

ENFORCEMENT GUIDE

WILDAID

The Nature
Conservancy 

NEAR SHORE ARTISANAL FISHERIES

PURPOSE

The Nature Conservancy commissioned this report to provide artisanal fisheries managers with an overview on the different enforcement systems they can use to monitor and manage near shore fisheries. The Conservancy uses this guide to inform and strengthen fisheries reform efforts and to capture lessons learned from using it with our partners and stakeholders.

ABOUT THE NATURE CONSERVANCY

The Nature Conservancy's mission is to conserve the lands and waters on which all life depends; it works to achieve this mission in more than 35 countries and all 50 states of the U. S.

www.tnc.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.

www.wildaid.org

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ABBREVIATIONS

AG	Attorney General
AIS	Automatic Identification System
CSI	Crime Scene Investigation
EEZ	Exclusive Economic Zone
EMS	Electronic Monitoring System
FAO	Food & Agriculture Organization of the United Nations
GMR	Galapagos Marine Reserve
GNPS	Galapagos National Park Service
HP	Horsepower
IMO	International Maritime Organization
KPI	Key Performance Indicators
KT	Knot
M&E	Monitoring and Evaluation
MER	Misool Eco Resort
MCA	Marine Conservation Agreement
MCS	Monitoring, Control and Surveillance
MPA	Marine Protected Area
PMB	Participatory Management Board
NGO	Non-governmental Organizations
NM	Nautical Miles
NTZ	No-Take Zones
O/B	Outboard
OEM	Original Equipment Manufacturer
PPE	Personal Protective Equipment
RFMO	Regional Fishery Management Organization
SOLAS	International Convention for Safety of Life at Sea
SPAG	Spawning Aggregation
SOP	Standard Operating Procedures
TURF	Territorial Use Rights for Fisheries
UAV/UAS	Unmanned Aerial Vehicles / Systems
USAID	United States Agency for International Development
UNCLOS	United Nations Convention on the Law of the Sea
VHF	Very High Frequency
VMS	Vessel Monitoring System

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EXECUTIVE SUMMARY

We need healthy oceans to support our way of life. “About 20% of the world’s population derives at least one-fifth of its animal protein intake from fish, and some small island states depend almost exclusively on fish¹” Unfortunately, fish stocks are under growing pressure and the need to find innovative and pragmatic resource management strategies is more important than ever. Disregard for fisheries and environmental laws is common and if we are to succeed in reversing the declining trend, we must draft relevant regulations, design and fund comprehensive enforcement programs and cultivate a culture of compliance. Historically, marine law enforcement has been the competency of Naval and Coast Guard authorities; however, many fishery and park agencies, who lack training, equipment, and at times controlling legal authority, are tasked with fisheries management and enforcement. Complicating matters, most agencies are understaffed; lack budgetary resources, and possess limited authority (i.e. power of arrest and the ability to use force).

WildAid in cooperation with The Nature Conservancy developed this guide to assist managers in designing a cost effective enforcement strategy for near shore artisanal fisheries. This document is not a recompilation of literature, but a practical guide based on our experience in the Eastern and Western Pacific. Generally, an enforcement system is designed to monitor all activities within a given area ranging from tourism, investigation, and transportation to fisheries; however, we will focus primarily on near shore artisanal fisheries. The objectives of this guide are three-fold:

1. Examine all factors considered for the design and operation of a marine law enforcement system;
2. Illustrate key components of an enforcement system and evaluate surveillance technology and patrol equipment options;
3. Guide managers in the design and implementation of an enforcement system.

In summary, we aim to equip managers with the tools needed to strengthen fisheries management and design enforcement systems that are practical, affordable and feasible to implement in a timely manner. Fisheries enforcement requires a holistic approach that accounts for surveillance, interdiction, systematic training, education and outreach and lastly, meaningful sanctions. Although we explore many surveillance technologies and management tools, we more importantly provide a blueprint for the capacity building and professionalization of enforcement officers, who truly are the core component of any fisheries enforcement program.

1. http://www.who.int/nutrition/topics/3_foodconsumption/en/index5.html

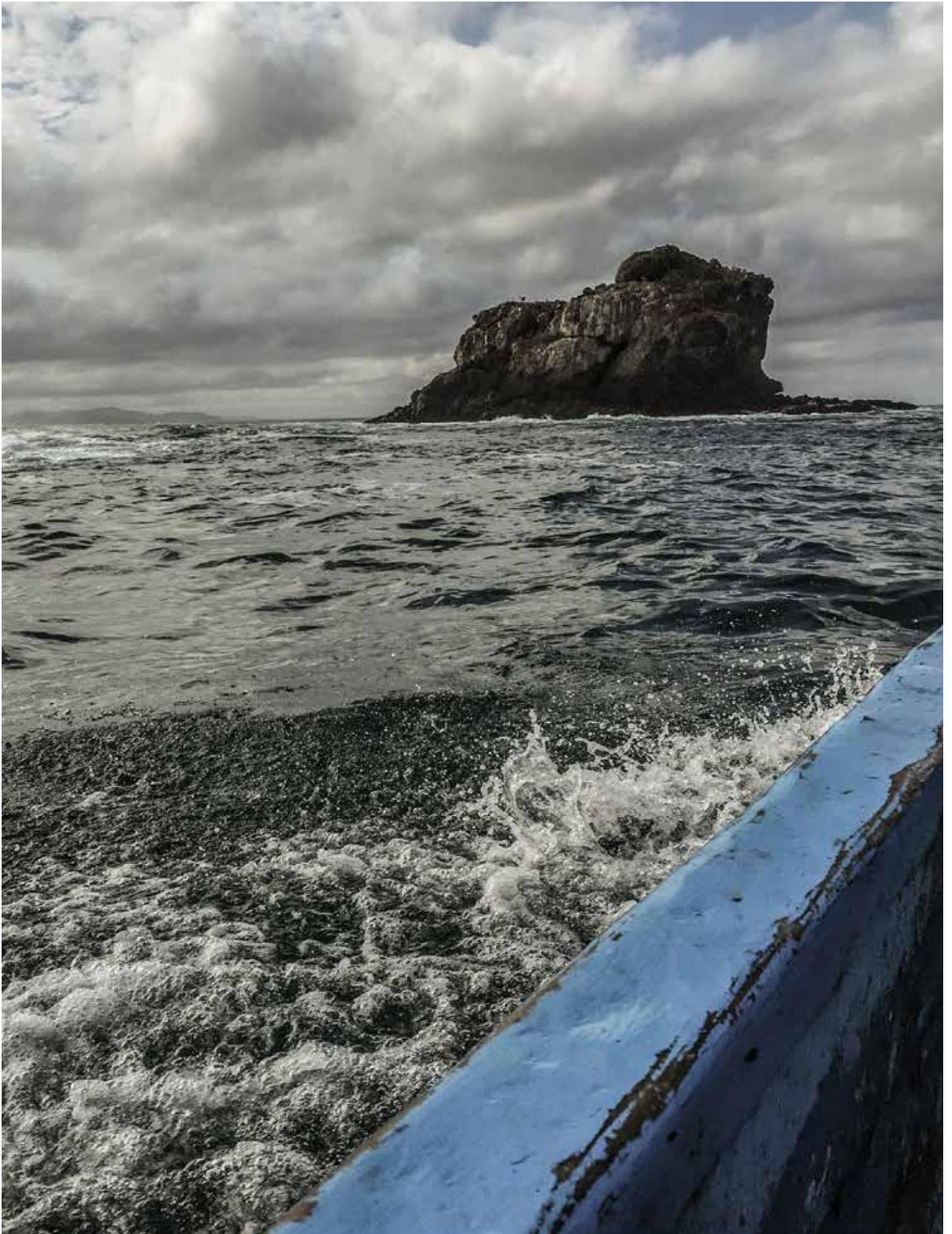






Image 02: Artisanal Fishers Returning to Port in Bahía de Los Angeles, Mexico

DESIGN & IMPLEMENTATION OF ENFORCEMENT SYSTEMS

INTRODUCTION & SCOPE

We need healthy oceans to support our way of life. “About 20% of the world’s population derives at least one-fifth of its animal protein intake from fish, and some small island states depend almost exclusively on fish²” Unfortunately, fish stocks are under growing pressure and the need to find innovative and pragmatic resource management strategies is more important than ever. Disregard for fisheries and environmental laws is common and if we are to succeed in reversing the declining trend, we must draft relevant regulations, design and fund comprehensive enforcement programs and cultivate a culture of compliance. Historically, marine law enforcement has been the competency of Naval and Coast Guard authorities; however, many fishery and park agencies who lack training and equipment are tasked with fisheries management and enforcement. Complicating matters, most agencies are understaffed, lack budgetary resources, and possess limited authorities to compel compliance within their fisheries zones (i.e. power of arrest and the ability to use force).

WildAid in cooperation with The Nature Conservancy developed this guide to assist managers in designing a cost effective enforcement strategy for near shore artisanal fisheries. We define near shore as “a belt of coastal waters extending at most 12 nautical miles (22.2 km; 13.8 mi) from the baseline (usually the mean low-water mark) of a coastal state³.” This document

As the definition of an “artisanal” fisher varies from country to country, we will use the United Nations Food and Agriculture Organization (FAO) definition:

“traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amount of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption. In practice, definition varies between countries, e.g. from gleaning or a one-man canoe in poor developing countries, to more than 20-m. trawlers, seiners, or long-liners in developed ones. Artisanal fisheries can be subsistence or commercial fisheries, providing for local consumption or export. They are sometimes referred to as small-scale fisheries.”

2. http://www.who.int/nutrition/topics/3_foodconsumption/en/index5.html

3. 1982 United Nations Convention on the Law of the Sea (UNCLOS) definition of territorial sea.

is not a recompilation of literature, but a practical guide based on our experience in the Eastern and Western Pacific. Generally an enforcement system is designed to monitor all activities within a given area ranging from tourism, investigation, and transportation to fisheries; however, we will focus primarily on near shore artisanal fisheries in this guide.

THE OBJECTIVES OF THIS GUIDE ARE THREE-FOLD:

1. Examine all factors considered for the design and operation of a marine law enforcement system;
2. Illustrate key components of an enforcement system and evaluate surveillance technology and patrol equipment options;
3. Guide managers in the design and implementation of an enforcement system.

An effective law enforcement system should dissuade potential lawbreakers from committing illegal activities as the consequences (punitive or societal pressure) associated with apprehension outweigh the economic gain. Enforcement entails two different facets: the hard and soft approach. The hard approach achieves compliance by increasing monitoring, control and surveillance (MCS) investment and creating strong penalties that are uniformly enforced. The soft approach achieves compliance through education and outreach and by generating incentives through management that benefits the community as a whole. We advocate for a combination of the two. An effective enforcement system possesses the following five key components:

LAW ENFORCEMENT CHAIN

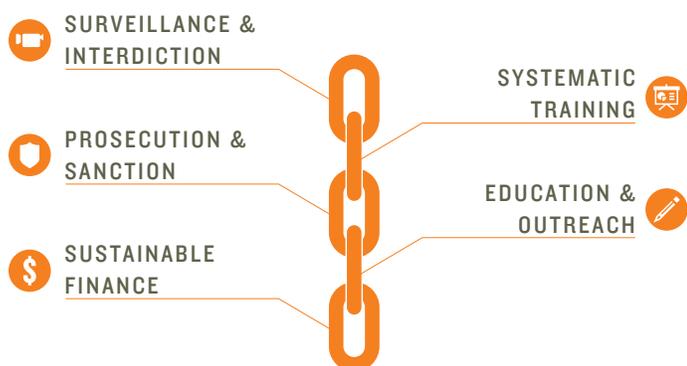


Figure 01: The Law Enforcement Chain

Surveillance & Interdiction: One must first identify the most cost-effective suite of sensors for detection in a given area, and then use the information accordingly to interdict the perpetrator. The response depends on institutional or community capacity i.e. available vessels and staff, fuel, protocols, etc.

Systematic Training: The regulations, systems, and tools are only as useful as those who are trained to operate and maintain them. Continuous training and professional development is the cornerstone of effective operations.

