



CUBA

GARDENS OF THE QUEEN
ENFORCEMENT PLAN

ASSESSMENT METHODOLOGY

This assessment represents the work of a multi-national team and was carried out in Cuba over a 2-week period in April 2016. Research methods were developed and applied by WildAid in cooperation with Global Conservation and Marlin Azulmar. Interviews were carried out with the following actors: Fishery officers, Flora and Fauna Wardens, naturalist guides, Marlin Azulmar, and Garden of the Queens fishermen. Despite both resource and time constraints, we are confident that sufficient information was collected to create a practical, yet versatile control and vigilance system.

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ABOUT GLOBAL CONSERVATION

Today, world heritage and national parks are becoming our Last Bastions of Defense against the decimation of wildlife and primary forests. Illegal poaching, logging, mining, land clearing and human encroachment are destroying our last intact wild places in the developing world. In the next decade, we will destroy over 50% of our last remaining intact wildlife habitats for megafauna - tigers, primates, bears, lions, elephant and rhinos. At current rates of deforestation, the last major intact primary forests in developing countries will reside only in best protected national parks and world heritage sites. Global Conservation is the only nature conservation group who's sole mission is the direct funding of park protection systems for saving our most important and endangered world heritage and national parks in developing countries.

www.globalconservation.org

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 protection model that strengthens management and enforcement of marine areas throughout the developing world. We work with governments in the design of strategic 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 and educational campaigns to inform the community of regulations and alternatives to unsustainable practices.

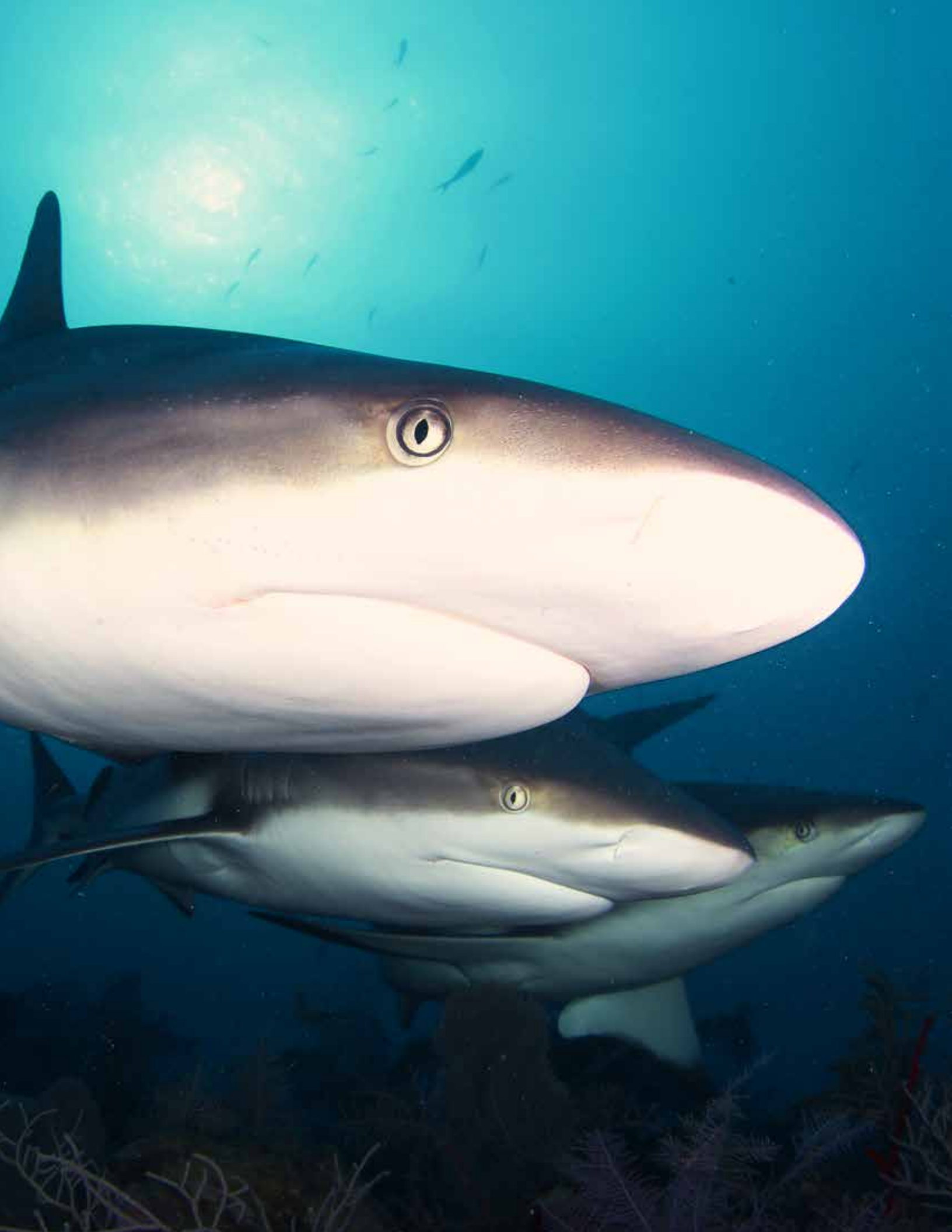
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ACRONYMS

AIS	Automatic Identification System
CAPEX	Capital Expenses
C&V	Control and Vigilance
EMS	Electronic Monitoring Systems
ENPFF	National Business for the Protection of Flora and Fauna
ETESCA	Cuba State Telecommunications Company
GQNP	Garden of the Queen National Park
HP	Horse Power
ITAR	International Traffic in Arms Regulations
MPA	Marine Protected Area
NM	Nautical Miles
NGO	Non Governmental Organization
NTZ	No-take Zone
IMO	International Maritime Organization
OB	Out Board Motor
OPEX	Operating Expenses
SOP	Standard Operating Procedures
VHF	Very High Frequency

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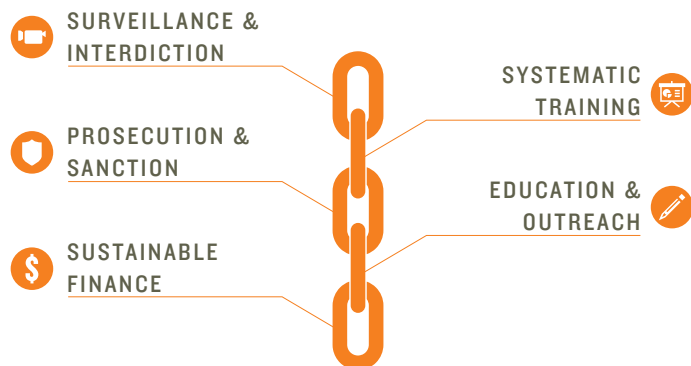
MARINE RESERVE CONTROL & VIGILANCE SYSTEM

DESIGN OBJECTIVES

The main objective of this assessment is to design a cost effective control and vigilance system for the Gardens of the Queen marine protected area (MPA). The specific objectives are:

1. Develop a practical control and vigilance system for the Gardens of the Queen based on interviews of local enforcement actors, analysis of existing enforcement strategies and a comprehensive site visit.
2. Prioritize a series of recommendations to optimize patrol costs and increase detection efficacy using Electronic Monitoring Systems (EMS).

LAW ENFORCEMENT CHAIN



WildAid's marine protection model is based on the law enforcement chain that encompasses the activities of detection, interdiction, prosecution and sentencing of lawbreakers. An effective law enforcement system should dissuade potential lawbreakers from committing illegal activities as the consequences/risks associated with apprehension outweigh economic gain. The law enforcement chain requires that each link function in an effective manner and no one link is more important than the other. In addition to these components, and part of WildAid's MPA enforcement chain, are outreach and education of stakeholders to increase MPA acceptance and compliance, as well as sustainable financing streams to fund ongoing operations.

