PNM)	9	4	01 Marine 01 Private	01 Marine 04 Private	01 Marine 01 Private			
El Pelado Marine Reserve	5	1	01 Private	02 Private	01 Private			
Santa Elena Point Coastal Marine Wildlife Reserve	11	1	01 Marine 01 Private	02 Marine 02 Private	01 Marine 01 Private			
El Morro-DATA Mangrove Wildlife Refuge	6	2	00 Marine 01 Private	00 Marine 03 Private	01 Marine 01 Private			
Churute Mangrove Ecological Reserve	6	2	01 Marine 02 Private	00 Marine 04 Private	01 Marine 01 Private			
El Salado Mangrove Wildlife Reserve	6	2	00 Marine 02 Private	00 Marine 03 Private	01 Marine 01 Private			
Santay Island National Recreation Area	10	0	00 Marine 01 Private	00 Marine 03 Private	00 Marine 01 Private			
Santa Clara Island Wildlife Refuge	8	1	01 Marine 01 Private	00 Marine 02 Private	02 Marine 01 Private			
Militar Arenillas Ecological Reserve	5	1	00 Marine 01 Private	00 Marine 02 Private	00 Marine 01 Private			
TOTAL MPAS RADIOS			09 MARINE 17 PRIVATE	06 MARINE 37 PRIVATE	11 MARINE 14 PRIVATE			

Table No. 43: VHF Equipment Requirements by MPA.

In addition, 6 Private VHF Base Radios should be added to the list to account for the regional offices and the SGMC.

In summary, the VHF network should include:

Marine/Private VHF Radio Bases:	31
Marine/Private VHF Mobile Radios:	26
Marine/Private VHF Portable Radios:	44

Table No. 44: Summary of Equipment Requirements for the VHF Network.

4. TRAINING / SOPS

SUBJECT	DESCRIPTION
IMO Basic Training	<ul style="list-style-type: none"> • First aid • Survival at sea • Fire fighting
Surveillance, Interdiction and Boarding	<ul style="list-style-type: none"> • Operational planning and preparation • Use of visual and electronic sensors for patrols • Boarding protocols: Inspections, required documents, what to check and look for, documenting the inspection. Training should include Prosecutors. • Interrogating and confronting suspicious crews • Crime scene protocols. Collecting and handling of evidence • Operational report. Items and information that should go into a “good” report
Operational Planning and Administration of Control Center	<ul style="list-style-type: none"> • Control Center functions, including risk assessment (GAR model), use of assets, reports, communication protocols, surveillance and documentation protocols • Telecommunication lines and collaborative procedures with coastguards • Situational assessment and real time reports • Reading and using nautical maps • Reading and using land maps • Search and rescue • Providing first aid services in the field • Considerations for personal security during patrols and boarding
Basic and advanced courses on OB motor maintenance	<ul style="list-style-type: none"> • All rangers should take a basic OB motor maintenance course provided by the manufacturer • In each area, one or two rangers should be assigned to attend the advanced course on OB motor maintenance and critical repair
Standard Operating Procedures	<ul style="list-style-type: none"> • Control Center (Operation) • Patrols • Boarding equipment • Maintenance

Table No. 45: Recommended Training Courses for Marine Wardens.

5. ZONIFICATION AND AWARENESS CAMPAIGNS

Currently most coastal MPAs lack zonification, which is a critical management tool required for safeguarding specific areas with higher ecosystemic value, facilitating surveillance and for designating specific uses i.e. absolute protection, fishing, tourism, scientific research, etc. In addition, MPAs managers must establish use regulations (fishing, tourism, transportation, etc.), which are tied to zoning policies. These two actions are an integral part of an MPA’s surveillance and control plan. Once officially established, the rules should be communicated to stakeholders and communities in a brief and instructive way. Additionally, the relationship between the MPA administrator and neighboring communities should be strengthened via community outreach programs to foster “buy in” and support for regulations. When possible, a co-management mechanism should be

established with stakeholders. Universities or local NGOs can be instrumental for carrying out outreach to communities.

6. PROVISION OF BASIC SAFETY AND SURVEILLANCE EQUIPMENT

Please find list of Basic Safety and Surveillance Equipment on page 86.

7. INSTALLATION OF LONG-RANGE CAMERAS AND MICROWAVE TRANSMISSION SYSTEM

Visual detection can be enormously improved by the use of fixed daylight/lowlight cameras as they can perform automatic surveillance by using digital processing imaging algorithms and is highly recommended when staffing is an issue. Specifications and performance parameters will be detailed in the next section. For the most extensive areas, we highly recommend using long-range cameras (daylight or low-light) as their 6 -10 NM range is sufficient for all coastal MPAs. Cameras used both locally and remotely will require the implementation of a database network, which can account for future growth and joint interagency work. It is critical that control centers receive the video signals and be able to give remote orders, record images, retransmit video to other users, etc. This is only possible with data links. The network will be configured according to IP standards thereby allowing remote access by SGMC – COGUAR if necessary.

The sites chosen for cameras and their respective data destination are listed below:

SITE NAME	LATITUDE	LONGITUDE	REACH	RECEIVING ENTITY
Galera Point	0°49'7.58"N	80° 3'9.38"W	10 MN	Local: MAE Galera
Union Manabita	0°41'24.10"N	80° 4'52.00"W	10 MN	Local: MAE Galera
El Mango	1° 3'48.10"S	80°53'8.30"W	9 MN	Remote: PNM
Isla de la Plata	1°15'45.86"S	81° 4'28.74"W	10 MN	Remote: PNM
Santa Elena Point	2°11'11.73"S	80°59'29.30"W	10 MN	Local: REMACOPSE
DATA	2°42'53.48"S	80°18'50.00"W	10MN	Local: El Morro Remote: SGMC y COGUAR
Stone Point	2°25'52.66"S	79°51'31.29"W	10 MN	Local: Churute Remote: SGMC y COGUAR
Sto. Domingo (Churute)	2°29'0.97"S	79°48'14.48"W	6 MN	Local: Churute Remote: SGMC y COGUAR
Puna	2°44'6.10"S	79°54'45.91"W	10 MN	Local: Churute Remote: SGMC y COGUAR
Santa Clara Island	3°10'24.33"S	80°26'14.82"W	10 MN	Local: Santa Clara Remote: SGMC y COGUAR

Table No. 46: The Coordinates for Placement of High- Power Video Cameras and Video Feed Destination.