Prosecution & Sanction: It is not worth investing millions of dollars in surveillance systems if there are no repercussions. Meaningful penalties are necessary to ensure compliance.

Education & Outreach: It is critical to foster community buy-in as well as to inform stakeholders of rules, regulations, and sanctions.

Sustainable Finance: Every enforcement system has a price tag. We must identify innovative ways to fund enforcement and reduce operating costs over the long term.

Fisheries management cannot succeed without effective law enforcement and compliance efforts. In the absence of enforcement and a governance framework, open access and marine resource conflicts will only continue to promote increased polarization and unsustainable resource use. Fishery management strategies such as establishing Marine Protected Areas (MPAs), setting measurable quotas, limiting access via licenses/permits, closing fishing areas or using specific seasons often requires establishing a framework where authorities, the private sector, local communities, NGOs, academic institutions, and other stakeholders agree to collective action. Establishing such a framework, enforcement, and respect for the law are the cornerstones of a good governance program.

CONTEXT ANALYSIS FOR ENFORCEMENT DESIGN

The design of an enforcement system first requires a comprehensive assessment of the local, regional and national context. As every country and/or site possesses unique characteristics, we have developed a methodology for analyzing the enforcement framework that ultimately helps managers systematize information, identify problems and prioritize actions. A brief synopsis of critical factors and things to look for in an assessment can be found in *Table 1*.

FACTOR	CRITERIA
LAWS AND REGULATIONS	<p>The legal framework is critical as it specifies competencies and jurisdictions of agencies. One cannot design an enforcement system without first understanding the roles and responsibilities of each agency in the enforcement of laws and regulations. One must analyze the coherence of laws, sanctions and regulations. There are typically up to six actors involved in maritime and fisheries management:</p> <ul style="list-style-type: none"> • <i>Maritime Authority/Navy/Coast Guard</i>: Safety at sea, security and the maritime police; • <i>Environmental Authority</i>: Responsible for specific protected area legislation as well as CITES related legislation. Jurisdiction is often limited to a specific geographic area i.e. MPA or species. • <i>Fishery Authority</i>: Primarily responsible for enforcement of fisheries regulations and investigation; • <i>Attorney General (AG)</i>: The AG typically processes both environmental and fishery violations; • <i>Municipalities</i>: Authority can be delegated to local municipalities for the enforcement of national laws and/or they can enact ordinances for activities within their jurisdiction. • <i>Community</i>: Authority to enforce local laws can be delegated to communities or fishers possessing ancestral territorial user rights or concessions.
EDUCATION AND OUTREACH	<p>Besides communicating laws and regulations, education and outreach efforts can increase compliance by generating support for an area or a specific fishery. One must examine whether outreach programs exist, targets, clarity and frequency of messaging, and the role of the public and private sector. Outreach should also be a component of an active public-facing patrol structure.</p>
GOVERNANCE	<p>Effective governance requires institutions apply laws and norms in an unbiased manner and possess sufficient resources for daily operations. One must examine whether Agencies are sufficiently staffed, have autonomy in critical decision-making (no political or industry pressures/corruption), possess resources to carry out operations and whether the law is applied in an equitable manner.</p>
SOCIO ECONOMIC	<ul style="list-style-type: none"> • <i>Fishing Sector</i>: Number of fishers, vessel and motor type, role of traditions & customs, fishing gear, target species, level of organization, primary ports, catch volume, annual sales and alternative sources of income. • <i>Tourism Sector</i>: Type of tourism, number of operators/vessels, level of organization, number of tourists, annual revenue, and geographic areas of interest. • <i>Transportation Sector</i>: Maritime and/or aerial transit routes, number of vessels/planes, level of organization, type of transport activity: passenger, cargo, other. • <i>NGOs and Scientific Sector</i>: Name, activities, level of organization and resource levels.
INSTITUTIONAL COORDINATION	<p>Regulatory frameworks tend to be highly fragmented and laws are thus difficult to implement as multiple agencies must participate in routine patrols and may share competing jurisdictional boundaries. Inter-institutional coordination is critical for maritime enforcement in most countries. One must determine whether inter-institutional agreements exist and whether they are actually implemented in the field. Do standard operating protocols (SOPs) exist and are there statistics supporting cooperation? Are there overlapping authority or jurisdictional boundaries that need to be resolved or coordinated?</p>

Continue

FACTOR	CRITERIA
SURVEILLANCE	<p>Effective surveillance requires dedicated personnel with systematic training and regular crew rotations to maintain a consistent presence. Prior to enforcement system design, it is first important to understand the nature of the threats and likely violations:</p> <ul style="list-style-type: none"> • What is the extent of illegal fishing? • Are targets industrial or artisanal fishers? Types of vessels and motors, fishing gear, and target fisheries. • Fishing patterns, seasons, level of organization, benthic vs. pelagic, local and/or foreign. • Is piracy, contraband, or drug trafficking prevalent? • Are threats posed by coastal development, contamination or invasive species? • Are tourism or transport vessels committing infractions? What is the nature of their operations? • Is there a potential for violence or resistance to enforcement actions? <p>Once the nature of threats is understood, one must examine the following factors:</p> <ul style="list-style-type: none"> • <i>Personnel</i>: Number, capacity and training levels. Do all agencies participate in regular trainings? • <i>Size and Complexity of Area</i>: km², geographic considerations, topography, ports, & oceanic conditions. • <i>Patrol Assets</i>: Number and type of vessels, endurance, & motors. • <i>Patrol Planning and Coordination</i>: Is there a trained organization to plan effective prevention, interdiction and education patrols? • <i>Surveillance/Communication Technology</i>: VMS, AIS, radar, VHF network, UAVs, binoculars, cameras, night vision devices. • <i>Local Populations & Maritime Activities</i>: Distance to communities and all maritime traffic and routes. • <i>Operational Days and Availability of Assets</i>: Agency budgets and percentage of time that vessels are operative in one year. Average: 75%. • <i>Surveillance Planning</i>: How and when are patrols carried out? Are there patrol logs or written registries? Are lessons learned applied within the planning cycle? • <i>Availability of Intelligence</i>: Is there access to external information sources? • <i>Assets Used by Infractors</i>: Types of vessels and motors, radars, satellite phones, cellular, etc.
SURVEILLANCE INTER-CEPTION & ARREST	<p>Upon detection, vessels and officers should intercept perpetrators. Moreover, officers must ensure team safety including using clearly articulable use of force guidelines at all times by following strict protocols.</p> <ul style="list-style-type: none"> • <i>Speed and Endurance of Vessels</i>: Determine speed/range of patrol vessels vs. perpetrators. • <i>Boarding Procedures and Crime Scene Investigation (CSI)</i>: Do proper boarding procedures and CSI techniques exist and do training courses contemplate this material? • <i>Appropriate and Adequate Reporting</i>: Do report formats include all relevant information and have they been developed with AG/prosecutors?
PROSECUTION	<p>The successful prosecution of cases is often hindered by the following factors: lack of familiarity with environmental law, limited budget, external pressures, political motives, corruption, etc. One must analyze the following factors:</p> <ul style="list-style-type: none"> • <i>Speed and Effectiveness of Judicial and Administrative Processes</i>: Verify times from start to finish for both and establish average time (for approximately 5 cases of similar type and complexity). • <i>Percentage of Cases Not Resolved</i>: Assuming records exist, research the percentage of cases not resolved vs. the total cases presented in the last 5 years. What are the primary bottlenecks or problems? Do problems stem from structural issues, evidence standards, authority, jurisdiction limits or are they due to lack of political will?
SANCTION	<p>The final step in hard enforcement is sentencing crimes and penalties. Sanctions must be fair and communicated to the general public in order to ensure compliance. One must analyze the following factors:</p> <ul style="list-style-type: none"> • <i>Appropriateness of Monetary and Criminal Penalties</i>: Verify whether the penalty is proportionate to the crime. Many countries possess antiquated legislation and fines do not serve as a deterrent. Are there other statutes or regulations, which can be employed to increase penalties? • <i>Dissemination of Sanctions to General Public</i>: Verify whether authorities disseminate penalties via outreach to the community and/or greater public. Awareness can help foster compliance.

Table 01: Context Analysis of a Law Enforcement System

KEY COMPONENTS OF AN ENFORCEMENT SYSTEM AND FACTORS FOR CONSIDERATION IN TECHNOLOGY SELECTION

In this section we examine the core operational components of an enforcement system. We also briefly evaluate different surveillance technologies and patrol equipment used for the near shore artisanal context. By no means is this a definitive list of all available surveillance technology, but a sample of technologies that we have deployed in our work. We have custom-designed high and low tech surveillance systems depending on the objectives and budgets of the local agencies as well the extent of the threat. This

section is meant to serve as reference point for managers considering surveillance technology options for improving mission efficacy and operational efficiency.

Generally speaking, an enforcement system should possess the following three core components:

1. A control center for operations planning and coordination;
2. A communication network to ensure constant coordination of personnel; and

3. Surveillance sensors and interdiction assets that are strategically located to monitor key fishing grounds and to perform timely interdiction.

An effective enforcement system also utilizes clear and concise standard operating protocols (SOPs) to optimize operations, govern the use and maintenance of all assets and ensure patrol crew safety. Systematic training programs should be carried out for individual agencies and among agencies to foster effective joint patrols.



Figure 02: Core Components of a Monitoring, Control and Surveillance Systems for Artisanal Fisheries

SURVEILLANCE TECHNOLOGY:

Typically there are two types of systems that are used for surveillance: Collaborative and Non-collaborative

- **Collaborative** surveillance systems require location transceivers on-board vessels and require that the location device is active. There must be a law that mandates the use of the transceivers and that dictates penalties for deactivation. Fishers must be part of the process for the implementation of this type of system. There are basically two types of collaborative technologies: Vessel Monitoring Systems (VMS) and Automatic Identification Systems (AIS). VMS is a closed source, proprietary system with one-way vessel to shore station exchange whereas AIS is an open source system allowing two-way exchange between vessels and shore stations.
- **Non-collaborative** systems do not require transceivers or the participation of stakeholders in the process. These surveillance systems detect vessels in a specific geographic area. These types of sensors include: visual, radar, optical and/or infrared. The sensors are either installed at strategic sites on the coastline and/or mounted upon mobile platforms, such as patrol vessels or Unmanned Aerial Vehicles (UAVs). The monitoring of radio communication is another non-collaborative option for identifying suspicious activity.

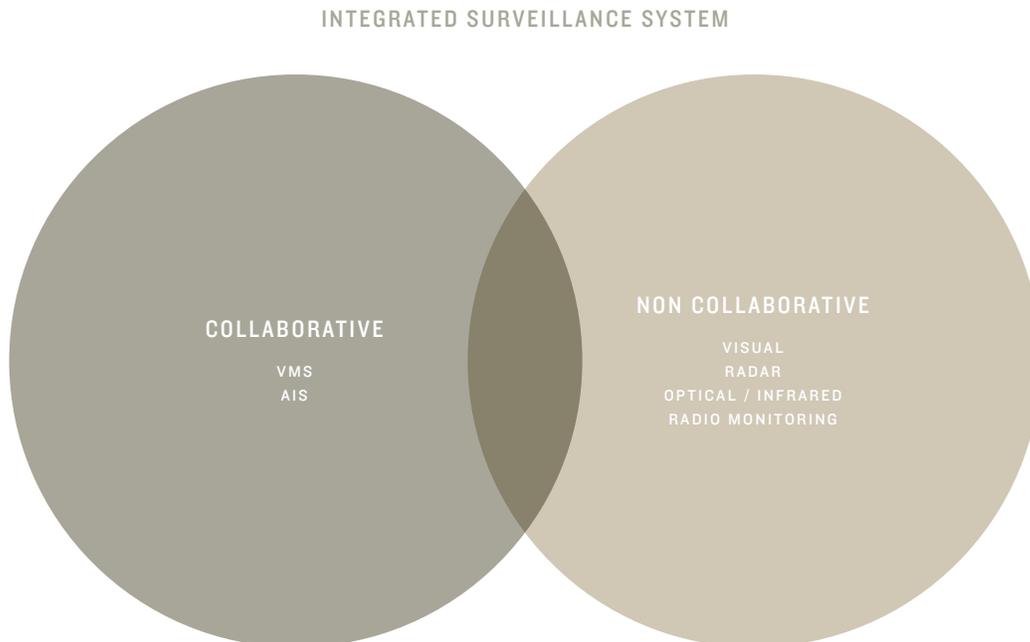


Figure 03: Collaborative and Non-Collaborative Systems



When selecting surveillance technology, the following factors are extremely important:

1. Size of enforcement area and related transit zones
2. Target size and types of materials used for vessels (wood, fiberglass, or aluminum)
3. Target profile (speed of vessels, spatial and temporal patterns)
4. Agency budget (Capital expenditures (CAPEX) and operating expenditures (OPEX))
5. Legal framework implications

As no one silver bullet technology exists, surveillance systems are often designed using multiple sensors. For example, radars or high power cameras can be used in combination with VMS and AIS. The radars or cameras can be placed near productive fishing grounds, passageways or ports to detect vessels that have deactivated their transceivers and are fishing in a prohibited area. As illustrated in Figure 4, we provide a general rule of thumb for collaborative and non-collaborative surveillance technologies and their respective coverage ranges.