RELEVANT SITE INFORMATION

LEGAL FOUNDATION:

The Gardens of the Queen MPA was created in 1996 via Cuba's Fisheries Law No. 164. On April 8, 2010 the MPA was categorized as a natural park via Decree 6803 to be administered by the Ministry of Agriculture. The Ministry of Agriculture conceded the administration to the National Business for the Protection of Flora and Fauna (ENPFF) via Resolution No. 1254 on December 30, 2015. All logistics provided to foreign vessels as well as tourism services must be contracted with the tourism operator Marlin Azulmar via Ministerial Resolution No. 26 signed March 22, 2016. Tourism entrance fee of US\$10 per person is collected by Marlin Azulmar and then distributed to ENPFF periodically.

LOCATION & SIZE:

The National Park Gardens of the Queen encompasses a surface area of 217,026 ha. of which 16,079 are terrestrial and 200,957 marine. The Archipelago spans roughly 70 miles West to East with an average width of 2.5 miles increasing to 14 miles at its eastern-most extremity. The archipelago is located within the

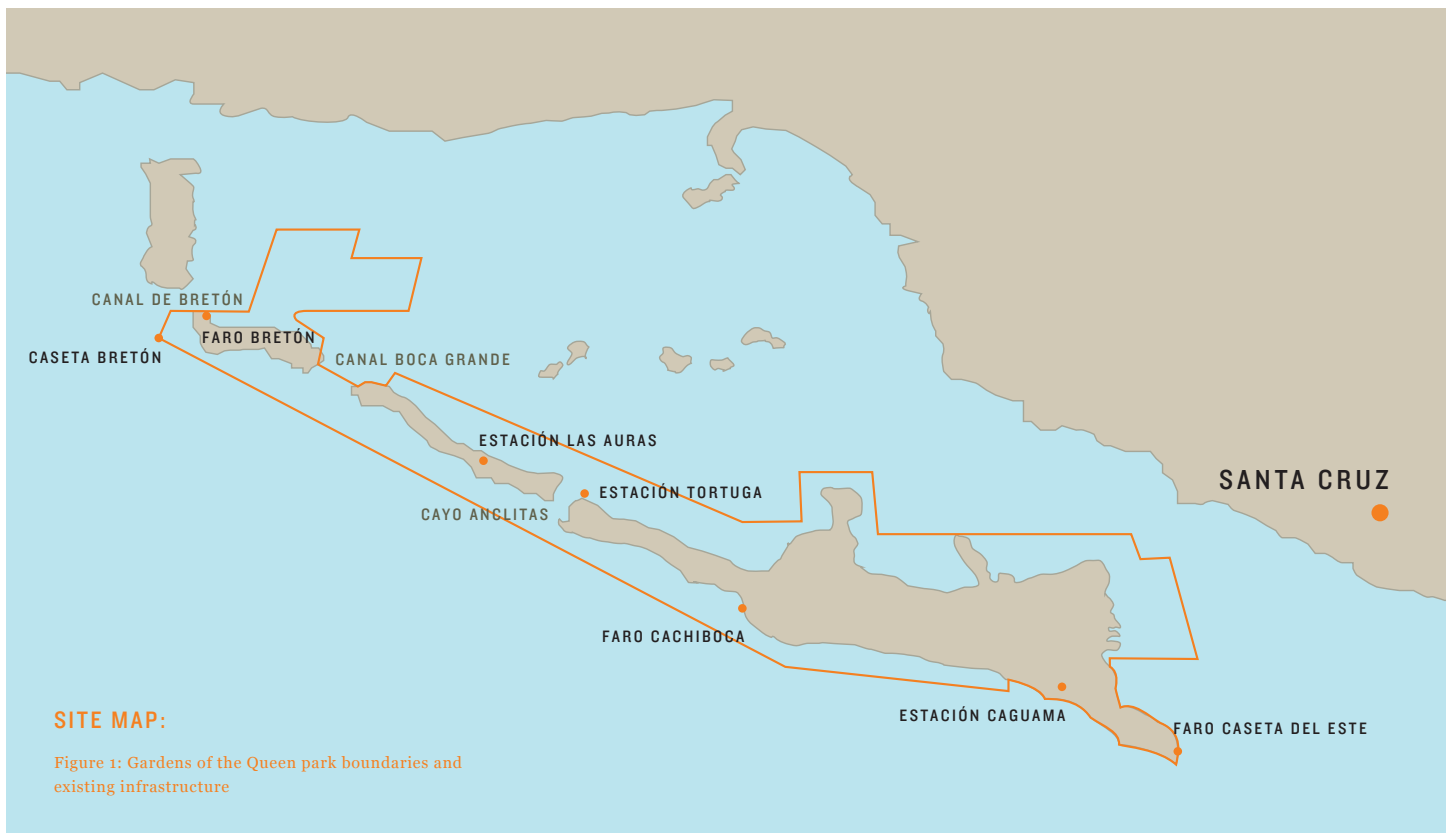
jurisdictions of three provinces: Espiritu Santo, Ciego de Avila and Camigüe. At its western extremity, the Gardens are roughly 46NM from Jucaro and from the eastern extremity, they are 18NM from the town of Santa Cruz.

BIODIVERSITY INFORMATION:

The Gardens of the Queen remains one of the most pristine and diverse MPAs in the Western Hemisphere despite overfishing. It is home to a vast array of species that rely on the connectivity of the coral reefs, sea grass, mangrove and open sea ecosystems. The confluence of terrestrial and oceanic currents converge over three ecosystems:

1. Mangroves, which serve as habitat for oysters and a nursery for many animals;
2. Sea-grass beds with high primary production and food for herbivores and carnivores; and
3. Coral reefs with tremendous biodiversity that provide shelter for fish and invertebrates.

The Gardens of the Queen's species include the American saltwater crocodiles, manatees, Queen conch, sea turtles, silky and nurse



sharks, among others. Key commercial species include: Spiny lobster and conch, white shrimp and pink shrimp, mackerel, Grouper (Black, Nassau, Goliath, Tiger, Yellow, Spotted), snapper, grunts and tuna (Skipjack and Black fin). Many species feed at night in the sea grass and take shelter in the reefs by day.

ISLAND INFRASTRUCTURE:

TOURISM:

- One floating 8-room hotel at Tortuga, a local dive shop with two compressors, and quarters for 20 workers
- 19 fly fishing skiffs with 60-70HP Yamaha 4-stroke OB motors
- Six 24ft. dive boats: Cinco Balas and Raya with 150HP OB motors/ Atlantic Diver, Anclita, Alfa, and Mares III with 60HP OB motors.
- A robust VHF marine radio network, electric generator
- Three 100-foot dive liveaboards: Avalon I + II, and the Aggressor with an additional vessel on the way.
- Three liveaboards of lesser length: Reina, Halcón and Georgina.
- Tanker: 38,000 liters of gas every 60 days & 7,000 liters monthly for 2 months of fleet operations.
- Maintenance: OB motor repair and a dry dock for repair of small vessels. Vessels transit to Júcaro and Cienfuegos for major repairs.
- National Business for the Protection of Flora and Fauna (ENPFF): Station Las Auras (West) & Caguama (East)
- Lighthouses (West to East):

Faro Breton:	33M	N21°07'21.67" / W79°0.26'56.5"
Faro Cachiboca:	34M	N20° 41' 27.6" / W 78°0.45'2.88"
Faro Cabeza de Este:	25M	N20° 31' 4.17" / W78° 19' 51.38"

LOBSTER PROCESSING PLANTS (West to East):

Caseta Breton	(Closed)
Peralta	(Operational: 200-250MT harvest in 2015 vs. 1,300MT ten years ago)
Pedro Soto	(Closed)

NATURE OF THREATS AND MANAGEMENT CONCERNS

ILLEGAL FISHING	<ul style="list-style-type: none"> • Artisanal fishers from Santa Cruz target lobster, finfish, turtles and jutias (native island rodents) • Targeting of undersized and out of season marine species • Fishing gear: spear guns and nets
TOURISM	<ul style="list-style-type: none"> • Anchoring in sensitive areas and coral destruction • Lack of demarcation buoys or mooring buoys for foreign vessels
POLLUTION/CONTAMINATION	<ul style="list-style-type: none"> • Lack of grey and black water treatment • Bilge waters from foreign sailboats
GLOBAL WARMING	<ul style="list-style-type: none"> • Hurricanes and storm surges cause coastal degradation and affect primary productivity of mangroves, reefs and lobster fishery • Localized coral bleaching episodes due to seasonal changes in sea surface temperature
INVASIVE SPECIES	<ul style="list-style-type: none"> • Lionfish