The camera locations and coverage are illustrated in the maps below:

Northern Sector:

As the Cayapas Mataje estuary zone is not suited for cameras, the MAE will continue to rely on traditional forms of surveillance (vessel patrols). At RMGSF, we recommend the installation of two cameras: one in the north in Galera Point (behind the MAE offices); and another to the south at “Unión Manabita.” Both sites offer excellent coverage of the entire marine area. The mangrove reserve areas in the Muisne-Cojimies sector will also be controlled by

patrol vessels as sensor performance is not cost effective in these type of areas. A repeater will be installed at “El Quingüe” where it will transmit data to the MAE office in Galera and the nearest Coastguard post or MAE office in Muisne.



Figure No. 10: High Power Video Camera Placement in Esmeraldas Province.

Central Sector

There are three areas in the central sector of Ecuador that extend to the ocean: Pacoche, the PNM (around Isla de la Plata) and Santa Elena. Other smaller areas (Corazon-Fragata, PNM's coastal fringe and El Pelado) will be monitored with patrol vessels and binoculars. For REMACOPSE a direct link is being established between the camera (located in the Puntilla hills) and the area's offices (no farther than 1.5 km).

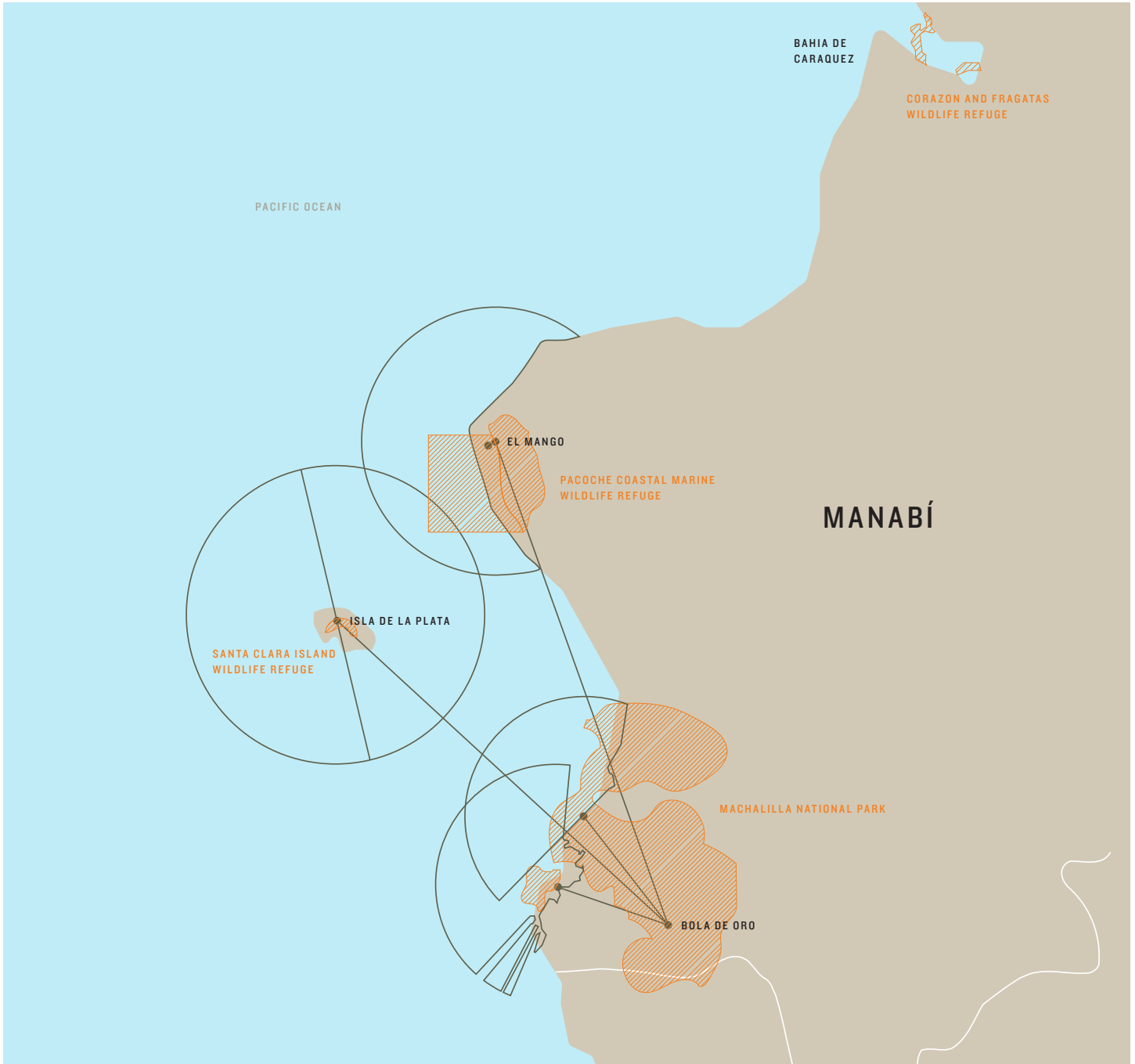


Figure No. 11: High Power Video Camera Placement in Manabí Province.



Figure No. 12: High Power Video Camera Placement in Santa Elena Province.

Gulf of Guayaquil

Both the MAE and the Navy have prioritized the modernization of the actual vigilance post at Santa Clara Island, which is staffed by two naval officers and a ranger. There is lodging, an electric network and a watchtower.