In the following tables, we will evaluate different surveillance technologies and patrol assets. We provide a brief background on each technology, evaluate its application in near shore artisanal fisheries and itemize expenses: both capital and operating expenditures over the useful life of the asset.

SNAPSHOT: AN INTEGRATED COASTAL SURVEILLANCE SYSTEM

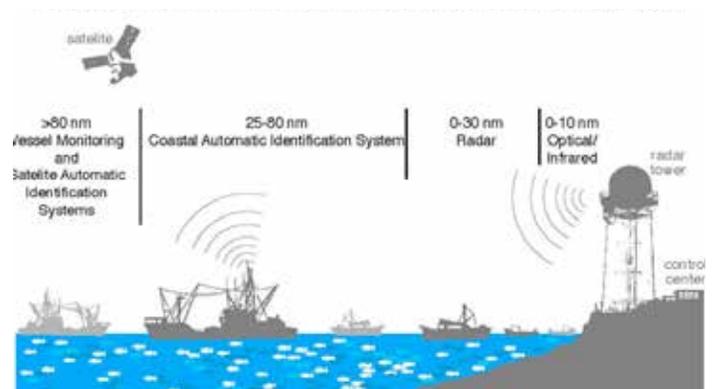


Figure 04: A snapshot of an Integrated Surveillance System

EVALUATION OF SURVEILLANCE TECHNOLOGY

Collaborative monitoring systems require vessel owners to place and activate transceivers on their vessels. Information generated includes: vessel name, latitude, longitude, course and speed. A law must be enacted obligating vessel owners to purchase and activate on-board transceivers and the law must consider strict penalties for deactivation. If the location device is disconnected or tampered, the control centers will not view vessel position. A major drawback of these systems is that they will not detect fishers from other areas or countries who do not employ transceivers.

VESSEL MONITORING SYSTEM (VMS)

BACKGROUND	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 adequate for larger vessels and where sheer oceanic expanses need to be monitored. As the system is satellite based, position frequency implies a monthly cost to the user. Higher position intervals translate into a higher monthly cost. VMS is a closed source system: transmitted information is coded and only seen by ship owner and the respective authority unless operated by an Regional Fisheries Management Organization (RFMO) or data sharing agreements exist between countries.
ARTISANAL APPLICATION	VMS is not suitable for artisanal vessels in a near shore context as small vessels tend to be too quick to monitor over one to six-hour intervals and the recurring monthly costs are typically too expensive for artisanal fishers.
CAPITAL / OPERATIONAL COSTS	<p><i>1. Control center cost: \$270,000–\$350,000</i></p> <ul style="list-style-type: none"> • 1-3 desktop servers, database, mapping, web services, application software, 2–3 workstations, 2–3 wall mounted displays, VMS information system software (marine scenario management) • Air conditioning, electric power supply (main & emergency) • Annual recurring costs: \$15,000 <p><i>2. Transceiver cost range: \$800–\$1,300</i></p> <p><i>3. Useful Life: 5–8 years</i></p> <p><i>4. Transceiver recurring service cost: \$60–\$80 per vessel/month (1 position/hour)</i></p>

VHF-SAT AUTOMATIC IDENTIFICATION SYSTEM (AIS)

BACKGROUND	AIS is a “focalized” system that initially worked over VHF frequencies and required shore-based stations to receive vessel position. The use of shore-based stations limited the coverage to the “radio horizon” (usually between 15-80 NM). Recent developments succeeded in placing AIS base stations on satellites, allowing them to overcome range limitations while still using the same VHF spectrum. Shore-based AIS service has no cost to the user and provides vessels positions every 3-30 seconds depending on the type of beacon on board: Class A - merchant ships, and Class B - small vessels. AIS is an open source system: information is public and all AIS equipped vessels can view one another.
ARTISANAL APPLICATION	AIS is deployed to monitor artisanal fisheries and several developing countries already do so. We recommend AIS for national surveillance systems versus site-based strategies as the system will only view vessels that possess transceivers: <i>all</i> vessels must use transceivers if the system is to be effective. While AIS is an extremely valuable tool for real-time vessel monitoring, two criteria must be met in order to determine feasibility: 1) the regulatory framework must be amended in order to obligate their use including penalties; and 2) the country must possess a reliable vessel registry in order to avoid cloning or shadow vessels. For the near shore context (x <20NM), we recommend erecting shore-based stations versus using satellite based AIS in order to avoid recurring costs.
CAPITAL / OPERATIONAL COSTS	<p><i>1. Coastal AIS base station cost range: \$65,000–\$80,000</i></p> <ul style="list-style-type: none"> • Tower, AIS shore station transceiver and microwave radio link (with IP networking capacity) • Electrical power supply (main and emergency) <p><i>2. Control Center cost range: \$30,000–\$35,000:</i></p> <ul style="list-style-type: none"> • PC with 2 displays • AIS information system software (marine scenario management) and mapping software • Microwave radio link (toward AIS shore station) and Marine VHF base radio • Air conditioning and electric power supply (main & emergency) • Optional \$125,000-\$165,000: Broadband Internet access (for broadcasting to external users), database (stores AIS data) and servers (if control center will work as data repository, data broadcasting, etc.) <p><i>3. AIS Transceivers cost: Solar \$900–\$1,200 and rechargeable \$500–\$600.</i></p> <p><i>4. Useful Life: 5–8 years</i></p> <p><i>5. Satellite-based AIS monthly service cost: \$35–\$50 (4–6 positions/day)</i></p> <p><i>When designing a MCS using shore-based stations for an entire coastline, an AIS base station should be erected every 40–45NM.</i></p>

CELLULAR – GPRS

BACKGROUND	Cellular networks offer location-monitoring services via the use of smartphones/cellular devices. To date, we are not familiar with any national fisheries monitoring programs that mandate the use of mobile marine transceivers via cellular networks. Typically, cellular service is limited to 8–10 NM offshore.
ARTISANAL APPLICATION	We do not recommend cellular based transceivers/smartphones for artisanal vessel monitoring given the high cost of devices, monthly service fees, and cellular range limitation in the marine environment. Cellular devices could be easily transferred at sea between vessels in order to evade detection and often do not meet IMO hermetic standards.

CAPITAL / OPERATIONAL COSTS	<p><i>1. Capital / Operational Costs Control center cost: \$15,000–\$20,000</i></p> <ul style="list-style-type: none"> • PC with 1 HD display and UPS (2kW, 2–4 hour support) • Mapping software and geo-information system software (vessel location plotting) • Marine VHF base radio <p><i>2. Smartphone cost: \$200–\$300</i></p> <p><i>3. Cellular/data service: \$18–\$35 monthly</i></p>
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Non-collaborative monitoring systems are the best equipment option when detecting vessels that are intentionally carrying out illegal activities in a specific geographic area and/or in the absence of collaborative systems. In this section, we will briefly examine different non-collaborative technologies and patrol assets and evaluate their appropriateness for artisanal fisheries.

RADAR (SURFACE)

BACKGROUND	<p>Radars employ radio pulsed signals to detect obstructions in its line of sight. As radars are a very mature and stable technology with easy to obtain technical support, they are often used by coastal surveillance agencies. Considerations for a radar based solution include the following: 1) the site must possess a clear arc of vision with no geographical obstructions; 2) the site requires an elevation of $x > 100$ meters for best coverage; 3) radars require a steady supply of energy including an emergency source; 4) radars require qualified staff for operation and maintenance; and 5) protective infrastructure for radar site protection against vandalism.</p>
ARTISANAL APPLICATION	<p>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 artisanal fisheries. This range can be increased by the use of solid-state radars (9–12 NM); however, these radars are very expensive.</p>
CAPITAL / OPERATIONAL COSTS	<p><i>1. Radar costs:</i> (Figures include radar, civil and electric works)</p> <ul style="list-style-type: none"> • Conventional radar: \$35,000–\$55,000 • Solid-state radar: \$250,000–\$450,000 <p><i>2. Recurring costs:</i></p> <ul style="list-style-type: none"> • \$5,000–\$6,000/year for conventional • \$3,500–\$4,000/year for solid-state <p><i>3. Useful Life: 8–10 years</i></p>

VIDEO CAMERA (DAYLIGHT/LOWLIGHT)

BACKGROUND	<p>Visual detection can be improved by the use of fixed video cameras. Camera ranges up to 12NM, accomplish automatic surveillance and detection (by using digital processing imaging algorithms) and perform identification. Cameras are an excellent option when staffing is an issue. Cameras do require additional infrastructure and the following minimum conditions: 1) Electrical power supply (permanent and an emergency source); 2) An $x > 36$ meter 3–4 wind supported (Guyed) tower for elevation; and 3) An operator station to control zooming, azimuth (pan) and tilt.</p>
ARTISANAL APPLICATION	<p>We recommend video cameras for monitoring key access ways, ports and specific geographic areas up to 12NM. Video cameras provide identification of activities whereas radars and VMS/AIS only detect and relay vessel position.</p>
CAPITAL / OPERATIONAL COSTS	<p><i>1. Video camera cost: \$9,500–\$20,000</i> (detection of 3–5 meter vessels at 8–12NM)</p> <p><i>2. Tower cost: \$12,500–\$25,000</i> (with main and emergency power supply)</p> <p><i>3. Control center cost: \$4,500</i></p> <ul style="list-style-type: none"> • PC with 1 HD display and UPS (2kW, 2–4 hour support) <p><i>4. Recurring costs: \$300–\$800/year</i></p> <p><i>5. Useful Life: 6–8 years</i></p>

NIGHT VISION DEVICES (NVDS) (FIXED AND PORTABLE)

BACKGROUND	<p>NVDs are video cameras that amplify remnant light from the environment in order to enhance images. NVDs produce clear images at night and require a permanent and stable power supply.</p>
ARTISANAL APPLICATION	<p>While NVDs can be used for artisanal fisheries monitoring, we have not recommended their use due to their high cost. Based on cost-effective analysis, daylight/lowlight cameras represent a better option. In addition, portable NVDs operation does not exceed 4-6 hours due to limited battery life.</p>
CAPITAL / OPERATIONAL COSTS	<p><i>1. NVD Camera cost:</i></p> <ul style="list-style-type: none"> • Fixed NVD: \$14,500–\$50,000 (detection of 3–5 meter vessels at 8–12NM) • Portable NVDs cost: \$2,000–\$7,000 <p><i>2. Recurring Costs: \$500–\$2,000/year</i></p> <p><i>3. Useful life: $x > 25,000$ Hours</i></p>

THERMAL SURVEILLANCE DEVICES (FIXED AND PORTABLE)