PERMITTED ACTIVITIES:

- Investigation and monitoring of lobster by the park and EPISUR
- Maritime trafficking and anchoring of vessels at authorized locations
- Artisanal Fishing: not permitted
- Commercial fishing: Lobster (closed from January to July) & bonito
- Sport: Tarpon, permit and bonefish (Catch and Release) / 2,000 annually
- Tourism: Scuba diving and snorkeling. 2,500 divers annually at over 80 dive sites

FISHER CHARACTERISTICS:

- There are an estimated 800 fishers and 40 fishing vessels
- Artisanal fishers access the Garden of the Queens by 4-meter skiffs using 10HP outboard motors and some operate from fishing camps within the lagoons on the North East area of the archipelago closest to Santa Cruz. Artisanal fishers also work in coordination with commercial vessels.
- Commercial fishers: Five to six 15-meter vessels target lobster and albacore
- Fishing gear: Hand lines and lobster pots

TELECOMMUNICATIONS:

- UHF and VHF on liveaboards / VHF base radios in each fly-fishing boat. Relay carried out by liveaboards though repeaters could be considered to improve radio coverage. Flora and Fauna uses a private channel radio. Internet is contracted directly via the Cuban State Telecommunications Company (ETESCA) for the floating hotel and dive shop.

REVIEW OF EXISTING PATROL OPERATIONS

Upon arrival to the Gardens of the Queen, we carried out a physical site survey and interviewed key actors involved in maritime enforcement.

GOVERNMENT AGENCY	COMPETENCY	PHYSICAL PRESENCE	SCOPE OF ACTIVITIES	BUDGET, PERSONNEL & INFRASTRUCTURE	OBSERVATIONS
FLORA AND FAUNA	Fish and wildlife resources enforcement. Officers do not bear firearms nor possess the power of arrest. Offices administered by two different provinces.	Two small bases: Las Auras & Caguama	Focus on enforcement of species-specific regulations: marine turtles, crocodile, manatees, coral reefs, sea grasses, birds, and iguanas.	Las Auras: Small office with bunks for 6 officers with kitchen and solar power. Total of 8 officers (15-Day Shifts of 6 officers ((technical and operational job bands paying 315 and 260 pesos cubanos, respectively)) / One 6-meter vessel w/ diesael engine (well-maintained and operational) / 2 private channel handhelds / NO uniforms, binoculars nor camera. 150 liter fuel ration for 15 days. Officers reported that new patrol vessel was to be delivered soon. Caguama: Larger office with bunks for 6 officers with kitchen and solar power. Total of 12 officers (15-Day Shifts of 6 officers ((technical and operational job bands paying 315 and 260 pesos cubanos, respectively)) / One 6-meter vessel w/ 40HP 2-stroke OB motor (operational) / 2 private channel handhelds / NO uniforms, binoculars nor camera. Patrols limited by fuel.	Officers undergo limited training and must coordinate with Fisheries for fishing violations. NO SOPS, job aides, nor reporting formats. Illegal fishing fines can reach 7,500 pesos cubanos (CUC\$300) though no officer could recall a recent citation (2015). Officers claimed that fuel was their primary limiting factor. No budgetary information available at either site.
FISHERIES	Fishery Enforcement. Officers possess the power of arrest.	Marlin Azulmar provides housing for officers	Daily patrols with Avalon-provided skiff and captain. Patrols normally target Boca Grande and Cabeza del Este.	Two uniformed fisheries inspectors are assigned to the Archipelago. They do not possess an office, vessel nor surveillance equipment. Avalon provides all operational support. Inspectors carry out 15-day shifts and typically alternate patrols to the east and then west.	Flora and Fauna officers and Avalon staff stated that Fishery inspector presence served as a strong deterrent for illegal activities.

In summary, Flora and Fauna and Fisheries have clear jurisdictions and competencies, however, given resource constraints, their effectiveness is limited. Despite owning two physical base camps, Flora and Fauna does not have sufficient resources to carry out meaningful patrols. While Fisheries have even fewer resources, their partnership with Marlin Azulmar combined with their perceived authority makes them a more effective enforcement agency. Fishery inspectors currently conduct routine patrols around illegal fishing hot spots: Boca Grande and Cabeza de Este. Fishing inspectors claimed that up to 200 illegal fishers entered the Gardens of the Queen when the liveaboards returned to Jucaro and when they were not present on the archipelago. It is clear that government capacity is extremely limited and sustaining operations in Gardens of the Queen is costly. In the absence of tourism, there would be practically no enforcement presence or rule of law in the Archipelago.

The vast number of liveaboards, fly-fishing skiffs and dive tenders actually serves as a critical deterrent for illegal fishers within the MPA. Marlin Azulmar divided the archipelago into three macrozones and they distribute fishing vessels and skiffs based on the

effects of fishing on each macrozone. The presence of the tourism sector cannot be understated as an effective deterrent and is a tremendous conservation asset. While Marlin Azulmar dedicates one fly fishing skiff to joint patrols with the Fisheries inspectors, 18 other fly-fishing skiffs, six liveaboards and numerous dive tenders all serve as important sensors to alert authorities of suspicious or illegal activity throughout the Archipelago and its labyrinth of canals. Marlin Azulmar has a robust VHF radio network and fuel-efficient four-stroke OB motors, which is especially critical given the cost of fuel at US\$4/gallon.

As illustrated below by the arrows, there are various routes that artisanal fishers and commercial vessels travel to reach the archipelago. The western region of the archipelago receives less incursions from artisanal fishing vessels given its distance from Cuba proper. The eastern region, on the other hand, lies less than 18 NM from the town of Santa Cruz and has been a traditional fishing area for locals. There are numerous cayes and canals that some claim are a natural extension of their territories. Marlin Azulmar distributes its vessels in the following manner:

MACROZONES	BOATS
A	4-6 BOATS
B	6-8 BOATS
C	4-6 BOATS

DISTANCE & TIME	FARO CAYO BRETÓN	BASE TORTUGA	FARO CABEZA DEL ESTE
FARO CAYO BRETÓN	0	40NM - 80 MIN	88NM - 170 MIN
BASE TORTUGA	40NM - 80 MIN	0	48NM - 90 MIN
FARO CABEZA DEL ESTE	88NM - 170 MIN	48NM - 90 MIN	0