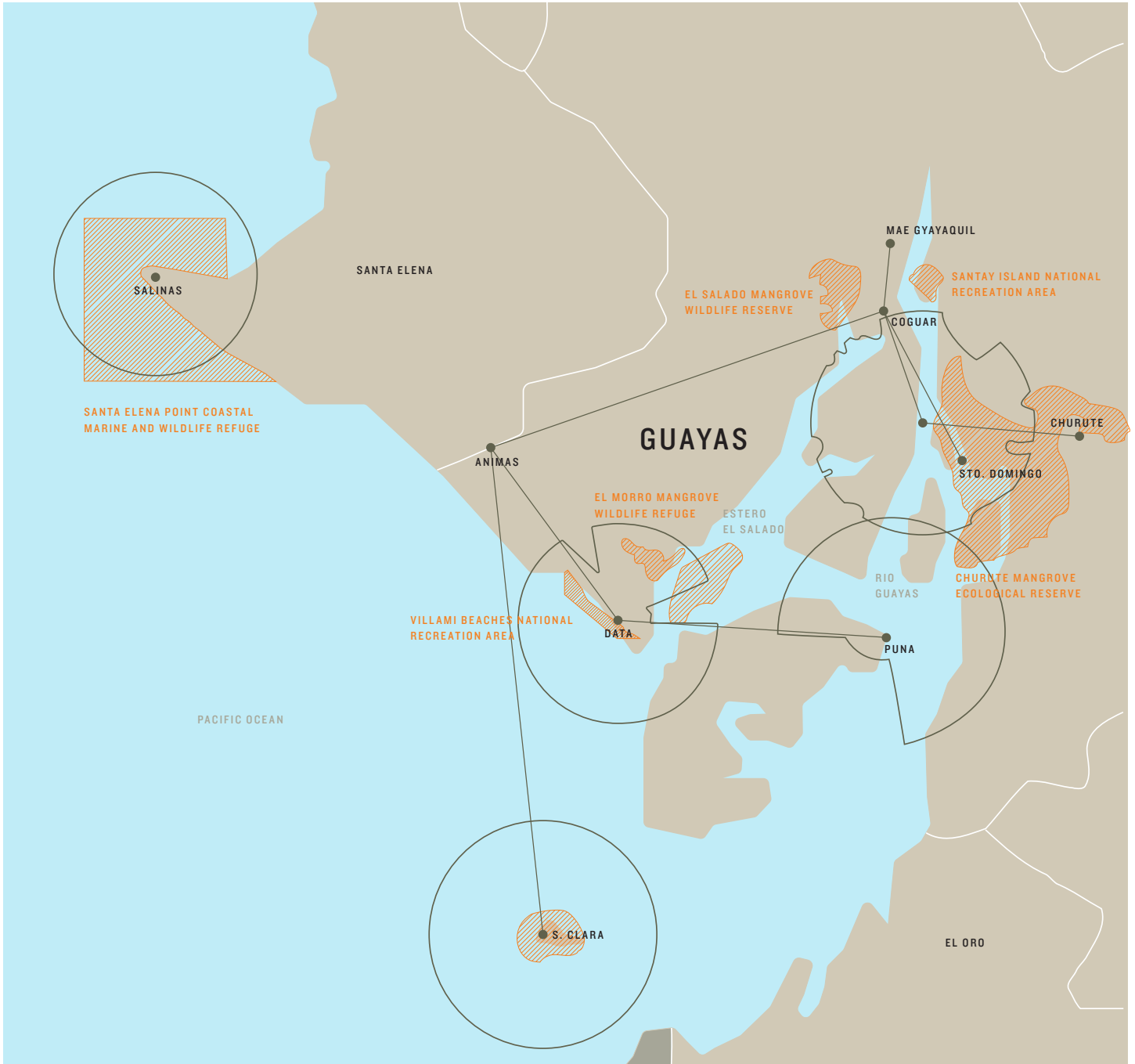


Figure No. 13 : High Power Video Camera Placement in Guayas and El Oro Province.

For the control of the DATA-Villamil coastal zone, a camera will be placed at the Port Authority of Guayaquil facilities known “Casa de Prácticos”. The installations have a 60m tower, electrical supply, security and complete visual coverage over the coastline. 11.6 km divide this vigilance post from the MAE offices at El Morro, which means the camera can be controlled remotely from their offices.

In light of the requirements outlined by the directors and officers we interviewed, surveillance in the Gulf of Guayaquil should include both local and remote visual coverage (from the SGMC and COGUAR

national control centers). This means the data links should be extended to Guayaquil. To accomplish this, the Cerro Animas (property of the Ministry of Defense) will have to be used and Guayaquil will be reached via the COGUAR towers. From here, the surveillance video feed can be retransmitted to SGMC. It is not possible to directly enter SGMC as there is no line of sight. Operators at Santa Clara, El Morro and Churute can control their cameras locally and receive warnings or detection signs.

In areas with narrow estuaries and high vegetation, the limited visual field doesn't

allow for the use of cameras. For Churute Mangrove Reserve in particular, cameras were placed at the area's entrances and exits. Out of the three estuaries, the one where Santo Domingo village is located is key due to its having the most traffic. The estuary branch that passes through here flows into the Guayas river at “Stone Point” (naval post). For this reason, placing cameras at both sites greatly improves surveillance. The third exit route at Churute is southbound, but this one has the least traffic. To monitor this stretch, a camera should be placed at Puna with a direct line of sight over the south exit canal.