BACKGROUND	<p>An Infrared (IR) camera is a device that forms an image using infrared radiation, similar to a common camera that forms an image using visible light. Instead of the 450–750 nanometer range of the visible light camera, infrared cameras operate in wavelengths as long as 14,000 nm (14 μm). The use of IR cameras can greatly aid search and rescue efforts as well as help in the identification of bodies hidden in mangroves given their ability to detect contrasts in body temperature from natural surroundings.</p>
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ARTISANAL APPLICATION	A fixed IR camera can be used for monitoring key access ways, ports and specific geographic areas up to 12NM, especially when illegal activities predominantly take place at night. Portable thermal binoculars can also be considered for nighttime patrols, but they tend to be a high cost asset. As IR performance-cost ratios improve annually, they may become more affordable in the not so distant future.
CAPITAL / OPERATIONAL COSTS	<p><i>1. IR Camera cost:</i></p> <ul style="list-style-type: none"> • \$15,000–\$75,000 (detection of 3–5 meter vessels at 8–12NM) • Portable cost: \$1,000–\$7,500 <p><i>2. Recurring Costs:</i> \$1,000–\$4,500/year</p> <p><i>3. Useful Life:</i> Mean Time Between Failures (MTBF) range from 8,500–15,000 hours thus implying higher replacement costs</p>

BINOCULARS AND TELESCOPES FROM VIGILANCE POSTS (STATIONARY OR ABOARD VESSELS)

BACKGROUND	The strategic placement of vigilance posts combined with the use of binoculars and/or telescopes can be extremely cost effective for monitoring near-shore fishing grounds and access ways. Normally, a crewmember has a visual horizon of 5.5–7.5 NM from a small vessel. When lookout height is raised to 12–15 meters, visual horizon reaches 9–10 NM.
ARTISANAL APPLICATION	We recommend the use of binoculars and telescopes since they are not expensive, are versatile and can be used both at vigilance posts and on board vessels. The recommended magnification for binoculars should be 10X and 30X–35X for telescopes.
CAPITAL / OPERATIONAL COSTS	<p><i>1. Binocular Cost:</i> \$150–\$300 (marine grade, floatable)</p> <p><i>2. Telescope Cost:</i> \$400–\$600</p> <p><i>3. Tower cost:</i> \$10,000–\$20,000 (8–10M: Costs may vary on construction materials)</p> <p><i>4. Recurring Costs:</i> \$500–\$600/year (for tower maintenance)</p>

EVALUATION OF VHF RADIO COMMUNICATIONS

COMMUNICATIONS: MARINE VHF, PRIVATE VHF AND HF

BACKGROUND	<p>Radio networks are comprised of repeaters (optional), base stations and handhelds. They are divided into three categories: Marine and Private VHF and HF.</p> <p><i>1. Marine VHF:</i> The marine VHF spectrum (mobile maritime service) is a public group of frequencies that the International Telecommunications Union as well as national authorities in each country assign for establishing communications among vessels and between coastal stations with vessels at sea. The frequency ranges 156.025 MHz–162.025 MHz. Channel 16 (156.800 MHz) is the international calling frequency for any ship or coastal station that desires to communicate or to request support. Other frequencies also have been assigned specific uses as well.</p> <p><i>2. Private VHF:</i> As a marine VHF is an open system (anyone can listen to conversations), a private frequency is highly recommended for sending/receiving sensitive information. The national telecommunications authority can assign private frequencies to management authorities upon request.</p> <p><i>3. HF:</i> High frequency radios are used for long distance links (x > 60–80NM). They are public frequencies and applicable for large areas. HF radios require reliable energy sources and sufficient space for antennas.</p>
ARTISANAL APPLICATION	A marine VHF network is a very useful low cost tool for enforcement planning and coordination. Marine VHF is the primary tool used for search and rescue as it allows authorities and other stakeholders to respond to an event in a cohesive, timely manner. In addition, VHF marine is useful for community enforcement models and for general safety at sea.
CAPITAL / OPERATIONAL COSTS	<p><i>1. Base Radio Costs:</i> (includes antenna and power supply)</p> <ul style="list-style-type: none"> • VHF \$800–\$900 • HF \$1,000–\$2,000 <p><i>2. VHF Handheld Costs:</i> \$300–\$400 (waterproof with GPS and rechargeable batteries)</p> <p><i>3. VHF Repeater Cost:</i> \$26,000–\$30,000 (Includes electric power supply, guyed tower and repeater)</p> <p><i>4. Operational/Recurring Costs:</i> \$1,900–\$2,200/year (network of 1 repeater, 3 base stations and 20 handhelds)</p> <p><i>5. Useful Life:</i> x >15 years</p>

EVALUATION OF PATROL ASSETS: VESSELS, AIRCRAFT AND UAVS

PATROL VESSELS AND OUT BOARD MOTORS

BACKGROUND

Patrol vessels are the foundation of a marine law enforcement program. The selection of an appropriate vessel and outboard (O/B) motor is critical as they have major implications on mission effectiveness, operational and maintenance costs and crew safety. Some important criteria include:

1. **Marine area factors:** Size, coastal or oceanic, and predominant weather conditions
2. **Stakeholder profile:** Type of vessel, speed, spatial and temporal considerations
3. **Endurance:** Fuel tanks and fresh water should be of prime consideration, but crew minimum comfort is also required (bathrooms, rest area, cooler, food storage, etc.). Standard coastal operations range from 6–48 hours.
4. **Vessel size:**
 - 8–12 meter vessel for near shore context (up to 12NM)
 - Vessel >14 meters is suggested for oceanic context (x>48h)
 - Crew capacity to ensure the patrol vessel can carry a large enough inspection team for typical fishing vessels in the operations area
5. **Hull:** “V” shaped for rough seas/oceanic patrols or flat bottoms for internal waters.
6. **Critical safety equipment:** Portable megaphone, portable GPS, binoculars, life jackets, raincoats, spotlight, flashlights, flares, signal mirrors, fixed and portable radio (marine VHF), magnetic compass, anchor, fenders, navigation lights, remote helm and speed control, hard canopy and watertight case (for storage of key items). Larger patrol vessels should also carry life rafts sufficient to carry all embarked staff.
7. **Motor size:** Many managers think bigger is better when procuring an O/B motor; however, big motors are big drains on budgets, especially in regions where fuel approaches \$6/gallon. Realistically, few interdictions are made as a result of hot pursuit and a balance must be found when selecting an (O/B) motor. We recommend the following O/B motors for patrolling and interdiction speeds of 12–15 knots (kt) and 25–30kt., respectfully:
 - Single 40–75HP 4-stroke O/B motor for vessels up to 8 meters; and
 - Single 100–150HP 4-stroke O/B motors for vessels ranging 10–12 meters.
 - Dual 100–150HP 4-stroke OB motors for vessels ranging 12–14 meters.

Generally, we recommend the use of 4-stroke O/B motors given their fuel efficiency and reduced environmental impact. When enforcement operations are remote or limited technical support exists, 2-stroke O/B motors may be a more appropriate alternative given their ease in repair and maintenance. Two motors are preferred for safety reasons for any offshore patrol vessel.

ARTISANAL APPLICATION

It's not the size of the motor, but the speed of the boat. One must match a motor of sufficient power with an appropriate hull to generate an acceptable interception/patrol speed, while maintaining safe stability and handling characteristics. Typically, an 8-meter vessel with a 40–75HP 4-stroke O/B motor is the most cost-effective option. If fishers use larger motors or fishing zones are over 8NM offshore, we recommend 10-12 meter vessels with single 100 HP O/B motors. Number of patrol vessels to cover an area is dependent upon the following factors: local geography, patrol area, desired response time, local support infrastructure, trained operator availability and other factors.

CAPITAL / OPERATIONAL COSTS

1. **Vessel and O/B Costs:**
 - 8 meter fiberglass vessel with 75HP 4-stroke and safety/inspection equipment: \$45,000–\$60,000
 - 10 meter fiberglass vessel with 100HP 4-stroke and safety/inspection equipment: \$55,000–\$70,000
2. **Monthly Operational Costs:**
 - Fuel & lubricants for 75HP 4-stroke /\$4.5/gal, 60–70 hours/month: \$245–\$270
 - Fuel & lubricants for 100HP 4-stroke /\$4.5/gal, 60–70 hours/moth: \$345–\$370
3. **Maintenance Costs (hull and motor):**
 - Rule of thumb: 3–5% of the asset acquisition cost
 - \$1,350–\$3,000/year (8 meter vessel); \$2,650–\$3,500/year (10 meter vessel)
4. **Useful life:**
 - 10–15 years for fiberglass assuming no hull or structural damage / 20 years for aluminum vessels
 - 5–8 years for a well maintained O/B motor

PATROL AIRCRAFT

BACKGROUND

Patrol aircraft can be a great asset for the surveillance of extensive areas $x > 500$ NM². In a rough oceanic environment, they can be more cost-effective than traditional patrol vessels as well as UAVs. Aircraft can be fitted with surveillance sensors (visual/thermal cameras and radars) to improve their surveillance capabilities.

<p>ARTISANAL APPLICATION</p>	<p>Patrol aircraft are effective when working in coordination with patrol vessels for interdiction or search and rescue. Patrol planes are not a recommended tool for most protected areas or government authorities, as they tend to have high operational and maintenance costs that will quickly surpass an agency budget. Although many single engine aircraft can operate effectively in a near shore environment, a twin-engine aircraft provides a safer operating margin for extended over ocean patrols. A patrol plane requires the following minimum personnel and equipment:</p> <ul style="list-style-type: none"> • A certified pilot and observer • Support crew for flights • Certified mechanics • A hangar with fuel tanks • Suitable maintained runway or take off / landing strip • Critical spare parts and special tools • Aircraft insurance
<p>CAPITAL / OPERATIONAL COSTS</p>	<ol style="list-style-type: none"> 1. <i>Fixed wing aircraft:</i> \$65,000-\$250,000 2. <i>Hangar and ground support:</i> \$45,000 -\$75,000 3. <i>Operational/Recurring Costs:</i> \$350-\$450/hour of flight. Insurance: \$12,000-\$17,000 4. <i>Useful life:</i> 12-15 years
<p>UNMANNED AERIAL VEHICLES (UAVS)</p>	
<p>BACKGROUND</p>	<p>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). Suitable maritime UAVs for maritime patrolling have the following general characteristics:</p> <ul style="list-style-type: none"> • Endurance: from several hours to 20+ hours of flight time depending on configuration, mission payload, and altitude • Stabilized and steerable video camera (day/low light) • Flight control computer (with radio telemetry) with live video transmission • Programmable flight/search patterns and automated search and recovery options • Portable ground control stations • Car/Short ramp launch and recovery options that do not require a runway • Spare parts
<p>ARTISANAL APPLICATION</p>	<p>Organizations should carefully assess any UAV or other unmanned system prior to acquisition to ensure the UAV can provide sustainable cost-effective surveillance and detection capability.</p>
<p>CAPITAL / OPERATIONAL COSTS</p>	<ol style="list-style-type: none"> 1. <i>UAV Cost:</i> \$50,000 to \$200,000 (per aforementioned performance standards) 2. <i>Recurring Costs:</i> 1-2 operators (salaries) and maintenance (\$100-\$140/hour) 3. <i>Useful Life:</i> x >10 years

GENERAL GUIDELINES FOR THE DESIGN OF AN ENFORCEMENT SYSTEM

Having explored key factors for context analysis and different surveillance tools, we provide the following general guidelines for the design and implementation of an enforcement system:

1. Limit Capital Expenditures (CAPEX) by leveraging existing infrastructure and keeping the number of vigilance posts and equipment costs to the minimum given the planned surveillance area, staffing and needed capability. All asset acquisitions must be performance driven, account for lifecycle maintenance and operations and not be dictated by donors. Many agencies have received patrol vessels and other assets from donors who had the best of intentions; however, their maintenance proved too costly and now they are just boats on sticks. In addition, technology is only a tool. It's not always the best technology that should be used, but the most appropriate for the context. We discussed many technologies in this section; however, the core component of every effective program is a trained group of Rangers/officers actively engaged in their enforcement mission.
2. Minimize Operating Expenditures (OPEX) by strategically placing vigilance posts, moorings and vessels, using appropriately sized and fuel-efficient O/B motors, deploying a VHF marine radio network and using cost-effective electronic sensors when feasible.
3. The incorporation of fisher, tourism operators and traditional leaders into an enforcement system can help reduce operating expenditures and can bolster compliance.