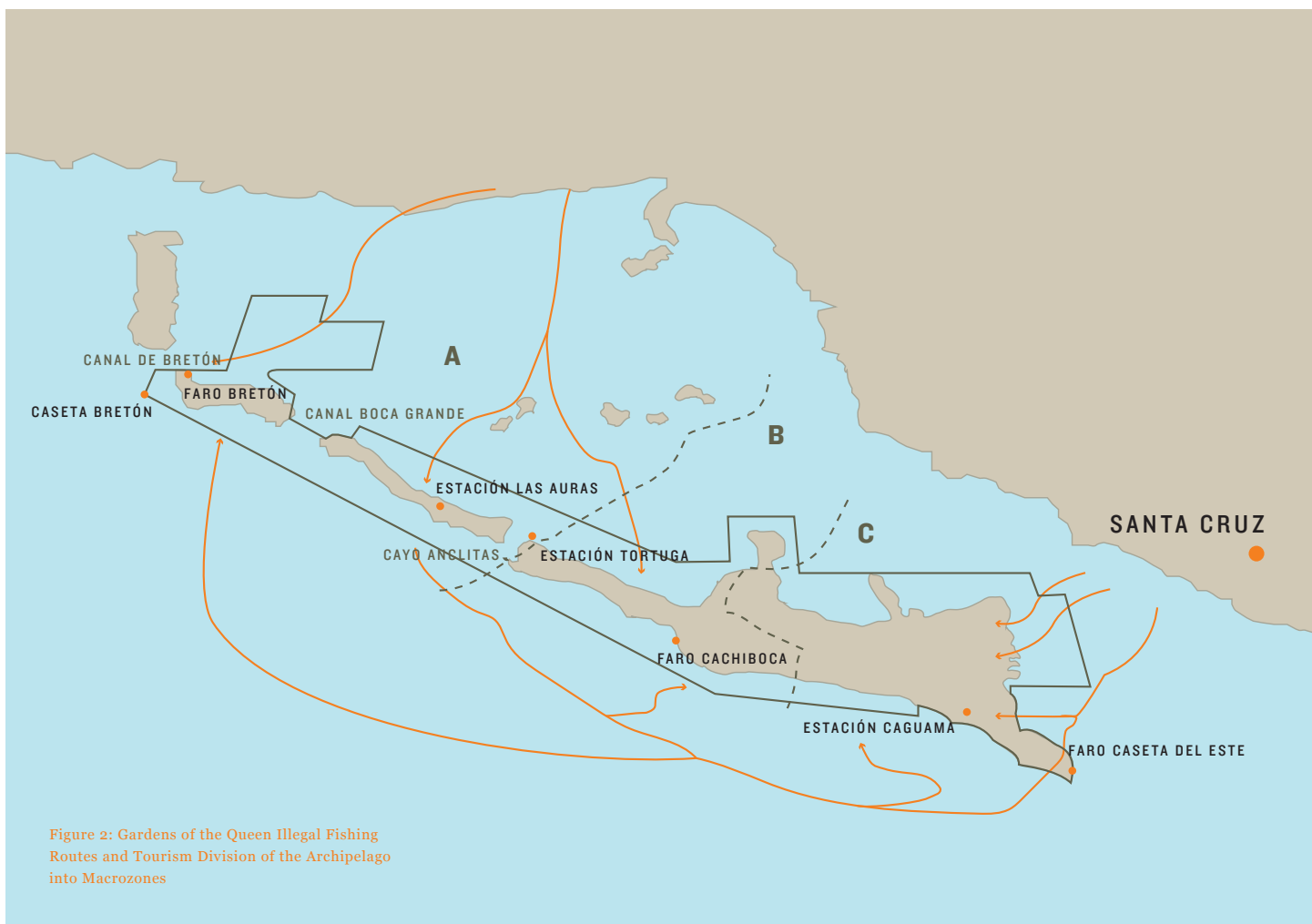


Figure 2: Gardens of the Queen Illegal Fishing Routes and Tourism Division of the Archipelago into Macrozones



TECHNOLOGY OPTIONS FOR SURVEILLANCE

WildAid carried out an exhaustive site inspection to determine the best possible combination of surveillance technology given site characteristics, the profile of stakeholders, use patterns, and capital and operating costs. In this section, we will briefly examine surveillance technology options and justification for final recommendations. Ideally, the surveillance system should cover the total area of the GQNP as well as a small buffer area beyond its boundaries. In terms of extension, the GQNP is unique given its relatively small 500-meter no-take buffer around the island. Normally MPAs have a minimum of 2-12NM. The GQNP extends 70 NM from West to East and extends 2.5 NM from North to South, with an exception of the most eastern extremity of 12.5 NMs.

TECHNOLOGY ANALYSIS

COLLABORATIVE monitoring systems require vessels to install and activate location transceivers on-board. Location messages include information such as: Vessel name, latitude, longitude, course and speed. The country must enact a specific regulatory law to compel vessel owners to purchase and activate on-board transceivers. If the location device is disconnected or tampered, the shore stations and control centers will not see the vessel's position. As lawbreakers tend to deactivate transceivers, regulations must consider penalties for opportunistic tampering. A major drawback of these systems is that they will not detect fishers from other areas or countries that do not employ transceivers.

SATELLITE VESSEL MONITORING SYSTEM (VMS)

CRITERIA	VMS is a satellite-based monitoring system that provides vessel positions around the world. As typical location intervals range from 1-6 hours, VMS is more appropriate for larger vessels and where large oceanic expanses need to be monitored. As the system is satellite based, position frequency incurs a monthly cost to the user. More frequent position intervals translate into a higher monthly cost. VMS is a closed source system: transmitted information is coded and only seen by the ship owner and respective authority. Cuba does not mandate the use of VMS on their vessels. However, some larger commercial vessels that fish in foreign waters have transceivers on-board to comply with international regulations.
RECOMMENDATION	VMS is not suitable for the Gardens as fisher vessels are too small and quick to monitor over one to six hour intervals and the recurring monthly costs are not typically feasible for artisanal fishers.

TECHNOLOGY VHF-SAT AUTOMATIC IDENTIFICATION SYSTEM (AIS)

CRITERIA	AIS is a "focalized" system that works in two different ways. It uses VHF (radio) frequencies with shore-based stations to receive vessel position. This method limits the coverage to the "radio horizon" (usually between 15-80 NM). Shore-based AIS has no cost to the user and provides vessel positions every 3-30 seconds depending on the type of transceiver on board: Class A- merchant ships, and Class B - small vessels. The second way places AIS base stations on satellites, allowing them to overcome range limitations while still using the same VHF spectrum; however this method incurs a user fee. AIS is an open source system: information is public and all AIS equipped vessels can view one another. We typically recommend using shore-based stations to receive vessel positions due to cost considerations.
RECOMMENDATION	AIS could be deployed to monitor tourism operations with the installation of only one AIS Base station tower at Tortuga (there are no geographic obstacles) and the installation of transceivers on liveboards and skiffs, among other vessels. An AIS system could be installed for less than \$50K for the tourism fleet if Marlin Azulmar wanted to provide real-time monitoring of its maritime assets. The incorporation of artisanal fishers would require the following: 1) the reform of the regulatory framework to mandate their use; 2) a government agency to administer the system and verify compliance; 3) transceivers would need to be procured and donated to the fishing sector in addition to reduce operation and maintenance costs. Given limited institutional capacity, the extremely small size of artisanal vessels and resource-poor fishers, we do not recommend the use of an AIS system as a monitoring solution for the artisanal fleet.

TECHNOLOGY ANALYSIS

NON-COLLABORATIVE monitoring systems are the best equipment option when detecting vessels that are intentionally carrying out illegal activities in specific geographic areas or in the absence of collaborative systems. Often we layer systems to make up for the deficiencies of one particular technology with the strengths of another. For example, radar systems often complement AIS systems in order to detect foreign vessels or vessels that have intentionally deactivated their transceivers. In this section, we will briefly examine different non-collaborative technologies and evaluate their potential use at the Gardens.

TECHNOLOGY	RADAR
CRITERIA	Radars are ideal for the detection of medium to large vessels up to 30 NM. Given small vessel size and vessel materials (wood or fiberglass), the detection performance of conventional radars is limited to 6 NM for most artisanal fisheries.
RECOMMENDATION	Radar is not a cost effective option for monitoring Cuban artisanal fishers given the small size and materials (wood) of their vessels.

TECHNOLOGY VISUAL (FIXED FROM OUTLOOK POST & WITH PORTABLE BINOCULARS AND TELESCOPES)

CRITERIA	The strategic placement of observation posts combined with the use of binoculars and/or telescopes can be extremely cost effective in near-shore detection. Typically a patrol boat crewmember has a visual horizon of 4.5 - 5 miles. When lookout height is raised to 12 - 15 meters, visual horizon reaches 9 - 9.5 nautical miles. While visual horizon does not guarantee that small intruders will be detected at those same maximum ranges, maximum visual range data allows planning the outlook posts distribution within the reserve in order to maximize coverage over the most valuable areas and pathways.
RECOMMENDATION	We do not recommend the construction of outlook posts in the Gardens because of the numerous pathways and canals that exist on the northern side of the Island, combined with the mangroves. Average mangrove height is 9 feet, obstructing the view, which makes it very difficult to detect an artisanal vessel. As both Flora and Fauna bases Las Auras and Caguama are not strategically placed in relation to where illegal fishing place takes place, elevated lookout posts should not be constructed there either. We do recommend equipping all fishing skiffs with portable 10X binoculars and waterproof cameras. They already have VHF marine radios.