8. ESTABLISHING INTERAGENCY AGREEMENTS

As most state agencies usually work with limited resources, interagency collaboration is critical in filling funding gaps and achieving conservation objectives. WildAid highly recommends the elaboration of interagency agreements with both the Navy and Police, which cover the following issues:

AREAS OF INTEREST	AGENCIES	AGREEMENT DETAILS
Personnel assignments at the MPAs	MAE – Navy MAE – Police	<ul style="list-style-type: none"> Naval personnel are needed during sea operations for security reasons (power to bear arms & arrest) and to ensure that boarding and interdictions meet legal requirements Request to have 1 full-time navy crewmember per MPA (monthly rotations would be possible) Similarly, 1 full-time police officer per MPA would be required for beach control operations
Control center operations and access to remote sensors	MAE - Navy	<ul style="list-style-type: none"> Navy personnel should be involved in situation assessment at the control centers Delivery of surveillance sensor data. The delivery would take place at the Guayaquil coastguard operations center. Oversee communication procedures: Communication lines Lead civil servants Incident assessment Response times

Table No. 47: Recommended Content for Interagency Agreements with the Navy and Police.

INTERDICTION

I. DEVELOPING SOPs FOR CONTROL CENTERS, PATROLS AND BOARDING

Each MPA should establish SOPs to meet its mission and carry out principal operations. These protocols are not designed to limit creativity and flexibility at work or to impose otherwise excessive restrictions. On the contrary, they are designed to guide daily tasks, maintain minimal professional standards and encourage adaptation to the situation at hand. Moreover, SOPs and systems of reporting/feedback are essential for institutionalizing procedures. In this way, they help new personnel learn appropriate actions, responses and methods

more quickly by providing a consistent, reliable and objective source for training and improvement. These protocols are living documents designed to ensure the best, up-to-date practices for MPAs. For this reason, they should be updated regularly in accordance with the input and experience of the rangers. Supervisors are expected to review the protocols for their reports after regular operations and include them in initial and ongoing training programs. Each MPA should develop SOPs for the following actions:

Control Center:

The control center should be staffed by at least one officer at all times and operational 24 hours a day, 7 days a week, 365 days a year. The operators communicate all infractions and events to the center supervisor. The center is responsible for monitoring information concerning vessels entering and leaving the MPA and any movement within or near the area. The center directs communication between officers, vessels and managers, as well as with other agencies. The center coordinates active



operations and sends backup as needed. The center maintains all archives including user manuals and SOPs. The center is in charge of communicating with external agencies and managing confidential information. The center is in charge of technology maintenance, knowing the maintenance state of resources, and the qualification status of personnel.

Patrol:

The SOPs for patrols should include:

- Pre-departure Requirements (verify that all the bridge gauges and indicators are operating, test the speed control and guiding system, prepare underway logs, personal equipment, etc.)
- Perform checks of other equipment: obtain machine report and verify that portable radios are functioning, etc.
- Submit pre-departure report to the operational director.
- Determine patrol and operation area and review reports on traffic and detection equipment for the MPA.
- Establish patrol strategies: multiple vessel patrol, patrol with cross search leader, barrier patrol, radar patrol, patrol with searchlights, among other strategies.

Boarding:

The Maritime Police Authority possesses the legal responsibility for carrying out boarding operations. Boarding inspections are subject to maritime control and interdiction procedures, the details of which exceed the scope of this report as inspected vessels can engage in illegal activities that range from fishing violations to greater crimes such as drug trafficking, piracy, contraband, murder, among others. Boarding inspections may be met with an armed and hostile response from a suspected vessel crewmember. All boarding plans must consider this a real and legitimate threat. As a result, boarding inspections should take the highest level of precaution for personnel and the vessels. The minimum requirements include:

- Determine if patrols will be performed undercover. Determine the distance and speed of vessels to be intercepted and detained.
- Use the GAR risk assessment model.
- Ranger personnel should have been trained in the inspection of different types of vessels and their associated risks. Be clear on chain of command, control, and abnormal situation assessment.

For example, escalation in force or seriousness of a detected crime.

- Remain in constant communication with the control center. Reinitiate communication at least every 15 mins.
- Note: Verify that all members of the boarding team are aware that none of them can use cellphones or personal cameras while performing a boarding inspection as this can put the security and success of the operation at risk. The leader of the team alone can use these devices.

2. ESTABLISHING CRITICAL SPARE PARTS INVENTORY AND MAINTENANCE SOPS

(Please find on page 84.)

PROSECUTION AND SANCTIONS

I. DATABASE WITH RECORD OF VIOLATORS

We highly recommend the creation of a simple database for recording and crosschecking information tied to violations. Normally, when basic background information exists on past incidents, important conclusions can be drawn with a recent incident as well as the motivation behind the crime. We have provided a list of the most common information required for the creation of a database in figure 14. The system should be accessible to other law enforcement entities and also permit the input of their records in order to provide a more comprehensive profile of violators. The more information recorded, the clearer the sketch of the violator. Additionally, the database could provide useful information for managers when scheduling and planning patrols thereby enabling a more efficient and low cost strategy.