Physical presence of an authority (boats in the water crewed by trained rangers) and outreach remain one of the best deterrents.

COMPONENT	RECOMMENDATIONS
SURVEILLANCE AND OUTREACH PATROLLING	<ol style="list-style-type: none"> 1. Staffing: <ol style="list-style-type: none"> a. A control center should be staffed with at least one officer 24 hours/day. b. A patrol vessel should possess a minimum of 3 officers. Additional crew should be included when risk of escalation is prevalent. c. Vigilance posts should possess a minimum of 2 officers. d. Officers should inspect key ports and access ways. 2. Training/SOPs: <ol style="list-style-type: none"> a. Basic IMO Safety Courses and Boat Captain's Course b. Marine Coastal Enforcement Operations c. Operations Planning and Use of Available Assets 3. Rules, Regulations & Fees: <ol style="list-style-type: none"> a. Develop outreach and education component for stakeholders. b. Carry out a vessel registry, require the painting of license numbers on hulls in a highly visible location and update annually. 4. Provision of basic surveillance and safety equipment for officers. 5. Equip control center with database and operations planning room. 6. Establish a marine VHF radio network: 1 base radio at control center, 1 base radio per patrol vessel, 1 portable radio per vigilance post and 1 handheld for on-duty officers. 7. Procure appropriate patrol vessel(s) based on aforementioned criteria and contemplate installation of mooring buoys in strategic locations. The vessel does not have to actively patrol, but should be moored in strategic locations to establish presence. Presence equals deterrence. 8. Develop inter-institutional agreement and SOPs with partner agencies for joint operations. 9. Patrolling: <ol style="list-style-type: none"> a. Patrols planned for two boat operations for mutual support/safety when possible. b. Patrol focus, tempo, and locations randomized to ensure effectiveness. c. Enforcement focus based on local fishing seasons, patterns, transit lanes, areas, and methods. d. Planning includes scenarios, communications, notification process for enforcement actions and potential support needs.
INTERDICTION	<ol style="list-style-type: none"> 1. Elaboration of control center, patrolling, evidence collection, seizure, use of force, and boarding SOPs. 2. Establish routine reports, case file preparation, and incident reporting formats. 3. Establish a critical spare parts inventory and Maintenance SOPs.
PROSECUTION AND SANCTION	<ol style="list-style-type: none"> 1. Establish a practical database that allows for case monitoring and the recording of repeat offenders. 2. Establish an inter-institutional agreement between the enforcement agencies and the attorney to ensure correct report writing and timely processing of both fishing and tourism violations. 3. Carry out trainings for judges, prosecutors, local police and other enforcement/legal authorities.

DESCRIPTION AND SKETCHES OF DIFFERENT ENFORCEMENT SYSTEMS

In this section, we examine three case studies from the Eastern and Western Pacific in order to highlight key components of their enforcement systems. For each site, we explore the nature of the threats, institutional framework, resource levels, level of community involvement, surveillance technology, patrol assets and maritime vigilance strategy. Each site has differing degrees of technical

sophistication, resource levels and community involvement. The case sites include:

1. The Galapagos Marine Reserve (GMR), Ecuador
2. Ngarchelong, Palau
3. Southeast Misool, Indonesia

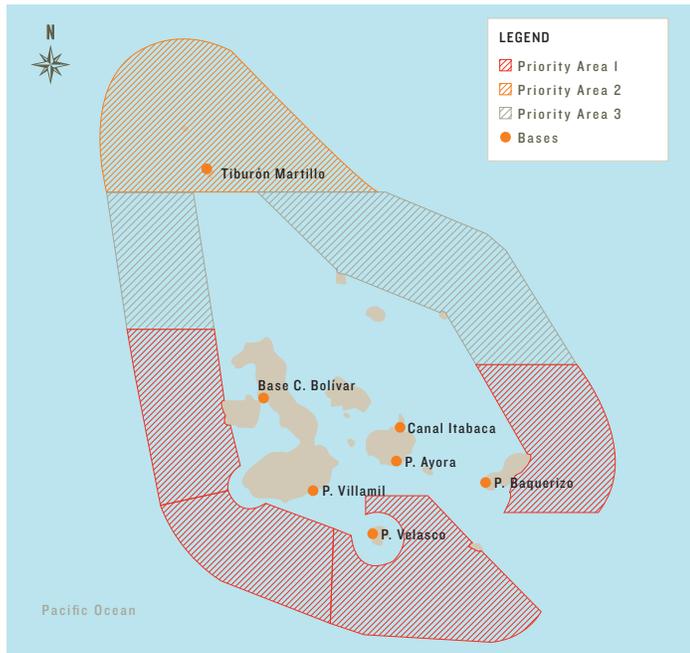
GALAPAGOS MARINE RESERVE, ECUADOR

COMPONENT	RECOMMENDATIONS
PROTECTED AREA CHARACTERISTICS	The GMR is the ninth largest marine reserve in the world at approximately 133,000 km ² . The GMR was formally created in 1998 via the Special Law for the Sustainable Development and Conservation of the Province of Galapagos (LOREG) and extends 40 nautical miles from its baseline around the islands.
THREATS	The primary conservation and management challenges facing the Galápagos marine environment fall into the following categories: <ol style="list-style-type: none"> 1. The artisanal fishing sector that resides within the Archipelago includes 1,000 fishers and a total of 355 vessels. Key fisheries include lobster, sea cucumber, tuna and several species of whitefish; 2. The national fishing fleet (largest tuna fleet in the South Pacific). Key fisheries include tuna and whitefish; 3. International fishing vessels from Colombia and Costa Rica. Key fisheries include tuna, sharks and whitefish; 4. 85 live aboards and 140+ day tour and inter-island vessels circulate throughout the Archipelago; 5. Unregulated land-based tourism activities; 6. Cargo and fuel tankers arrive weekly to three key ports.
INSTITUTIONAL FRAMEWORK	<p>The management of the GMR is carried out via the Participatory Management Board (PMB). The PMB equally involves the members of the community in the management of the protected area, from creating policies and strategies, to planning, implementing, and evaluating the actions that have been performed. At the local level, its members are:</p> <ul style="list-style-type: none"> • Galapagos Artisanal Fisheries Sector • Galapagos Chamber of Tourism • The Charles Darwin Research Station • Naturalist Guides Association • The Galapagos National Park Directorate. <p>Once decisions have been reached at the local level, they are then sent to the Institutional Management Authority (AIM) at the national level for approval. It establishes policies for the GMR, approves plans, monitors and evaluates management tools, supported by principles of conservation and sustainable development. This authority consists of seven members:</p> <ul style="list-style-type: none"> • Ministry of Environment • Ministry of Defense • Ministry of Trade and Fisheries • Ministry of Tourism • Galapagos Chamber of Tourism • Galapagos Artisanal Fisheries Sector • Conservation Sector <p>The Navy and the Galapagos National Park Service (GNPS) carry out GMR enforcement via joint patrols. The arrangement melds Naval power of arrest and firepower with GNPS patrol vessels and environmental expertise. In practical terms, this means the sharing of vessels, VMS data, expenses and the definition of clear roles and responsibilities based on respective jurisdictions.</p>
BUDGET	<ul style="list-style-type: none"> • Average yearly personnel, operating and maintenance budget: \$2M • The GNPS marine enforcement unit consists of 42 Rangers and 1 Director.

COMPONENT	RECOMMENDATIONS
COMMUNITY INVOLVEMENT	<p>The governance system is characterized as participatory as the community is formally involved in creating and evaluating policies via the PMB; however, the enforcement model is top-down. Fishers are organized into four cooperatives across three Islands; however, benefits of membership are limited. Fishers must be affiliated with a cooperative to obtain a license from the GNPS. Importantly, only artisanal fishing is permitted in the GMR.</p>
COLLABORATIVE SURVEILLANCE TECHNOLOGY	<p>VMS: Ecuador promulgated a law in July 2007 requiring all vessels above 20GT to use VMS transceivers. Stiff penalties were included for transceiver deactivation and violators lost access to subsidized fuel. VMS transceiver signal frequency was set to hourly for Ecuadorian vessels. The vessel owners pay the monthly service. This was a 3-year process initiated in 2006 and both the Navy and GNPS share access to data and received control centers for vessel monitoring.</p> <p>AIS: AIS shore-based infrastructure was also donated and installed throughout the Archipelago in 2012; however, it has been largely ineffective as there is no legislation to date obligating the use of AIS transceivers. A national law mandating the use of AIS on all vessels irrespective of size is expected by 2016.</p>
NON-COLLABORATIVE SURVEILLANCE TECHNOLOGY	<p>Patrol Aircraft: The GNPS procured a four-seat airplane with the help of the United States Agency for International Development (USAID) in 2004. Given the high cost of vessel operations, the patrol plane was first thought to be an excellent surveillance tool; however, over time it has become quite expensive, as all parts must be imported, the plane requires insurance, special fuel, a full-time mechanic and pilot. Maintenance has been further complicated as the plane manufacturer ceased operations in 2009.</p> <p>Vigilance posts: As many highly productive fisheries are concentrated in specific geographic areas, the GNPS set up vigilance posts at key sites where fishing pressure is strongest. A physical presence of Rangers with binoculars, a patrol vessel and VHF marine radios has been the most effective system for these highly productive and lucrative fisheries. Rangers are also stationed at docks during the sea cucumber and lobster fisheries to inspect vessels and catch.</p> <p>High power video cameras and radars: The GNPS completed the installation of harbor surveillance radars and video cameras at three key ports in November 2013. The additional sensors are extremely useful tools to help the GNPS and Navy enforce local fishing, tourism and maritime trafficking regulations. The cameras are especially helpful tools for citing infractions; such as fuel contraband, illegal fishing, overloaded interisland passenger boats, and cleaning fish in port, among others. Both the port captain and GNPS control center coordinate with a staffed zodiac in the bay, which can respond swiftly as violations are identified. The radar is specifically useful for identifying vessels entering and leaving the bays with illegal contraband and with location transceivers deliberately turned off. Combining these sensors within a manned command center enables the watch center staff to compare various sensor feeds and thus build a more comprehensive traffic, violations and operations picture.</p>
PATROL ASSETS AND MARITIME VIGILANCE STRATEGY	<p>The GNPS possesses a total of 11 patrol vessels, one floating base, a terrestrial base and a four-seat patrol plane. While the VMS system provides location information for all 20GT commercial vessels, the patrol plane carries out perimeter patrols to ensure that foreign artisanal vessels are not fishing within the GMR and supplying fish to commercial vessels outside of the GMR. In the north, the GNPS deploys a floating base at Wolf island, which is staffed with 3 Rangers and 1 Navy officer 24/7. The floating barge possesses a small patrol vessel that carries out routine patrols of the area. The GNPS also constructed a permanent vigilance post at the Canal de Bolivar, which is a known sea cucumber recruitment area. Based on the geographical distribution of past industrial fishing vessel interceptions and the location of highly productive marine mounds, the GNPS has classified patrols into three categories:</p> <ul style="list-style-type: none">  Area 1. High Fishing Pressure <i>Patrol 3-4 times per week</i>  Area 2. Medium Fishing Pressure <i>Patrol 2-3 times per week</i>  Area 3. Low Fishing Pressure <i>Patrol 2-3 times per month</i> <p>Prior to selecting patrol routes, the manager and patrol crews also considers the following variables:</p> <ol style="list-style-type: none"> 1. The usual hours for setting fishing gear is between 03:00-07:00 and 19:00 to 23:00; 2. Lunar calendar: increased fishing activity occurs around a new moon; 3. Seasonality: Changes in seasons/currents affects species geographical distribution.