TECHNOLOGY VIDEO CAMERA

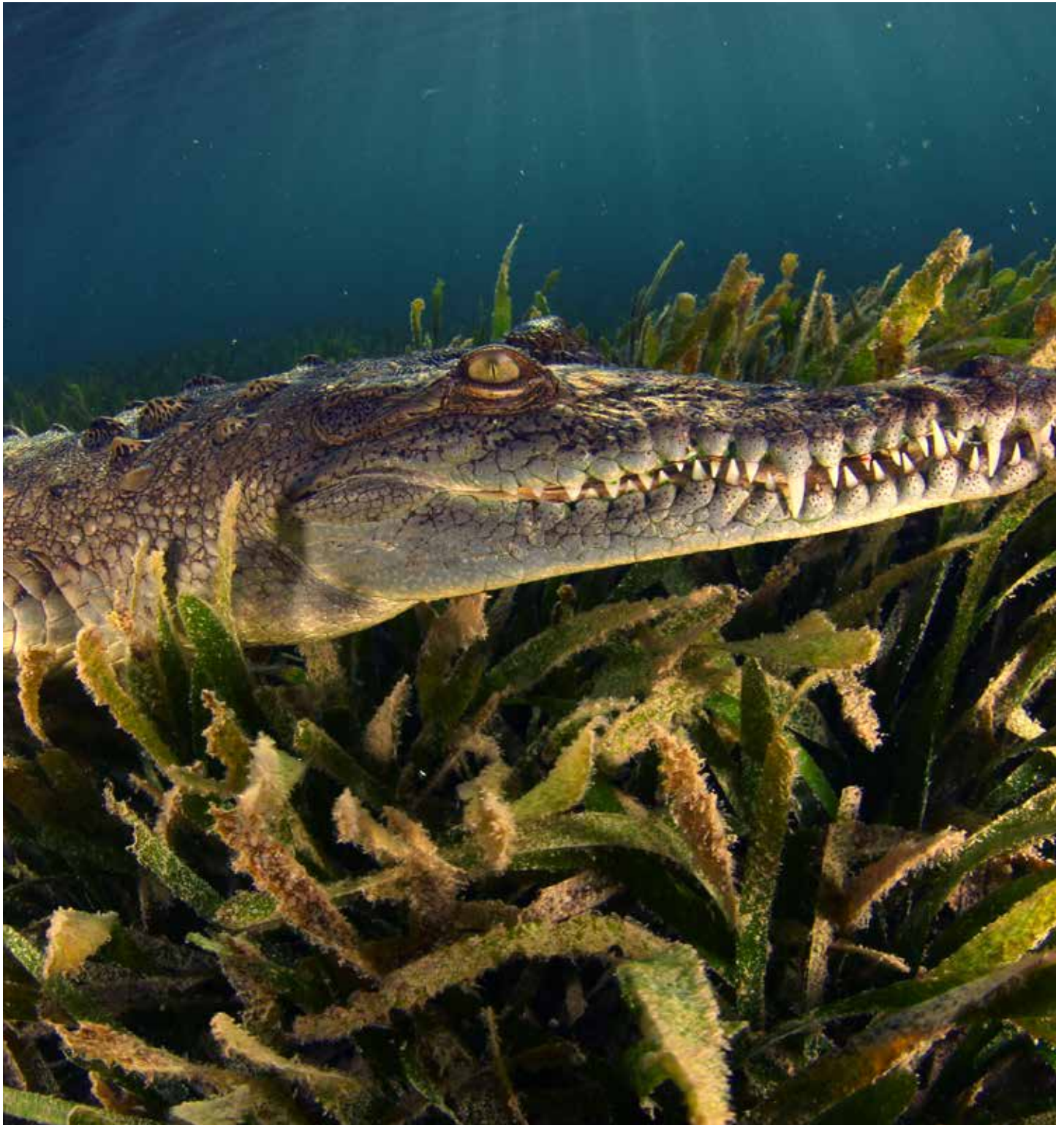
CRITERIA	Visual detection can be enormously improved by the use of fixed cameras. Cameras do require additional infrastructure and the following minimum conditions: <ul style="list-style-type: none"> • a permanent and stable electrical power supply • a 12-48 meter 3-4 wind supported (Guyed) tower for elevation • an operator station to control Zooming, Azimuth (Pan) and Tilt.
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TECHNOLOGY ANALYSIS	
RECOMMEN- DATION	We do not recommend the use of fixed long-range video cameras given the numerous pathways and canals that artisanal fishers can use to access the marine reserve. Mangrove height presents a challenge for large static surveillance towers by obstructing the view, necessitating the need to erect various towers to improve surveillance. We inspected existing lighthouses at Breton and Cabeza del Este, however, even if permits to install cameras could be procured, the video feed would need to be sent over 35NM to a control center located at or near Tortuga. The response time would be over 90 minutes in good conditions. Nonetheless, in the event a mobile surveillance platform were attained, a fixed high power camera could prove useful for enforcement efforts.
TECHNOLOGY	NIGHT VISION DEVICES (NVDS) (FIXED AND PORTABLE)
CRITERIA	Night vision devices operate in a similar way as video cameras with the exception that it “amplifies” the scarce light that could be found in the observed scenario, therefore improving the vision capacity of the observer. Various drawbacks can be noted regarding this technology: <ul style="list-style-type: none"> • When operating in all dark conditions or very poor residual light, the detector will not be able to generate an image • NVDS are not low cost devices and with the advent of more efficient lowlight technology, common daylight/lowlight cameras are the first option from a cost/benefit point of view. • Light amplification requires power, therefore, in portable devices, energy is an issue and normally continuous operation does not exceed 3 to 4 hours.
RECOMMEN- DATION	We do not recommend the use of NVDS at the Gardens.



TECHNOLOGY ANALYSIS	
TECHNOLOGY	THERMAL SURVEILLANCE DEVICES (FIXED AND PORTABLE)
CRITERIA	The use of thermal radiation for marine surveillance revolutionized the former concepts of search and rescue since warm or hot bodies could now be easily detected against colder backgrounds (such as ocean water). Bodies even behind bushes or mangroves are now identifiable.
RECOMMEN- DATION	We recommend procuring two portable thermal binoculars for nocturnal patrols to identify clandestine camps and illegal fishers hiding in the canals.
TECHNOLOGY	UNMANNED AERIAL VEHICLE (UAV)
CRITERIA	UAVs are versatile platforms that can be configured to perform surveillance and detection activities with longer on scene times and less risk than manned aircraft. Operators do not typically require the same degree of training, certification and experience as maritime patrol pilots. UAVs do not require large ground crews, costly maintenance and certifications, and are less weather dependent. In short, they provide the benefit of aerial surveillance similar to that of an airplane at far less cost and with enhanced safety. They are particularly suited to overfly planned patrol lanes (i.e., closed area boundaries).
RECOMMEN- DATION	We believe that a UAV may enhance surveillance and detection capability at the Gardens; however, we will need to investigate alternatives prior to making a recommendation. International Traffic in Arms Regulations (ITAR) could also serve as an impediment for exporting a robust UAV to Cuba. The Cuban Coastguard may be the most appropriate authority to receive and operate a UAV in cooperation with Flora and Fauna and Fisheries inspectors in the Gardens.