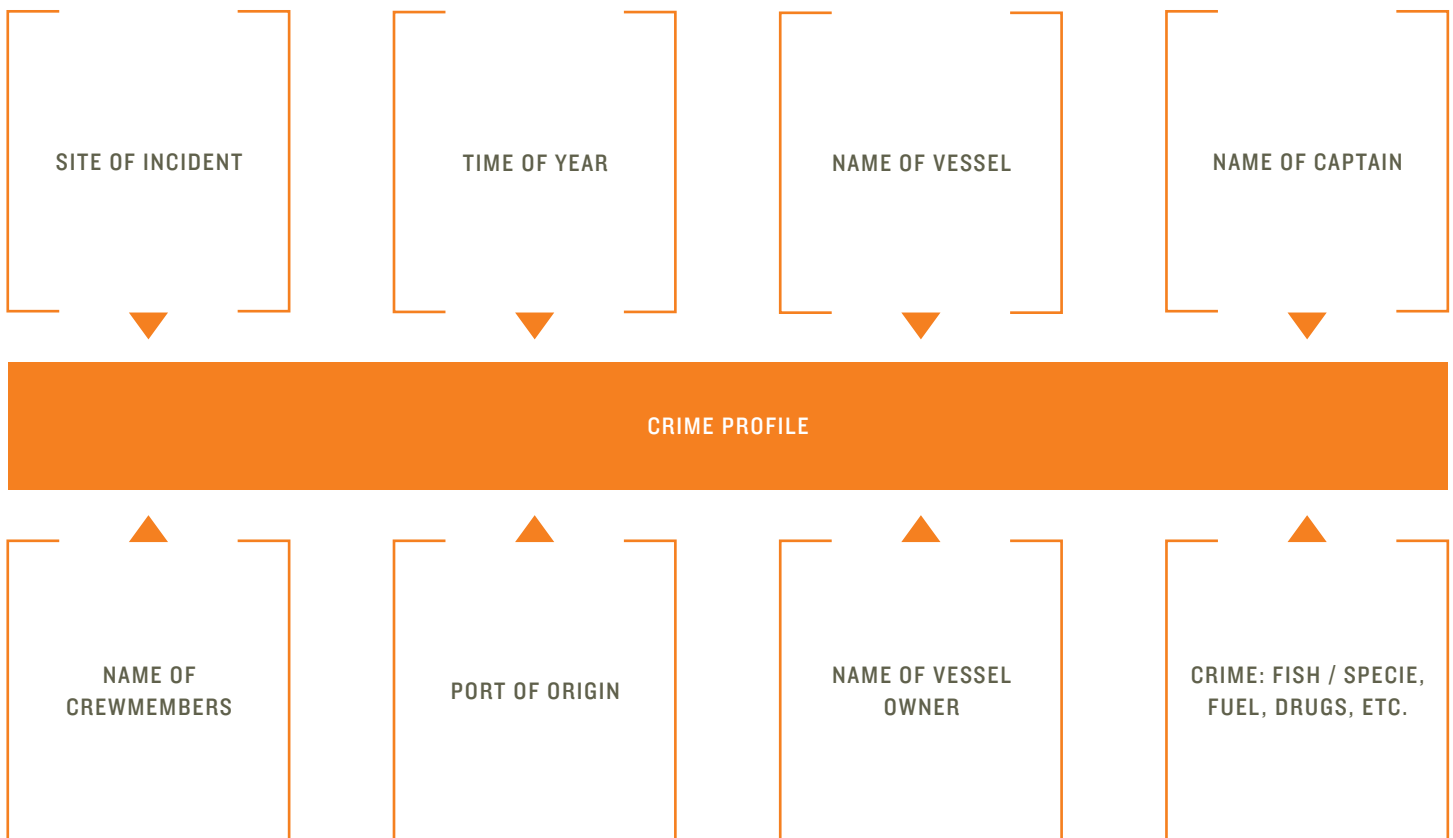


Figure No. 14: Necessary Elements for the Development of Infraction Database.

2. ESTABLISHING INTERAGENCY AGREEMENTS WITH THE ATTORNEY'S OFFICE FOR JUDICIAL CASES

The following actions are recommended to improve judicial proceedings:

1. Establish a standardized boarding report format with recommendations from the Attorney's office.
2. Park Rangers should be trained in the completion of this format.
3. Formalize official relations between the MPAs and their regional attorney for aquatic spaces.
4. Carry out training workshops for judges, attorneys and lawyers once a year.
5. Assign additional lawyers from NGOs or support agencies to follow-up on environmental marine violations or crimes.
6. Set up private prosecutions for major cases using outside lawyers.

3. DELEGATE SANCTION AUTHORITY TO MPAS

In order to expedite the sanctioning process, administrative sanctions should be carried out at the local level. According to article 18 (Chapter Two of the Regional Districts), the competencies and responsibilities of the professional in charge of the local technical offices are: comply and ensure compliance of the specific and general legal framework. As fines are relatively low, we also recommend non-economic sanctions such as:

- Vessel detention for a limited time
- Restrict sailing authorization permits (zarpes)
- Seize fishing gear
- Temporary suspension of the permits of vessels, crew members or the vessel-owner
- Revoking the operating licenses of vessels, vessel-owners, agents, maritime personnel or fishers



ANNEX

OVERALL CAPEX ESTIMATION

INVESTMENT ITEMS	TOTAL
Maritime Surveillance System	\$392,000
Metal Mechanical Works	\$779,000
Electric Supply and Electric Protection	\$626,800
Security	\$90,000
Civil Works	\$96,000
Telecommunications	\$770,800
Processing	\$779,670
Vessels & Motors (incl. Critical spare parts)	\$206,000
Infrastructure	\$102,000
TOTAL	\$3,842,270

OPEX ESTIMATION

I. REFERENTIAL MPA CREW REQUIREMENTS

TITLE	CANT.	ANNUAL (INC. 33% BENEFITS)	TOTAL
Area Director	1	\$24,000	\$24,000
Marine Park Wardens (on board and at Control Center)	6	\$14,400	\$86,400
TOTAL / YEAR			\$110,400

2. FUEL

Operation with 100HP or 75HP O/B motor 100HP (4 stroke)

FUEL TYPE	RETAIL PRICE/GAL USD\$
Gas	\$1.50
Diesel	\$1.10

MOTOR TYPE (HP)	MOTOR LOCAL COST (MIN.)	MOTOR LOCAL COST (MAX.)	WOT DEMAND GAL/H.	WOT %	HOURS OF OPERATION (P/MO.)	FUEL CONSUMPTION: GAL/MO.
75	\$9,000	\$10,000	5.59	70%	100	391.59
100	\$13,000	\$14,500	7.46	70%	100	522.12

CHARACTERISTICS	TYPE A	TYPE B
Length	7.5 - 8 m.	9.5 - 12 m.
Minimum Crew	3 h.	3 h.
Economical Speed	8-10 Kt	8-10 Kt
Maximum Speed (WOT)	>28 Kt	>32 Kt
Endurance	6 a 8 h	8-10 h
Propulsion	1 x 75 HP	1 x 100 HP