Figure 05: GNPS classification of patrol routes by fishing pressure

Figure 06: Incidence of commercial fishing captures from 2001–2012



NGARCHELONG, PALAU

COMPONENT	RECOMMENDATIONS
PROTECTED AREA CHARACTERISTICS	Ngarchelong State is the northernmost state on Babeldaob Island and is home to some of Palau’s most abundant and productive fishing grounds. The Ngarchelong Marine Managed Area (NMMA) encompasses 1,964 Km ² of reef, channels, lagoon, mangrove, and open ocean out to 12 miles. There are three key ports (two on the West and one on the East) and a number of passageways on the Western side of the Island, which are used by out-of-state fishers to access Ngarchelong and Kayangel territorial waters. The local population has easy access to the primary lagoon and outer reefs.
THREATS	<p>The primary conservation and management challenges facing the NMMA fall into the following categories:</p> <ul style="list-style-type: none"> • The artisanal fishing sector consists of an estimated 48 local vessels: 6-8 meter vessels with 85HP O/B motors. There are a minimum of 16 tourist sites for snorkeling, scuba, research and sport fishing (both catch and release & catch and consumption). There are tourism and fisher vessels that pass through territorial waters en route to Kayangel, which is located North of the NMMA. • Occasionally, large fishing vessels from Vietnam and China encroach upon the area. • Fishing threats include overfishing from unlicensed local commercial fishing & unpermitted fishing for customs and the targeting of undersized and out of season marine species. • Key fisheries include groupers, rabbit fish, snapper, parrotfish, wrasse, lobster, unicorn and surgeon fish, emperor fish, sea cucumber, giant clams, corals, trochus, green turtles, mangrove and coconut crabs. • Fishing gear: Hand lines, spear guns, rod and reel, and reef fishing with nets (no smaller than 3-inch mesh). Use of gillnets and SCUBA gear is prohibited. • Unlicensed tourism operators and anchoring in sensitive areas and coral destruction • Poor fuel management as well as used hydrocarbons (oil) and battery disposal.
INSTITUTIONAL FRAMEWORK	The Ngarchelong Department of Resources and Development (NDRD) was created via the adoption of Bill No. 16-01 on January 15, 2013. The NDRD mandate is to manage, implement, and enforce the natural resource laws and regulations of the state of Ngarchelong.
BUDGET/STAFFING	<ul style="list-style-type: none"> • Average yearly personnel, operating and maintenance budget: \$90,000 • The enforcement unit consists of 6 Rangers and 1 Director.

Figure 07: Range of High Power Video Camera and Buoy Location

Image 04: Ngarchelong Boat Capitan, Palau

COMPONENT	RECOMMENDATIONS
COMMUNITY INVOLVEMENT	The governance system is characterized as participatory as the fishers are involved in the formulation of regulations; however, the enforcement system is characterized as top-down. There is little formal organization of the fishing sector.
COLLABORATIVE SURVEILLANCE TECHNOLOGY	No collaborative system is currently deployed in Palau for near-shore fisheries. AIS could theoretically work; however, the maritime authority would need to promulgate a national law requiring transceivers on all vessels, not just those registered in Ngarchelong. Palau also faces another obstacle, as there is no national vessel registry. Currently, The Bureau of Marine Management (BMM), Palau's maritime authority, registers all commercial vessels greater than 65 feet; however, 90% of all vessels in Palau waters are of shorter length. Vessel registration is currently left to states while marine motor registration is carried out by the BMM. At a minimum, a universal vessel registration among states would need to exist prior the deployment of AIS. Palau deploys VMS to monitor the commercial tuna fleet operating within its Economic Exclusive Zone (EEZ). Given the quickness of artisanal vessels and small coverage area combined with long interval times for vessel location, VMS is not appropriate for the artisanal sector.
NON-COLLABORATIVE SURVEILLANCE TECHNOLOGY	<p>High power video cameras: As 70% of enforcement expenses are typically related to personnel and fuel, Ngarchelong installed a high-power video camera at Todai with combined visual/thermal capacity to provide 10NM coverage as illustrated in Figure below. The video camera provides coverage of key access waterways to identify vessels traveling into territorial waters at both night and day. Once a vessel is detected, the control center informs Rangers via the VHF marine network to interdict. In the near future, Ngarchelong will install four buoys throughout the NMMA to moor the patrol vessel. Once a perpetrator is detected by video surveillance, the patrol vessel can start its engine and intercept the perpetrator. Four moorings were chosen based on bathymetry and the strategic location of Ebiil, SPAGs and territorial boundaries.</p> <p>Binoculars: Rangers also use binoculars for surveillance. They are appropriate given the small maritime area and clear demarcation of protected areas.</p>
PATROL ASSETS AND MARITIME VIGILANCE STRATEGY	<p>The Ngarchelong State Rangers possess two patrol vessels: a 27 ft. vessel with one 225 HP (4 stroke Mercury) and a 23 ft. vessel with one 150HP (4-stroke Mercury). When patrol planning, the Rangers take the following factors into consideration:</p> <ol style="list-style-type: none"> 1. Most illegal fishing takes place at night with small fiberglass vessels; 2. Monsoon season (November to April) limits patrols, as does the entry of out-of-state fishers; 3. Prevalent Easterlies from May through October cause out-of-state fishers to enter Northern Reefs on western side of Island; 4. Westerlies from November to April cause out-of-state fishers to enter the Northern Reefs on eastern side of Island.



COMPONENT	RECOMMENDATIONS
PROTECTED AREA CHARACTERISTICS	<p>Raja Ampat is located in the center of the Coral Triangle and is the home to the highest concentration of fish and coral biodiversity found anywhere in the world today. The area is geographically isolated and surrounded by open seas, creating an oasis for pelagic fish. The Batbitim (126 NM²) and Daram (98NM²) No-Take Zones (NTZs) are located within the South East Misool MPA and are separated by 24.6 nautical miles. The areas are characterized by their abundance (100+) of small islands, islets and rocks and an extremely irregular coastline with numerous coves and 100-150M+ peeks. The geographical and topographical complexities pose difficulties for the use of radar and radio communication due to the numerous shadows that are created for microwave and VHF waves, respectively. Both NTZs are not close to maritime traffic routes.</p>
THREATS	<p>The primary conservation and management challenges facing the Southeast Misool marine environment fall into the following categories:</p> <ul style="list-style-type: none"> • There are an estimated 200+ fishers inside the MPA who typically use small 3–5 meter vessels with 5 – 10HP O/B motors or no engine at all. Fishers are not organized into cooperatives nor are they required to register vessels with any management authorities. The majority of fishers use hand lines for subsistence means. Fishers from other Papua provinces enter the MPA regularly and tend to use larger vessels with more crew. Large Javanese vessels also enter the MPA and usually hire the local police or Navy for escort. • Target Fisheries: Sharks, live reef fish (groupers and Napoleon Wrasse), snappers, tuna, jacks, lobster, bivalve, sea cucumber, shellfish, and squid. • Fishing gear: Hand lines, Dynamite, Cyanide (Rare), Gill Net, Long line, and Drag Line. • Coastal development and trash.
INSTITUTIONAL FRAMEWORK	<p>The bulk of regulations and decrees guiding marine conservation and zonation activities are promulgated at the Regency and local “Adat” level. Unique to only West Papua, the Adat, the traditional local community council, has traditionally recognized authority to govern its ancestral lands and presents a very unique advantage for the local administration of protected areas and the rule of law. This “right” is not officially acknowledged under any national law per say, but is permitted in only certain areas of Eastern Indonesia, including West Papua.</p> <p>The Misool Eco Resort (MER) established a Marine Conservation Agreements (MCA) with the local communities in exchange for the right to establish a tourism resort on Batbitim Island and to protect two NTZs within the Southeast Misool MPA. The agreement prohibits fishing within the NTZs yet respects traditional “sasi” zones allowing the targeting of <i>Trochus niloticus</i> and <i>Turbo marmoratus</i> for two weeks every two years. In an effort to separate conservation activities from the business/shareholders and ensure local ownership of marine resources, the MER established a local NGO called Misool Baseftin Foundation, meaning “Misool: We Own It Together” in January 2011. The Board is comprised of five Indonesian members and the organization possesses its own bank account and is a registered Indonesian charity.</p>
BUDGET	<ul style="list-style-type: none"> • Average yearly personnel, operating and maintenance budget: \$120,000 • The enforcement unit consists of 6 Rangers, 6 Community Rangers and 1 Director.
COMMUNITY INVOLVEMENT	<p>The enforcement system is top-down and participatory. Baseftin has developed a unique private-community compliance model for both Batbitim and Daram NTZs. There are a total of 6 Baseftin Rangers, 6 paid Community Rangers and 1 security officer who comprise the enforcement team. Community Rangers are rotating positions to increase the amount of community engagement and buy-in for the NTZs. Extensive outreach activities are carried out by Baseftin Rangers in surrounding communities as well as social investment.</p>
COLLABORATIVE SURVEILLANCE TECHNOLOGY	<p>Given the small size and quickness of target vessels (3-5 meter wooden vessels) combined with geographical complexities of the area, neither VMS nor AIS is appropriate for near shore coastal management.</p>
NON-COLLABORATIVE SURVEILLANCE TECHNOLOGY	<p>Patrol vessels, satellite base camps and binoculars. Given the high cost of fuel associated with running continuous patrols, Baseftin smartly built three strategically placed base camps at Kalig, Yillet and Daram Islands to ensure a continuous presence. Each base camp possesses its respective small vessel to carry out coastal patrols. Rangers use binoculars for surveillance and VHF marine radios to coordinate with the larger patrol vessels and the control center when necessary. The Rangers utilize vessel logs and have an adaptive planning mechanism in place.</p>

Figure 08: South East Misool MPA No-Take Zones and Location of Base Camps

Image 05: Baseftin Rangers, South East Misool, Indonesia

COMPONENT	RECOMMENDATIONS
<p>PATROL ASSETS AND MARITIME VIGILANCE STRATEGY</p>	<p>Baseftin possesses two 9-meter aluminum patrol vessels with two 85HP motors each and three 3-meter wood patrol vessels with 10HP motors (one vessel for each base camp). Maximum patrol speeds range 6 knots for small vessels to 30 knots for the aluminum patrol boat. 2-stroke O/B motors are used given ease of maintenance and local familiarity with the equipment. Baseftin coordinates 10 patrols per month with the larger aluminum patrol vessels. Frequency of patrols is limited by the high cost of fuel. There is limited institutional presence (Police, Navy, Army, Fisheries) for patrols though a Police officer is periodically incorporated into the Daram patrol. Daram is permanently staffed with 3 Rangers and is the primary target for bomb fishers among other illegal fishers given its remoteness. The other two base camps are staffed with 2-3 officers (Baseftin Rangers or Community Rangers) on a weekly basis.</p>



TOOLS FOR MANAGER-ORIENTED INTERVENTIONS IN ENFORCEMENT SYSTEMS TO IMPROVE FISHERIES MANAGEMENT

In this section, we briefly examine some tools employed to improve fisheries management. These tools are field tested, have yielded positive results and are feasible for replication. While there is no one single tool or solution for improving artisanal fisheries management, managers must determine which combination is most feasible for application in their local context. Management is

meant to be adaptive and processes should allow for continuous experimentation and improvement over time. Note: this is not meant to be a manual in fisheries management as that is a science that involves aspects that exceed the scope of this guide. In Figure x, we examine several tools that can assist managers improve fisheries management.