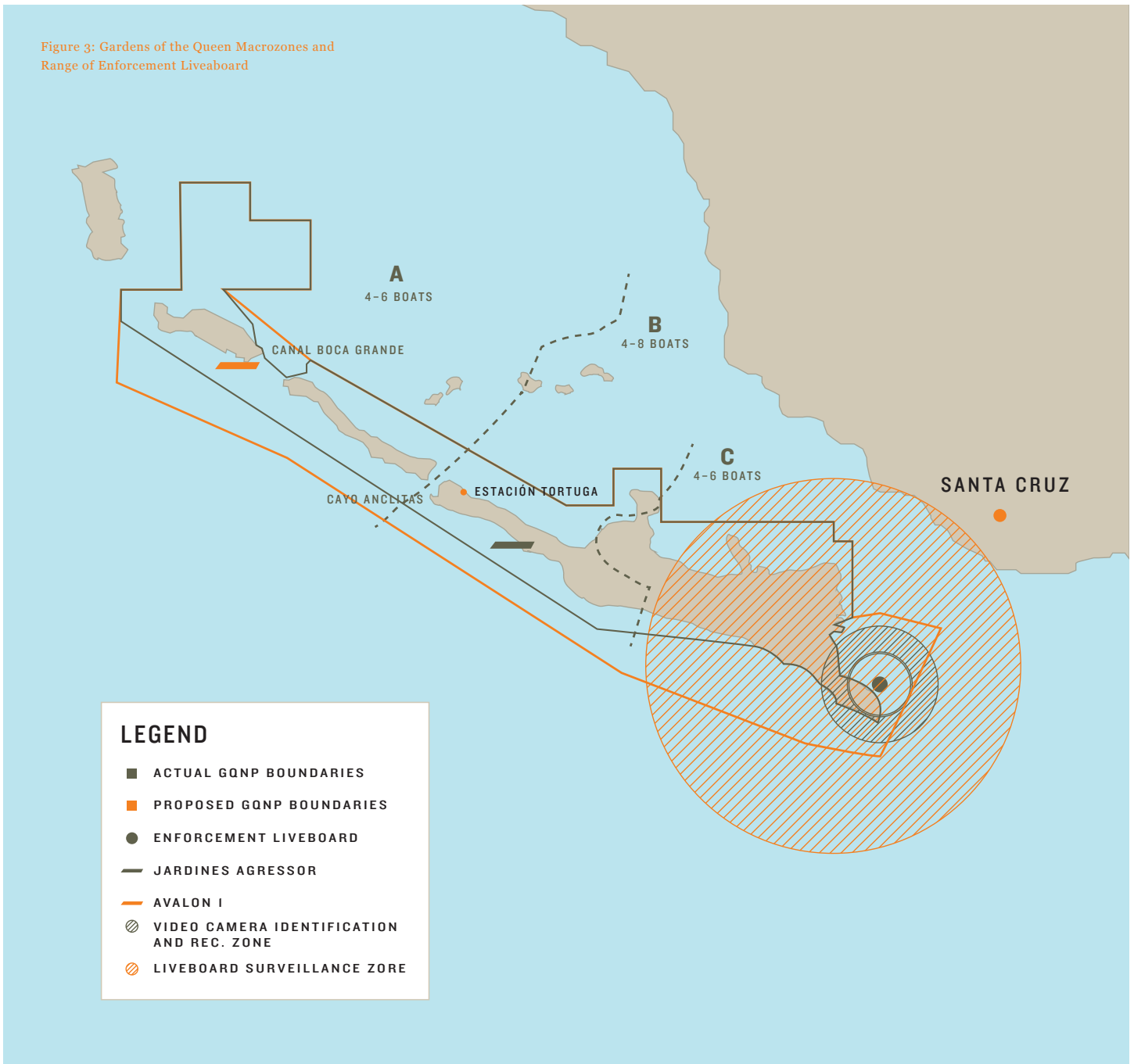
CONTROL & VIGILANCE SYSTEM DESIGN SUMMARY

The following control and vigilance plan is designed with the following criteria:

1. Limit Capital Expenditures by using pre-existing infrastructure, especially that of tourism and keeping the number of vigilance posts and equipment costs to a minimum.
2. Limit Operating Expenditures by incorporating Marlin Azulmar tourism operations into the vigilance system and with the introduction of a 100ft. enforcement liveboard with research station capabilities.

COMPONENT	RECOMMENDATIONS
SURVEILLANCE	<ol style="list-style-type: none">1. One 100 ft. enforcement liveboard with research station capabilities and the installation of one long-range camera aboard the vessel.2. Visual surveillance equipment: Equip each fly-fishing skiff with high power binoculars and water-proof camera. (They already possess VHF marine radios.)3. Develop and deliver training on maritime surveillance for all captains and fly fishing guides.
INTERDICTION	<ol style="list-style-type: none">1. Fast patrol vessels: The enforcement liveboard will require two fly fishing skiffs with 70HP OB motors.2. Draft control center, patrolling and boarding Standard Operating Procedures (SOP).
PROSECUTION AND SANCTION	<ol style="list-style-type: none">1. Establish an inter-institutional agreement between Marlin Azulmar, Flora and Fauna and Fisheries to determine operational roles and responsibilities for each agency and ensure correct report writing and timely processing of both illegal fishing and tourism violations.2. Establish a practical database that allows case monitoring and tracking repeat offenders.
EDUCATION AND OUT-REACH	<ol style="list-style-type: none">1. Rules, Regulations & Fees:<ul style="list-style-type: none">• Develop outreach and education campaign to coastal communities: Jucaro and Santa Cruz.• Determine the feasibility of incorporating artisanal fishers into system as first alert aids. (It may be more cost-effective to provide incentives to Santa Cruz fishers rather than taking a hard enforcement approach.)

Figure 3: Gardens of the Queen Macrozones and Range of Enforcement Liveboard



SURVEILLANCE COVERAGE

The Gardens of the Queen have two unique characteristics that influence the nature of our recommendations:

- The sheer size of the MPA (70 NM from west to east), the numerous passageways, and the height of mangroves, means that erecting traditional vigilance posts (whether manned or equipped with camera) will have limited effectiveness to detect and identify artisanal fishers. Illegal fishers could easily evade surveillance towers via mangrove-lined canals less than 500 meters away. Surveillance in this context would be best served by a mobile enforcement platform that could move throughout the archipelago in anticipation of or in response to fishing patterns and seasons. Day patrols will not suffice as perpetrators can set up camps within the archipelago and fish

in the early morning or late afternoon when the patrol vessel has returned to Tortuga. Additionally, substantial fuel is used for the daily 75+ NM round-trip patrol from Tortuga to Cabeza de Este. A sustained presence from a mobile enforcement platform would prove most frustrating for illegal fishers.

- Limited government presence in the GQNP means that the infrastructure and assets of Marlin Azulmar are even more important to sustaining enforcement operations in the Archipelago. A surveillance system for the GQNP must include tourism assets, as they will operate throughout the archipelago on a weekly basis. Tourism numbers will only trend higher as the US removes travel restrictions and even more vessels will be distributed throughout the archipelago. Additionally, Marlin Azulmar shares the GQNP's conservation goals and has

vessels that are well maintained and already have a robust VHF radio network. The liveaboards and fly-fishing skiffs are important enforcement agents.

RECOMMENDATIONS:

1. *Enforcement Liveaboard*

To improve surveillance at GQNP, we strongly recommend deploying an enforcement liveaboard versus building a few fixed stations or vigilance posts, as the liveaboard allows greater flexibility in response to changing user patterns and zoning areas. The liveaboard can be moored at either primary entrance/exit waterways on the Eastern side of the archipelago or at key conservation areas to serve as a deterrent, inspection point and mobile surveillance platform. We have deployed floating platforms in other marine reserves with great success. While there may be a greater initial capital cost, the investment will pay for itself in the long run.

As illustrated in Figure 3, the enforcement liveaboard can be moored on the eastern extremity of the archipelago to provide a sustained presence in an area that is notorious for the incursion of illegal fishers. As

fishers move in response to the location of the enforcement vessel, it too can reposition itself to not only protect resources in the east, but in the middle and west depending on the fishery and evolving nature of threats. The liveaboard would also serve as the control center for enforcement operations throughout the archipelago and would maintain close communication with fly-fishing skiffs and other vessels. We recommend equipping the liveaboard with a long-range camera to assist with surveillance, one 32 foot vessel with 150HP motors and one small fly-fishing skiff with 70HP OB motors for fast response capacity. The liveaboard would have excellent surveillance capacity of its immediate 6-8 NM as illustrated by Figure 3. The boundaries of the GQNP are slated to increase by 6NM seaward on the southern side of the archipelago making the liveaboard especially useful for patrolling those areas from commercial fishers during snapper and grouper spawning seasons.

Liveaboard specifications can be found in Annex 1. We initially considered a smaller vessel; however, given discussions with Marlin Azulmar concerning the difficulty of operating and maintaining vessels in Cuba, we agreed on a 100 ft. liveaboard.