MOTOR 75HP	VALUE	
Operation Hours/Month	100	3.33 h/day
TOTAL Gal/Month	391.59	Gal
TOTAL USD Fuel/month	\$587.38	
TOTAL USD / YEAR	\$7,048.57	

MOTOR 100HP	VALUE
Operation Hours/Month	100
TOTAL Gal/Month	522.12
TOTAL USD Fuel/month	\$783.17
TOTAL USD / YEAR	\$9,398.09

3. CASH FLOW

CAPEX (PER SITE ESTIMATE)	
ITEMS	UNIT COST
10m Vessels Cost	\$14,000
100HP O/B Motor	\$15,500
Surveillance System (Camera, tower, electric supply)	\$114,800
Telecommunications and Processing System	\$130,110
TOTAL	\$274,410

OPEX (PER SITE ESTIMATE)						
ITEMS FOR A REFERENTIAL MPA	FIXED ASSET %/YEAR	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Salaries		\$110,400	\$110,400	\$110,400	\$110,400	\$110,400
Fuel (75 HP O/B motor)		\$9,398.09	\$9,398.09	\$9,398.09	\$9,398.09	\$9,398.09
Maintenance	3%	\$885	\$885	\$885	\$885	\$885
Repairs (motor and hull)	5%	\$1,475	\$1,475	\$1,475	\$1,475	\$1,475
Surveillance System	3%	\$3,444	\$3,444	\$3,444	\$3,444	\$3,444
VHF communications & Microwave links	3%	\$3,903	\$3,903	\$3,903	\$3,903	\$3,903
EXPENSES FLOW		\$129,505	\$129,505	\$129,505	\$129,505	\$129,505

4. OVERALL CAPITAL EXPENSES ESTIMATION

COST PER SITE / STATION		\$31,700	\$14,500	\$0	\$23,600	\$1,000	\$85,300	\$126,150	\$73,050	\$245,950	\$37,650	\$21,700	\$1,000	\$86,700	\$111,500	\$21,550	\$48,050	\$550	\$210,750	\$35,500	\$31,560
SYSTEM COMPONENTS	REFERENTIAL UNIT COST (INSTALLED)	SAN LORENZO - REMACAMP	LA TOLA	RIO VERDE	ESMERALDAS	OF. MAE TONSUPA	COQUITOS (NODO)	MAE GALERA-SF	UNION MANABITA	QUINGÜE (NODO)	MUISNE	CORAZÓN-FRAGATA	OFIC. MAE PORTOVIEJO	JABONCILLO	EL MANGO	MAE SAN LORENZO - PACOCHE	ISLA DE LA PLATA	MIRADOR FRAILES	BOLA DE ORO (NODO)	PNM SUR	MAE MACHALILLA
1. MARITIME SURVEILLANCE SYSTEM																					
Visual Daylight/Lowlight w/IR illuminator Cameras. 300-400 mm lens	\$40,000							1	1						1		1				
Visual Daylight/Lowlight Camera w/IR illuminator. 120-150 mm lens	\$32,000																				
2. METAL MECHANICAL WORKS																					
Squared Tower 12m(for comms. Equipment)Installed	\$15,000											1		1		1					
Squared Tower 24m (for comms. Equipment)Installed	\$30,000							1	1						1				1	1	
Squared Tower 36m (for comms. Equipment) Installed	\$45,000																				
Squared Tower 48m (for surveillance sensors)Installed	\$132,000																				
Squared Tower 36m (for surveillance sensors)Installed	\$60,000									1											
Current Towers Refit	\$12,000	1	1			1	1				1										
Fiber glass + metallic Shelters 3.5m x 3.5m	\$18,000																				
Fiber glass + Metallic outdoors cabinet 2m x 1.5m	\$2,500	1	1			1	1	1				1	1			1			1		
3. ELECTRIC SUPPLY AND ELECTRIC PROTECTION																					
Supply line (100mts legs, include fiber glass posts)	\$2,800						2			1				1						2	
Transformers 10 KVA	\$2,500						1			1				1						1	
Distribution Panels (single phase) & Breakers (90A, 50A, 40A)	\$2,000						1			1				1						1	
Electrical Protection																					
Lightning Rods	\$5,500						1			1				1						1	
Grounding Mesh (ground Kits, 4 bronze bars,includes installation)	\$8,500						1			1				1						1	

5. MARINE PARK WARDENS REQUIRED TRAINING

ACTIVITY	DIRECTOR	CC OPERATORS	MARINE WARDENS
"Green Class Room" course (Basic Park Wardens Training)	X	X	X
IMO Basic Course: First Aid, survival at sea, fire control.	X	X	X
Marine and Coastal Control Operations:			
Maritime & Marine Environmental regulations	X	X	X
Basic Marine Ecology and MPA eco-system review	X	X	X
Nautical Charts reading and pilotage navigation	X	X	X
VHF Radio Operation (pro's - con's)	X	X	X
GPS Operation	X	X	X
Surveillance at sea: Use of binoculars, night vision devices and Thermal sensors. Concepts & practice	X	X	X
Operations planning procedures	X		
Operations execution Procedures	X		
Bearding and CSI Procedures	X	X	X
AIS & other electronic maritime control system: Basic Theory & applications	X	X	X
Inter-Institutional Operational Procedures. Information sharing and interactions	X		
O/B motors basic maintenance	X	X	X
Strategic Planning and available assets use.	X		
Operations Procedures at Control Centers & Remote Surveillance	X	X	X
Legal Procedures			
Crime Scene Investigation	X	X	X
Report Formats & Writing reports Tips	X	X	X
Legal Proceedings: Administrative Sanctions and the Judicial Process	X	X	X