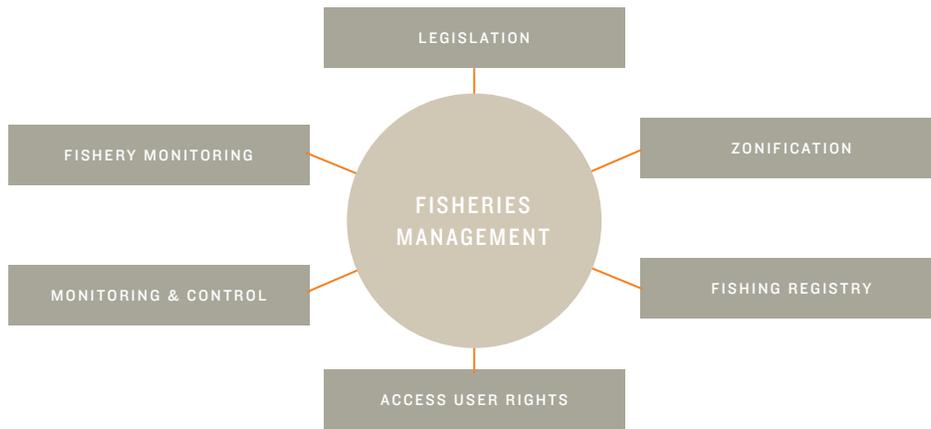


Figure 09: Tools for Artisanal Fisheries Management

I. LEGISLATION/ MANAGEMENT TOOLS

First off, managers can use the regulatory framework to promulgate new regulations to either limit or prohibit activities as it relates to a specific fishery. Typical fishery management tools include: gear restriction, prohibition of harvesting of specific species, area closure, fishing seasons, quotas and size limits. In our experience, we do not recommend establishing quotas or size limits until reliable scientific information on population and sexual maturity exists as many mistakes have been made when these tools were used without sufficient data causing open conflicts and distrust between fishers and management authorities. Other tools, such as fishing gear restrictions, prohibited species, area closure and fishing seasons, require less hard science and can normally be determined via interviews and rapid rural surveys in cooperation with fishers. These surveys should be carried out during the elaboration of management plans and the information should also inform enforcement strategies.

FISHERIES MANAGEMENT TOOLS AND ENFORCEMENT CONSIDERATIONS

- 1. Size limits: The enforcement of size limits requires presence of officers at ports and inspection at sea.*
- 2. Reef/fishing ground closure: The enforcement of closed areas can be managed from a distance and does not require constant physical presence unless a vessel enters the area. It's key to create boundaries that are easily identifiable by the local fishers and the local enforcement teams, especially for local fishers who lack clear position determination equipment.*
- 3. Gear restriction: The enforcement of gear restrictions requires inspection at ports and sea.*
- 4. Season closure (i.e. spawning periods.) The enforcement of season closure requires presence of officers at ports and inspection at sea.*
- 5. Quotas: The enforcement of quotas requires presence of inspectors at ports or commercialization centers. Fisheries enforcement and data collection should not be mutually exclusive activities.*

*Image 06: Seized Vietnamese Vessel in Palau Near
Shore Waters*



2. ZONIFICATION

Zonification is a tool that can help safeguard specific areas with higher ecosystemic value, manage specific activities (i.e. fishing, tourism, transportation, etc.) and facilitate surveillance within a given area. Unfortunately, the tool is often misused as too many different areas are created within a protected area making it nearly impossible to enforce by officers. Zoning schemes tend to be replicated irrespective of protected area size thereby confusing stakeholders and generating conflict. During the development phase of a zonification scheme, we recommend thinking through the operational implications of enforcement as well as the stakeholder perspective. Zonification schemes should be easy to understand by all stakeholders as well as the officers who are tasked to enforce them. Perfection is the enemy of good: we recommend beginning with easy to understand zoning schemes and limiting the number of use areas.

3. FISHING VESSEL REGISTRY

Fishing vessel registries are powerful tools that authorities do not tend to fully harness for fisheries management, as registries are often either non-existent or outdated. We recommend establishing a fishing registry in order to prevent open access problems, allow for better control of stakeholders and improve organization of the fishing sector. An actualized fishing vessel registry provides critical information to enforcement authorities about the vessel, the owner, and is vital for levying sanctions. In our experience, there are a few potential pitfalls one must account for when developing a fishing vessel registry:

1. Many foreign fishers will suddenly try to enter the registry with the support of local leaders and fishers. This must be avoided as the fishing registry could

ultimately have the undesired consequence of increasing fishing pressure;

2. We recommend registering both fishers and vessels; however, special emphasis must be placed on vessels as the number of vessels will ultimately dictate overall fishing capacity⁴.
3. The maritime authority (Ministry of Transportation or Coast Guard) should be responsible for vessel registration and should have all vessels convene at one port for identification and in order to avoid cloning. The same authority should conduct periodic inspections to validate registry information and limit the ability of owners/operators to “shift” registrations without approval.
4. A specific fishery must be registered to the fisher or the vessel as this helps in the distribution of fishing pressure. Control mechanisms must account for situations where one fisher operates in multiple fisheries.
5. Managers can use the following criteria for vessel registration: 1) Register only fishers that are members of a local fishing cooperative (in the event they exist); 2) Monitor fishers over time and formalize their access with a license (this method proves costly and appropriate for smaller areas/fisheries); or 3) Determine a procedure using the following criteria: fishing permits, fishing history, sale receipts, etc.

4. TERRITORIAL USER RIGHTS FOR FISHERIES

Territorial User Rights for Fisheries (TURFs) are also powerful co-management tools whereby fishery concessions are managed directly by fishers under the

⁴ In Machalilla National Park, only divers were recorded in the fishing registry, as it was determined that numbers of divers not vessels reflected the true fishing effort.

supervision of the environmental authority often in cooperation with academic institutions. The granting of exclusive rights to fisher organizations has proven successful to manage sedentary resources (oysters, crabs, abalone and seaweed), habitat conservation, community organization and the improvement of the local economy. However, the establishment of TURFs is a lengthy process and is not for every country as there are several prerequisites for implementation: 1) the legal and institutional framework must contemplate rights-based management; 2) fishers must be well organized into cooperatives or associations; and 3) sufficient scientific studies must be carried out for TURF design. Ultimately, the establishments of TURFs does not eliminate the need to fund enforcement, however, they are proven management tools, especially in countries where limited financial resources and institutional presence are an issue.

5. MONITORING AND CONTROL

While we examined top down MCS systems in Section III, we also advocate for participatory surveillance systems. When access is restricted to a specific area or a licensing mechanism exists, we recommend incorporating stakeholders into the surveillance system given the high costs associated with patrolling. Once under restricted access, theoretically an area will only be accessible to an exclusive number of fishers and registered fishing vessels. When these conditions are met, we recommend the establishment of a practical visual detection system whereby all registered fisher vessels are painted with a single color as well as the installation of a pole and flag. From a surveillance perspective, this aids in easily differentiating between local and foreign fishers. Illegal tourism is also a potential problem, which can be resolved by including both licensed fishers and tourism operators into the

surveillance system. Select fishers and tourism operators can receive a marine VHF handheld radio and alert local authorities about any unusual activity or unidentified boats entering an area. In our experience, local fishers expressed fear of reprisal from illegal fishers; however, they still collaborated as the illegal fishers completely disregarded catch size limits. A fisher and tourism surveillance program should be anonymous, rolled out gradually and perhaps initially limited to only 3-5 strategic contacts (depending on the area). Participating fishers would require minimum training and equipment at first, yet their inclusion is cheaper than hiring official rangers over the long term. Radio property and responsibilities for their use must be clearly stated and resolved in advance.

6. FISHERIES MONITORING

In the absence of formal state sponsored fisheries monitoring programs, we recommend the implementation of the following low-cost data collection model. Generally, three institutions are involved in the model:

- Fisher organizations are responsible for collecting field data in a simple format and delivering to investigators. Fishers should at least be literate or have their children help in filling out the form(s).

- Research institutions are responsible for data analysis and sharing the information with the management authority and fishing community. We recommend establishing a formal agreement with a local University to ensure a long-term commitment with the local area.
- Non-governmental Organizations (NGOs) develop the conceptual design, elaborate protocols/formats, serve as intermediary between fishers and research institution, provide key technical assistance/training and accompany the process for a minimum of three years.

The model has several advantages: it reduces the cost of data generation; creates a direct relationship between research institutions and local communities; improves space-time data sampling with the integration of local knowledge; and finally it provides greater level of confidence given greater sample size. The implementation of an artisanal fishing data registry does not come without its problems. In our experience, research institutions/scientists are highly skeptical of the quality of the data collected by fishers. Granted, data collection will initially possess many errors, but improves over time via systematic training and more importantly, in situ verification. Importantly, fishers should be incentivized through the provision of basic project gear; data analysis should be shared with fishers and disseminated annually.



Figure 10: Tools for Artisanal Fisheries Management

Image 07: "Cangrejeros" from Ecuador
(Concessionaries)

30



SYSTEMATIC TRAINING: CHECKLISTS, JOB AIDS AND SOPs FOR KEY ENFORCEMENT ACTIVITIES

In this section, we highlight the key elements for the design of a systematic training program and recommend various tools to ensure consistent and standard application of regulations. Enforcement officers engaged in active patrolling require specialized skills and knowledge to *safely* and *effectively* perform their mission. While many agencies draw their enforcement staff from experienced fishers and boaters, active maritime enforcement requires developing and maintaining additional skills to ensure mission effectiveness, patrol team safety, and the even application of the law. A foundational element of a professional maritime enforcement program is an organized top-down training system designed to impart and sustain these skills. Effective maritime enforcement training programs:

1. **Are systematic and recurrent.** Senior leaders must establish a top-down training directive and monitor program performance to ensure desired results. Content within the program should be supported by SOPs to ensure that *what* is trained is consistent and meets organizational goals. This includes using standardized lessons plans to support delivery and completion of performance-based objectives within a repeatable delivery structure. Lesson objectives must reflect the missions, operational constraints, legal mandates, jurisdictional boundaries and local procedures to ensure that the enforcement officers conduct operations and enforcement activity to a reliable, repeatable, and operationally sound *standard*.

Standard operating protocols are key for ensuring continuity and preventing informal interpretations of rules and regulations. They are also important given high staff turnover. The devil is in the details: define clear roles and responsibilities for each agency for different scenarios.

2. **Deliver performance-based training that includes realistic activities and exercises.** Performance-based training *must* focus heavily on the actual actions that are required to do the job. This means conducting realistic class-based training and exercises that build in complexity to ensure trainees can realistically perform their jobs in the field. Lesson plans should include planned formative activities and exercises that are tied to the objectives. Courses should include summative exercises that fuse course content into realistic and situational appropriate missions. Instructors should use scripted guides and checklists to plan, deliver, and evaluate these exercises. The checklists can also serve as effective planning tools and memory aids for the enforcement teams and patrol staff.

3. **Are actively managed and delivered by local teams.** Although external training experts may augment local teams, active programs typically require local support. The management team should establish the training program, develop training schedules, and ensure that training is delivered per standard, which includes developing local experts to serve as trainers (train-the-trainer). Training delivered by qualified local instructors is not only cost-effective, but local instructors also serve as valuable coaches for newly assigned enforcement staff. Relying on local instructors as the program's core trainers also ensures that the instructor thoroughly understands local regulations, equipment constraints, organizational issues, local fishing characteristics, and community concerns.

4. **Include initial and refresher skills development.** Training that relies on "one off" programs that are infrequently and inconsistently delivered rarely provide teams with the sustainable skills and knowledge development they need to perform missions correctly over time. This is especially true for objectives that are difficult, infrequent, and critically important as trainees may not recall or be able to perform a difficult task without refresher training or job aids. Initial training should be delivered as soon as possible after a person joins the enforcement team and then periodically refreshed to ensure that new standards, policies, processes, equipment changes, and other objectives are performed to standard.

5. **Use Job Aids and Checklists.** Many training programs rely on a "train to memory" type of approach; however, infrequently used skills rapidly erode over relatively short time frames. Professional trainers often refer to this as "use it or lose it". One way to limit this erosion and improve performance is to develop checklists and job aids within the training program and subsequent field operations. Job aids and checklists are very beneficial for critically important tasks, such as building a case file or performing a "ready for sea" operational boat check. They provide enforcement staff with a quick reference that can enable a novice or inexperienced person to still perform to standard.

The use of vessel logs, checklists and job aides result in effective predictive maintenance instead of costly corrective repairs.