The 100 ft. vessel offers many advantages: 1) Marlin Azulmar already operates and maintains five 100ft. crew vessels in the Gardens; 2) an existing stock of spare parts and local maintenance capacity; and 3) avoiding months, perhaps years of delays to get government approval to import new equipment and spare parts for a different model vessel. The 100ft. liveaboard could also be designed to include a research station for visiting scientists and/or students interested in the unique GQNP ecosystem. The vessel should be primarily dedicated to enforcement; however, with an appropriate plan to allocate resources, the research component could be critical to help underwrite operating expenses. We recommend investigating this option once the liveaboard is operative within the archipelago.

Under the current co-management framework, Marlin Azulmar would operate and maintain the liveaboard with its six crew in cooperation with government inspectors. We anticipate a minimum of two enforcement personnel and two control center operators for a total of 10 full time individuals aboard the vessel with 15-day work assignments. A command and control center would be housed within the liveaboard and would serve as the official dispatch



center, surveillance monitoring center, coordination office especially with Marlin Azulmar naturalist guides and finally alarm monitoring center. A simple maritime vigilance strategic plan would need to be crafted and disseminated among enforcement officers as well as Marlin Azulmar employees. Not all employees would be involved with control center operations, but they would need to know procedures to follow upon the detection of suspicious or illegal activities.

2. Visual surveillance equipment

We recommend the installation of a long-range 1080p COHU camera with 55X on the enforcement liveaboard. The video camera can identify an artisanal vessel at 1.8NM and recognize a small vessel at 7.5NM. We also recommend equipping each small patrol vessel with high power binoculars and a waterproof camera with video capacity to identify and document illegal fishers. Two portable

thermal detection cameras should also be procured for night patrols in the mangroves.

3. Training

We recommend developing and delivering training on maritime surveillance for all enforcement inspectors, captains and fly-fishing guides. A comprehensive training program will improve enforcement team capacity. Training programs must be executed by certified instructors and preferably provided by accredited entities. We highly recommend a combination of theory and practical exercises for improved retention of information and swift adoption of newly developed skills. We also recommend complementing workshops with comprehensive Standard Operating Procedures (SOPs) to institutionalize processes and prevent informal interpretation of best practices. Below are the minimum suggested courses for the GQNP enforcement staff.

COURSE TOPIC	COURSE DESCRIPTION
BASIC IMO TRAINING	<ul style="list-style-type: none"> • First Aid • Survival at Sea • Fire fighting
SURVEILLANCE, DETECTION, INTERDICTION AND BOARDING	<ul style="list-style-type: none"> • Operations planning and preparation • Use of visual and electronic sensors in marine patrolling • Boarding procedures: Performing Inspections, documentation to request, what to look for, and documenting your inspection • Interviewing the suspect’s boat crew • Crime Scene Key practices. Evidence collection and handling • Operations/Felony Reports. Information and items that are typically in a “good” report
OPERATIONS PLANNING AND CONTROL CENTER MANAGEMENT	<ul style="list-style-type: none"> • Control Center functions including risk assessment, asset use, reporting, communications procedures, surveillance procedures, and documentation • Telecommunications lines and coordination procedures with Control center, inspectors and Marlin Azulmar guides • Situation escalation procedures and real-time reporting • Terrestrial chart interpretation and navigation • Nautical chart interpretation and navigation • Search and rescue • First aid provided in the field • Personal safety issues for patrolling and boarding
STANDARD OPERATING PROCEDURES (SOPS)	<ul style="list-style-type: none"> • Control Center • Boarding Teams • Patrolling • Maintenance

INTERDICTION

1. FAST PATROL VESSELS

As mentioned earlier, the enforcement liveaboard will require one 32 ft. vessel with 150HP OB motors and one fly fishing skiff with 70HP OB motors. The skiffs have very little draft and are able to reach speeds of up to 25 knots within the lagoons and the canals, which makes them not only ideal for fly-fishing, but patrolling. Like the enforcement liveaboard, these skiffs also have the advantage of an existing stock of spare parts and local maintenance capacity, as well as pre-existing government approval.

2. STANDARD OPERATING PROCEDURES (SOPS)

Drafting and implementing SOPs would institutionalize training sessions and raise professional standards for control center

operation, patrolling and boarding. SOPs are vital for the smooth operation of enforcement activities and the safety of officers. The following are key considerations to include in SOPs:

DOCUMENT POLICIES AND PROCEDURES. We recommend capturing desired and correct policy, process, guidelines and required actions within an institutional framework that supports immediate access, definition, and fidelity. These documents should be generated in the form of individual SOPs. The SOPs provide staff with a ready source of information and guidance related to patrol management, evidence collection, case file generation requirements, use of force policy, report submission and information requirements, equipment checklists, mainte-

nance procedures, and other key tasks. Creating the SOPs can be an iterative process with initial focus on SOPs that are likely to yield immediate performance support and field enhancements. SOPs should be collected into a Mission Readiness Manual (MRM) or similar document. Each SOP should be reviewed at least annually to ensure the procedures and content are current, that they reflect the direction and goals of the organization's leaders and that they are understood and used by the Park staff. SOPs should cover at least the following areas:

- A. DOCUMENT ALL REPORTING REQUIREMENTS.** Document all required reports including their required submission period (i.e., monthly, yearly, as occurs), sample reports that are correctly completed, guidance about any areas that typically require improvement and submission information (i.e., who submits, where the report is sent). The SOP should emphasize operational and safety reporting best practices and principles as noted in the operations section and as delivered in the training program.
 - B. INSTITUTE A RISK ASSESSMENT PROCESS.** Inspectors, Control Center officers, and senior leaders should institute the operational risk assessment model provided in the training course within a specific risk assessment and management SOP. The Green, Amber, Red (GAR) model provides a uniform basis for assessing and mitigating risk. Implementing it across all jobs will support more effective operations, more honest and open communications and discussion regarding risks encountered while conducting patrol and enforcement operations. The SOP should include the person responsible for completing the assessments, when they are conducted, and how they are reported.
 - C. CREATE AND DOCUMENT OPERATIONS PROCEDURES.** Document guidance, policy, and process regarding planning and conducting patrols, operational tasks (i.e., when to conduct a boarding, when to conduct a seizure, authority levels), pre-planned actions (i.e., what to do if a vessel is overdue), use of force policies and examples, key points of contact and their designated responsibilities within an Operational Guidance SOP or SOPs.
 - D. IDENTIFY AND DOCUMENT MAINTENANCE PROCEDURES.** This SOP series should include general maintenance process and policy to support systematic maintenance and support including supply sources, job aides and systems. This SOP may be broken into a separate Maintenance Support Manual as all aspects of the maintenance program are documented and institutionalized.
 - E. CREATE INITIAL AND RECURRENT TRAINING PLANS.** The Training SOP should include all required training events, delivery frequency, evaluation and review procedures, and exercises and drills for basic survival, lifesaving, and enforcement. The SOP should also include specific training programs and materials for each piece of major equipment/equipment systems including tasks and steps needed to perform routine operations, maintenance, and repair.
 - F. CREATE JOB AND TASK SPECIFIC JOB AIDES AND CHECKLISTS.** Capture Job and Task specific guidance, steps, and processes within standardized job aides and checklists. Incorporate these job aides and checklists into their respective SOPs and place them into ready reference guides that can be kept in a cargo pants or shirt pocket for use in the field. Examples of typical boarding job aides include vessel measurement, search and seizure steps and reporting tasks, synopses of laws and their enforcement requirements, equipment operating steps for key equipment tasks, etc.
- OPERATIONS.** Operational recommendations are mainly focused on enacting and then putting into practice the preceding recommendations regarding training, equipment and policy. These include:
- A.** All at sea patrol vessels should regularly report their location and key operational factors back to the control center at a specified time frame, dependent on the type of mission or event. Operational reports should include current position or references from predetermined points if using unsecure communications, intentions, and key operational factors when they exist (e.g., sea state, fatigue, GAR model risk assessment, fuel state, departures/changes from arranged patrol plan movements).
 - B.** Establish and maintain a live 24-hour presence/watch in the control center whenever at-sea and boarding operations are ongoing. Include normal operations reporting, lost communications reporting/actions, in brief and debrief checks as part of their routine operations.
 - C.** Create sample case files, case debriefs and regular liaison sessions with the state attorneys to ensure that Rangers develop and implement enforcement activity that has a high confidence of standing up in court.
 - D.** Issue and use personal protective equipment (PPE). This includes the safety items described in the equipment recommendations section.