6. CAMERAS TECHNICAL SPECIFICATION

TECHNICAL SPECIFICATION

ITEM	PARAMETER	PERFORMANCE SPECS/REQUIREMENTS
1.	Azimuth Range	360° Continuous
2.	Elevation Range	From -30° to +60° or better
3.	Focus	Automatic
4.	Horizontal Field of View	Variable and Continuous
5.	Wide Angle	≥ 20°
6.	Narrow Angle	≤ 2°
7.	Digital Resolution	640 x 480 (required), 1280 X 720 - HDTV (optional), 1920 X 1080 - HDTV (optional)
8.	Frames per second	≥30 @ HDTV 640x48
9.	Zooming capacity Digital Zoom Optical Zoom	≥400 (combined optical + digital) ≥4X ≥100X
10.	Image enhancing	Digitally processed. Image enhancing algorithms
11.	Residual light	0.0003 lux in B&W mode, <0.3 lux in Color mode
12.	Video Output format	NTSC, PAL
13.	Video Compression	H.264, Motion JPEG-4
14.	Video Output connectors	BNC, RS-232, RS-485
15.	Image capture format	TIFF or JPEG
16.	Programmable search	YES
17.	Activity/Motion detection (multiple simultaneous targets on screen)	YES
18.	Data interface	RS-232 and/or RS-422, Ethernet RJ-45
19.	Timestamping, target azimuth on video screen and stored video	YES
20.	Environmental Standards	
21.	Operational temperature range	0°C to 55°C
22.	Ingress protection rate	IP-66 (resists water jets)
23.	Sand and Vibration	Mil Std 810-F or better
24.	Power Supply Energy Consumption Desktop server Video Recording	12/24/48 VDC 50 W Reference: HP DL360e Gen8 E5-2403 w/video card and HDD 2TB internal
25.	Storage	4 Tbytes external
26.	Stored video FPS	Same as live video
27.	Time stamp / Azimuth on stored video	YES
28.	Monitor	23" Screen or better
29.	Networking	IP v4/v6, QoS
30.	MTBF	MTBF Better than 12000 hours

7. VHF COMMUNICATIONS NETWORK

VHF DSC RADIO BASE AT CONTROL CENTER

ITEM	PARAMETER	SPECIFICATIONS/REQUIREMENTS
1.	Frequency Band	Mobile Marine: 156.000 MHz - 162.025 MHz
2.	Tx Power	25 W
3.	DSC capacity	DSC Class A
4.	Channel bandwidth	12.5 kHz over all MM channels
5.	GMDSS compliant	According to Palauan region. Audio/Visual alarm required
6.	Microphone/Loudspeaker	Hand microphone with PPT button type. External speaker (Wall/desk mounted loudspeaker)
7.	Operational Temperature Range	0°C to +55°C
8.	Power supply	12VDC
9.	Ingress protection rating	IP-X6 or better
10.	Antenna: <ul style="list-style-type: none"> • Type • Frequency Range • Nominal Impedance • Maximum input power rating • Gain • Material • Quantity 	Dipole, omni-directional. Mobile maritime range preferred. If not, maximum range would be 146.0 to 162.5 MHz 50Ω >100W 6 dB Fiber glass or polyurethane lacquer coated. Specific for open marine environments Two (2). One for VHF communications and the second for simultaneous DSC reception

VHF RADIO BASE (MARINE)

ITEM	PARAMETER	SPECIFICATIONS/REQUIREMENTS
1.	Frequency Band	Mobile Marine: 156.000 MHz - 162.025 MHz
2.	Tx Power	25 W
3.	DSC capacity	DSC Class D
4.	Channel bandwidth	12.5 kHz and 25kHz over all MM channels
5.	Microphone/Loudspeaker	Hand microphone with PPT button type. Internal speaker
6.	Operational Temperature Range	0°C to +55°C
7.	Power supply	12VDC
8.	Ingress protection rating	IP-X6 or better
9.	Antenna: <ul style="list-style-type: none"> • Type • Frequency Range • Nominal Impedance • Maximum input power rating • Gain • Material • Quantity 	Dipole, omni-directional Mobile maritime range preferred. If not, maximum range would be 146.0 to 162.5 MHz 50Ω >100W 3 dB Fiber glass or polyurethane lacquer coated. Specific for open marine environments One

VHF RADIO PORTABLE (MARINO)

ITEM	PARAMETER	SPECIFICATIONS/REQUIREMENTS
1.	Frequency Band	Mobile Marine: 156.025 MHz - 162.025 MHz
2.	Tx Power	High and Low positions with maximum 5W output
3.	Battery life	≥ 8 hours operation at low power
4.	DSC capacity	DSC Class D
5.	Channel bandwidth	12,5 kHz and 25kHz over all MM channels
6.	Microphone/Loudspeaker	Both internal
7.	Operational Temperature Range	0°C to +55°C
8.	Power supply	Internal long life Battery
9.	Ingress protection rating	IP-X7 with floating capacity
10.	GPS	YES, internal. Better than 24 channels

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INDIVIDUAL ON-BOARD SECURITY EQUIPMENT (PER VESSEL)

ITEM	QTY	UNITS	ON BOARD EQUIPMENT	ESTIMATED LOCAL PRICE	TOTAL
1.	2	U.	25W marine Megaphone with rechargeable batteries	\$ 60.35	\$ 120.69
2.	1	U.	Portable, waterproof/shockproof GPS	\$ 525.00	\$ 525.00
3.	4	U.	First Aid Kit	\$ 25.00	\$ 100.00
4.	12	U.	Life saving jacket (PFD)	\$ 114.75	\$ 1,377.00
5.	1	U.	O/B 15HP Motor (for emergency use)	\$ 3,000.00	\$ 3,000.00
6.	3	U.	Marine waterproof Binoculars 12X50 or 16X50	\$ 250.00	\$ 750.00
7.	1	U.	Marine Night vision Binoculars 5X Optical Zoom	\$ 1,400.00	\$ 1,400.00
8.	3	U.	Portable LED search light. Waterproof and with rechargeable batteries	\$ 190.00	\$ 570.00
9.	1	U.	Digital 14 MPixel Shockproof/Waterproof camera with 5X Optical Zoom and internal GPS	\$ 450.00	\$ 450.00
10.	2	U.	Additional Batteries for digital camera	\$ 23.00	\$ 46.00
11.	2	U.	Digital camera holster	\$ 35.00	\$ 70.00
12.	2	U.	32 GB SDHC flash memory for the digital camera	\$ 52.00	\$ 104.00
13.	6	U.	Leatherman multiple tool	\$ 115.00	\$ 690.00
14.	6	U.	Rechargeable, waterproof, positive buoyancy flashlight with additional battery	\$ 35.00	\$ 210.00
15.	8	U.	Inflatable Vinyl fender (8" x 24", white)	\$ 105.00	\$ 840.00
16.	6	U.	Inflatable Vinyl fender (12" x 36", white)	\$ 135.00	\$ 810.00
17.	6	U.	Flares Kit	\$ 81.00	\$ 486.00
18.	2	U.	Vernier Caliber	\$ 25.00	\$ 50.00
19.	4	U.	Pelican Case 1620	\$ 325.00	\$ 1,300.00
20.	2	U.	Police lights	\$ 350.00	\$ 700.00
SUB - TOTAL					\$ 13,598.7