EDUCATION AND OUTREACH

As education and outreach is critical in fostering a culture of compliance, we recommend the creation of a simple education and outreach plan directed towards local fishers, commercial fishers and the community alike. A simple fact sheet outlining zonification, regulations, restrictions, and fines should be widely distributed to all stakeholders. As many of the illegal fishers entering the GQNP are from Santa Cruz, a special effort must be made to inform that part of the community about the rules and regulations. Fisheries inspectors, Flora and Fauna officers and Marlin Azulmar naturalist guides would be ideally poised to disseminate the fact sheet and other educational materials.

MINIMUM SURVEILLANCE AND SURVIVAL EQUIPMENT

See Annex II

BUDGET SUMMARY FOR CONTROL AND VIGILANCE SYSTEM

LINE ITEMS	REMARKS	ANNUAL EXPENSES	3-YEAR TOTAL
CAPITAL EXPENSES			
100 ft. Enforcement Liveboard including one fly-fishing skiff and one 32 ft. vessel	See Annex I for vessel specifications.		\$1,225,000
Surveillance Equipment: Long Range Camera, two portable thermal cameras, binoculars, digital cameras and safety equipment	See Annex II for equipment specifications. Camera installation and shipping of materials: \$20,000		\$122,460
SUBTOTAL			\$1,347,460
LIVEBOARD OPERATIONAL EXPENSES			
*ALL FIGURES PROVIDED BY SWEET SPA SA			
Vessel Depreciation	Depreciated over 15 years	\$80,000	\$240,000
Fuel		\$250,000	\$750,000
Insurance and Maintenance		\$200,000	\$600,000
Shipping and Handling		\$30,000	\$90,000
Spare Parts		\$50,000	\$150,000
Salaries		\$72,000	\$216,000
Naval Agent		\$30,000	\$90,000
SUBTOTAL		\$712,000	\$2,136,000
TRAINING & OUTREACH			
IMO Basic training certification. Firefighting, first aids, survival at sea	\$5,000 x 6 individuals		\$30,000
Control and Vigilance Plan	Strategic Plan and Use of Available Assets		\$20,000
Maritime Vigilance: Operations Planning and Execution	One 2-week workshop per year x 3 years @ US \$25K		\$75,000
Control Center, Patrolling and Boarding SOPs	Develop and delivery of SOPs, job aides and checklists		\$45,000
Education and Outreach Materials	Maps and outreach materials & Design of Traveler Fund		\$30,000
SUBTOTAL			\$200,000
TOTAL			\$3,683,460

INCOME

LINE ITEMS	SWEET SPA SA	TRAVELER FUND	TBD	3-YEAR TOTAL
CAPITAL EXPENSES				
100 ft. Enforcement Liveboard including 2 fly-fishing skiffs	\$1,225,000			\$1,225,000
Surveillance Equipment			\$122,460	\$122,460
SUBTOTAL	\$1,225,000		\$122,460	\$1,347,460
LIVEABOARD OPERATIONAL EXPENSES				
Vessel Operation, Maintenance, Salaries and Fuel	\$786,000	\$1,350,000		\$2,136,000
SUBTOTAL	\$786,000	\$1,350,000		\$2,136,000
TRAINING & OUTREACH				
Maritime Vigilance Training, SOPs and Education and Outreach			\$200,000	
SUBTOTAL			\$200,000	
TOTAL	\$2,011,000	\$1,350,000	\$322,460	\$3,683,460

Sweet Spa SA would underwrite the construction of the liveboard valued at \$1.225M. and Sweet Spa SA estimates annual operating expenses of \$712,000. Sweet Spa SA has agreed to finance up to 50% of operating expenses. WildAid recommends establishing a tourist conservation fund whereby every diver and fly fisher pay US\$100 upon entrance to the GQNP. This fund alone could underwrite the bulk of operating costs, as there were an estimated 4,500 tourists in 2015 that could have generated US\$450,000. Again, as tourism is expected to increase with the removal US travel restrictions, revenue will only increase over time. The addition of a US\$100 entrance fee or donation would not deter tourists from

choosing the GQNP as a tourism destination, as it represents a marginal addition to the cost of a vacation in the Gardens. The typical cost for a trip on a liveboard is US\$5,000 for a week-long stay and other conservation areas impose similar fees. For example, in the Galapagos, the conservation fee is currently \$100 per person and soon to increase to US\$200. Finally, an additional \$322,460 is needed to underwrite surveillance equipment, training and outreach and education costs.

ANNEX I

ENFORCEMENT LIVEBOARD SPECIFICATIONS

PARAMETER	SPECIFICATIONS
Dimensions	20/23' width x 100' long x 5' draft
Speed	15/20 knots
Navigational equipment	Radar (36MN range) ECDIS, AIS class A, radio VHF, HF, Eco sounder, GPS
Hull Material	Aluminum
Superstructure	Aluminum
Accommodation	6 crew. 2 enforcement personnel. 2 control center operators. 12 scientists/eco-tourists
Mast	15m (50feet) height aluminum with lookout canopy on top
Engines	2/3 main engine,
Generators	2X60KW
Air Conditioning	YES
Water tank capacity	1000 plus gallons
Desalinization plant	2 Osmosis plant 1500GPD
Galley and Wardroom	Kitchen, refrigerators, sink with garbage disposal / Dining area for 12+ / Living room for crew, enforcement personnel, control center operators and scientists
Operational Area	Control monitoring center with two 52" HD display, 4 computers, 6 back up discs 1Terabyte capacity, 24 hour satellite internet access, copy/printer machine, 2 work stations. 2 PCs, VHF Radio, Scientific research laboratory
Long range video camera	1080p COHU camera with 55x, mount device, cables, software, etc.
Additional Equipment	Laboratory fully equipped for scientific research

ANNEX II

SURVEILLANCE & SAFETY EQUIPMENT

QUANTITY	ONBOARD EQUIPMENT	UNIT COST	TOTAL
1	COHU 880ohd H264 High Definition Long Range Camera Surveillance System, 24vdc Power Input, With Variable Speed Wide Dynamic Range Positioning System, 1080p30 Day/Night Cmos Camera Imaging System, 1/2" Zoom Lens, High Definition,	\$57,660	\$57,660
3	Megaphone 25W (AmpliVox S602MR Mity-Meg Plus Rechargeable Megaphone)	\$200	\$600
20	Waterproof/Shockproof/Portable GPS (Garmin eTrex 30X)	\$250	\$5,000
1	First Aid Kit (West Marine 3.5 medical kit)	\$80	\$80
60	PFD, Life saving Jacket (floatation) Yellow or Orange	\$50	\$3,000
20	Marine waterproof Binoculars 10X50 or up to 12X50. High Level 10X50 Rangefinder Army Waterproof & Shockproof Military Binoculars Shockproof Telescope With Rangefinder	\$280	\$5,600
2	Marine waterproof Thermal Devices with 4X Zoom. Flir RS32, 4-16x	\$6,000	\$12,000
20	LED Search Lights. w/Rechargeable batteries. Waterproof Rechargeable Boat 400 LED SPOTLIGHT TORCH	\$75	\$1,500
2	Waterproof & floatable Handheld Marine VHF Radio 5 to 6W with built in GPS-DSC capability	\$250	\$500
3	14.1 MPixel Shockproof/Waterproof Digital Camera with Optical16x Zoom and built in GPS	\$500	\$1,500
20	Leatherman Multi Tool	\$60	\$1,200
20	Solar powered flashlights with battery backup	\$20	\$400
12	Inflatable Vinyl Boat Fender (8" x 24", White)	\$30	\$360
81	Coastal Locator Flares Kit	\$100	\$8,100
20	Pelican Case 1620. In flight suitcase size	\$250	\$5,000
TOTAL			\$102,460

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