CRITICAL SPARE PARTS (PER MPA)

ITEM	QTY.	UNITS	PARTS & MAINTENANCE EQUIPMENT	LOCAL PRICE USD\$	TOTAL
1.	1	U.	Propeller 100 HP O/B motor	\$ 222.00	\$ 222.00
2.	2	U.	Propeller 75HP O/B motor	\$ 130.00	\$ 260.00
3.	4	Box	Spark plugs 100 HP and 75 HP O/B motors	\$ 116.00	\$ 464.00
4.	20	U.	Gas filters 100HP y 75HP O/B motors	\$ 10.00	\$ 200.00
5.	2	U.	12V 105Ah Batteries for 100HP and 75HP O/B motor	\$ 225.00	\$ 450.00
6.	2	U.	O/B motor Remote control cables (Moorse)	\$ 180.00	\$ 360.00
7.	1	U.	Switch board	\$ 120.00	\$ 120.00
8.	3	U.	Fuel Rubber pumps	\$ 15.00	\$ 45.00

REMARKS		YEAR 1	YEAR 2	YEAR 3
	1 per vessel	\$ 120.69	\$ 0.00	\$ 0.00
	1 per vessel in patrol activities	\$ 525.00	\$ 0.00	\$ 0.00
	1 per vessel and 2 at control centers	\$ 100.00	\$ 0.00	\$ 0.00
	6 per vessel	\$ 1,377.00	\$ 0.00	\$ 0.00
	On board vessels in patrol activities	\$ 3,000.00	\$ 0.00	\$ 0.00
	1 per vessel and 1 at control centers	\$ 0.00	\$ 750.00	\$ 0.00
	For night patrols	\$ 0.00	\$ 1,400.00	\$ 0.00
	1 per vessel	\$ 570.00	\$ 0.00	\$ 0.00
	1 camera per vessel	\$ 450.00	\$ 0.00	\$ 0.00
		\$ 46.00	\$ 0.00	\$ 0.00
		\$ 70.00	\$ 0.00	\$ 0.00
	For the cameras	\$ 104.00	\$ 0.00	\$ 0.00
	1 per park warden	\$ 690.00	\$ 0.00	\$ 0.00
	1 per park warden	\$ 210.00	\$ 0.00	\$ 0.00
	For vessels 10m length	\$ 840.00	\$ 0.00	\$ 0.00
	For vessels 6 to 8 m length	\$ 0.00	\$ 810.00	\$ 0.00
	2 per vessel	\$ 0.00	\$ 486.00	\$ 0.00
	For measuring captured species	\$ 50.00	\$ 0.00	\$ 0.00
	2 per vessel for storing handheld equipments and log books	\$ 1,300.00	\$ 0.00	\$ 0.00
	Marine weatherized	\$ 700.00	\$ 0.00	\$ 0.00
		\$ 10,152.7	\$ 3,446.0	\$ 0.0

REMARKS		YEAR 1	YEAR 2	YEAR 3
		\$ 222.00	\$ 222.00	\$ 222.00
		\$ 260.00	\$ 260.00	\$ 260.00
		\$ 464.00	\$ 464.00	\$ 464.00
		\$ 200.00	\$ 200.00	\$ 200.00
		\$ 450.00	\$ 450.00	\$ 450.00
		\$ 360.00	\$ 0.00	\$ 360.00
		\$ 120.00	\$ 0.00	\$ 120.00
		\$ 45.00	\$ 45.00	\$ 45.00

ITEM	QTY.	UNITS	PARTS & MAINTENANCE EQUIPMENT	LOCAL PRICE USD\$	TOTAL
9.	10	Tubes	Grease	\$ 18.00	\$ 180.00
10.	2	U.	Yamaha/Mercury tools set	\$ 140.00	\$ 280.00
11.	1	U.	Yamaha/Mercury Pressure testers	\$ 500.00	\$ 500.00
12.	1	U.	Yamaha/Mercury diagnostic computer (inc. PC)	\$ 2,800.00	\$ 2,800.00
13.	1	Set	Critical spare parts (as manufacturer's recommendations) Fuel pump, filter set, propeller shaft, starter, carburetor, pistons, crankshaft bearings, seals set, rings set, etc. Carburetor repair set, starter motor group, starter, bearings set, Starter relay, forward/reverse transmission, transmission bearings, etc.	\$ 4,500.00	\$ 4,500.00
SUB-TOTAL					\$ 10,381.0



REMARKS	YEAR 1	YEAR 2	YEAR 3
	\$ 180.00	\$ 180.00	\$ 180.00
	\$ 280.00	\$ 0.00	\$ 0.00
	\$ 0.00	\$ 500.00	\$ 0.00
	\$ 0.00	\$ 2,800.00	\$ 0.00
	\$ 4,500.00	\$ 4,500.00	\$ 4,500.00
	\$ 7,081.0	\$ 9,621.0	\$ 6,579.0





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