6. Are built around common foundation and specialized objectives. Common objectives typically include general safety and operating skills that are used across the agency. These skills should be included in a foundational/initial training program or set of courses. Foundational topics typically include:

- *First Aid.* Basic first aid and lifesaving skills for patrol and enforcement staff.
 - *Basic Safety and Personal Protective Equipment (PPE).* “How and when to use” training for basic lifesaving and PPE equipment including flotation, signaling, fire-fighting, toxic/anoxic gas detection equipment (for programs dealing with larger vessels),
 - *Command, Control, and Communications (C3).* Equipment use and methods for boat, enforcement team, and C3 staff to effectively direct, complete and report on patrol and enforcement actions. This may include specialized training for controlling staff (i.e., a watch or control center) that focuses on patrol planning, coordinating resources, supporting mission teams with on call resources and other related C3 functions.
 - *Enforcement tools and materials.* Team and individual methods and procedures to use measurement and identification devices (i.e. local catch size scales or identification keys), inspection tools (i.e. a borescope if equipped), and other available equipment.
 - *Jurisdictional and Legal Framework.* Local legal framework including jurisdictional and enforcement constraints and requirements tied to the *specific* actions, evidence standards, notification requirements and other elements needed to conduct enforcement that generates results. Includes how/when to make a seizure, arrest, or other enforcement action that is supported by the legal system.
 - *Enforcement Team Tactics.* Inspection and boarding team organization, general tactics, controlling methods, typical hazards, and inspection tips and techniques geared towards the typical boats and vessels that operate in the area.
 - *Search and Seizure Methods and Procedures.* Sweep, inspection, search, evidence collection and seizure/enforcement techniques and limits. Training provides enforcement teams with the methods and processes they need to follow to catch violators and prevent further violations while conducting enforcement that is fair, reasonable, and perceived by locals as beneficial to shared local objectives.
 - *Evidence Collection and Case File Preparation.* Documenting enforcement actions, determining position information and activity descriptions for violations and intercepting patrol teams, command and control actions, evidence collection, and case file preparation activities per the local legal standard. In short, what does the controlling legal authority need to make a successful case? Training typically includes local legal system representatives to ensure training yields the desired result. Legal staff should also receive basic enforcement training to foster effective communication with the enforcement arm.
 - *Use of Force and Personal Protective Tactics (Optional).* Fisheries enforcement teams may not have formal law enforcement authorities including the legal authority to arrest or use weapons. However, basic training to develop patrolling and boarding officer professional demeanor, communication skills to defuse tension, and use of force methods related to personal and boarding team protection build confidence and help members to professionally deal with aggressive or violent fishers.
 - *Operational mission and boat checks.* Prepare boat crew and other patrolling staff to safely conduct at sea operations using checklists and job aids. This also may include preparing sensors and other specialty equipment for operations and patrolling.
 - *Patrolling and boat handling skills.* This includes coxswain (boat commander) and crew skills, duties, and functions needed to safely operate at sea or in local operating coastal waters. Includes specific boat tactics to support an inspection and enforcement team, response actions, sensor use, and C3 actions.
 - *Local situational awareness development.* This may include training to ensure the patrol teams, especially if they are not drawn from the local fishing community, understand local fishing methods, local species of interest, economic concerns, program benefits, and other issues. Training needs to help local teams to develop the awareness and message/communication skills they need to serve as effective program “ambassadors” and outreach staff. Consistent messaging and responses to questions like “Why are you inspecting me?” or “Who said you could stop me?” are also important components of a program that the public perceives as fair and honest.
- 7. Develop specialty skills and knowledge in addition to foundational objectives.** After mastering these objectives, enforcement and management staff should receive training in key

specialty skills that are directly tied to their specific jobs and functions. These typically include highly technical or rigorous equipment maintenance and repair tasks, formal licensing (i.e. larger vessel operator), instructor development (T3) training, and fishery management training. Training should leverage original equipment manufacturer (OEM) training, OEM technical manuals and materials, and locally developed/maintained job aids.

8. *Is regularly reviewed, updated, and implemented.* Senior staff should review the training program at least annually, which should start with a look at operational performance. Training will not fix resource shortfalls, insufficient legal authority, or other environmental issues. However, the program should address operational performance that is impacted by the staff's knowledge and skills. This should include capturing lessons learned to see where performance needs to be reinforced, institutionalizing and sharing "best practices", and ensuring that training accurately conveys current standards and requirements. The review should examine lesson plans and other content, instructor performance, program frequency, equipment operations and maintenance. Reviewers should also canvass their operating teams to try and determine what skills and knowledge the operators need to do their jobs safely and effectively.

STANDARD OPERATING PROCEDURES (SOPS)

SOPs are essential for institutionalizing enforcement procedures and help new personnel learn appropriate actions, responses and methods more quickly by providing a consistent and objective source for operations. SOPs are living documents designed to ensure the best, up-to-date practices for enforcement. For this reason, they should be updated regularly in accordance with the input and experience of the officers. As a minimum, SOPs should be developed for the following core enforcement components:

1. **Control Center:** The control center should be staffed by at least one officer at all times and ideally operational 24 hours a day, 7 days a week. The operators communicate all infractions and events to the control center supervisor. The center is responsible for monitoring information concerning vessels entering and leaving MPAs and any movement within or near the area. Main responsibilities of the center include:
 - Direction of communication between officers, vessels and managers, as well as with other agencies.
 - Coordination of active operations as well as interdictions and sends backup as needed.
 - Maintenance of all archives including user manuals and SOPs.
 - Communication with external agencies and managing confidential information.

MORE ON JOB AIDS AND CHECKLISTS

Job aids and checklists enable a user to perform a job even if they do not recall all of the specifics, actions, or steps associated with that job. Prepare job aids and checklists that are concise, focused, and written at the language and reading level of the typical user. Incorporate pictures, diagrams and other visual elements when they can make a point faster or clearer than a written text

section. Prior to implementation, one must ensure that each job aid and checklist is thoroughly tested and reviewed. Ideally, develop your job aids and checklists on water resistant paper and make them small enough to easily fit into a pocket or clipboard. The following table highlights the types of activities, functions and benefits associated with job aids and checklists.

ACTIVITY / TASK	JOB AID / CHECKLIST FUNCTION AND BENEFITS
RECALL PROCEDURES AND STEPS	<ul style="list-style-type: none"> • Guide the user through each step in sequence from the first time • Task performance is standardized, reliable, and repeatable • Training uses the job aids that are in turn used in the field to build competency with a minimum of required training time
INSTITUTIONALIZE OEM CONTENT	<ul style="list-style-type: none"> • Capture content from OEM turn over training in a job aid or checklist to avoid "losing" those skills during warranty or initial operational time periods • Use still pictures and diagrams to show specific actions, parts, and results
MAKE EFFECTIVE CHOICES	<ul style="list-style-type: none"> • Job Aids that use "if-then" patterns can help users make correct choices and decisions for standard situations and issues
REPORT / DOCUMENT ACTIONS	<ul style="list-style-type: none"> • Provide clear reporting and documenting requirements and direction coupled with key operational tasks and functions • Guides the user on what and when they need to report who gets the report

A sample ready for operations boat checklist and job aid can be found in Appendix I

- Maintenance of technology and state of resources.
- Knowing that the personnel profile fits the functional need of the different posts.

2. 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 boat patrol, patrol with cross search leader, barrier patrol, radar patrol, and patrol with searchlights, among other strategies.

3. Boarding: Boarding inspections are subject to maritime control and interdiction procedures and must take into account a range of potential activities from fishing violations to greater crimes such as drug trafficking, piracy, contraband, and

murder, among others. Boarding inspections may be met with an armed and hostile response from a suspected crewmember. All boarding plans must consider these real and legitimate threats. Boarding inspections should take the highest level of precaution for personnel and the vessels. The minimum requirements of a boarding SOP include:

- Determine if patrols will be performed undercover.
- Determine the distance and speed of vessels to be intercepted and detained.
- Minimum training requirements for personnel in the inspection of different types of vessels and their associated risks.
- Protocols for the chain of command, control, and abnormal situation assessment (Ex: the escalation of a detected crime).
- Communications protocols to keep constant communication with the control center (Ex: perform periodic checks every 15 min).
- Restrictions on the use cellphones or personal cameras while performing a boarding inspection (this can put the security/success of the operation at risk). Only the team leader is allowed to use them.

PROSECUTION AND SANCTION

Political will is one of the most important factors for enforcing regulations. Political will must exist both vertically and horizontally: from the Minister to the Park Director to Wardens to Prosecutors to Judge, etc. If just one of those actors does not do his or her part, the system fails

Enforcement systems require effective criminal, civil and/or administrative sanctions. Simply put: if there are no repercussions, fishers will return tomorrow. Lack of penalties will undercut community respect for regulations as well as negatively impact enforcement team morale. Unfortunately, environmental crimes often tend to be a low priority for elected officials and are difficult to prosecute as multiple agencies are involved in the administration of justice. In addition, many judges and attorneys are not trained or regularly updated on fisheries or environmental laws; contributing to case error and incorrect application of the regulations. Regardless, measures must be taken to avoid delays, improve coordination and decentralize the sanction process as impunity ultimately represents a loss for all involved. Sanction is a broad term with different meanings in different contexts and legal systems; however, we are using the term to define a punitive action carried out by a controlling legal authority with jurisdiction over the violation. Generally speaking, sanctions are either administered under criminal/civil law requiring lawyers and courts and/or carried out by an administrative agency. For example, federal and state environmental protection agencies are authorized by statute

to levy fines against fishers that violate environmental laws and regulations. While the legal framework is unique in each country, the following types of sanctions should be considered in the development of enforcement systems:

ANCESTRAL SANCTION MECHANISM IN INDONESIA

In Western Papua, Indonesia, the MER has worked with the community leaders of Yillu to develop a local fining mechanism that is truly unique and effective for enforcement. In summary, the mechanism permits the Adat council to levy fines against anyone fishing in the Batbitim NTZ. The ruling, which is signed by all the Adat leaders and the village head, imposes fines of between \$500- \$1,000 per boat that is caught fishing inside the NTZ. The ruling has been in effect since May 2011. There are three key advantages to this mechanism:

- 1. The Adat ruling and sanctions can be completed within one or two days as opposed to a court case, which may take many months to complete.*
- 2. The Adat ruling presents zero costs whereas cases processed via the judicial system can be costly and require third party funding.*
- 3. The Adat fine goes straight into the local community fund and hence provides incentive to catch and prosecute violators.*

Criminal/Civil Sanctions: The following actions are recommended to improve judicial proceedings:

- Establish a standardized boarding report format that can be leveraged within a subsequent case or violation file based on recommendations from the Attorney General.

- Officers should be trained to complete the boarding report to conform to the desired level of specificity, descriptions, nomenclature, and methodology.
- Formalize official relations between the agency and their provincial and/or federal counterparts.
- Carry out training workshops for judges, attorneys and lawyers at a minimum once a year. Training should include a review of sample cases, reporting tips, case file preparation techniques and a frank dialogue between the legal team that prosecutes the case and the enforcement team that collects the evidence and enforces the law.
- Assign additional lawyers from NGOs or support agencies to follow-up on environmental marine violations or crimes.
- Set up private prosecutions for major cases using external lawyers.

Administrative Sanctions: In order to expedite the sanctioning process, where possible administrative sanctions should be carried out at the local level. The severity of measures should correspond to the seriousness of the violation. The following administrative sanctions should also be considered:

- Vessel detention
- Restriction of sailing authorization permits
- Seizure of fishing gear
- Temporary suspension of the permits of ships, crewmembers or the ship-owner
- Revoking the operating licenses of ships, ship-owners, agents, maritime personnel or fishers

THE GALAPAGOS SPECIAL LAW

The Galapagos Special Law (LOREG) is a model piece of legislation as it clearly defines violations and establishes sanctions for all fishing and tourism activities within the GMR. The LOREG specifically grants authority to the GNPS Director as a first instance judge for environmental infractions thereby allowing the swift sanction of violators at the local level, only leaving criminal offences to the courts. The Director can fine Captains and crew, suspend artisanal fishing licenses, and confiscate fishing gear and vessels. The GNPS Director has the same authority as an Undersecretary under the Minister of Environment, which delegates authority for the drafting of or amendment of regulations (ultimately they need to be approved by the Presidency of the Republic).

Systematizing Violations: Management should create a simple database for recording and tracking information on violations. Documenting and recording basic background information on past incidents may help draw important conclusions with recent incidents as well as the motivation behind the crime. See *Figure x* for basic information to include in the design of a database. The database should be accessible to other law enforcement entities and permit the input of their records in order to provide a more comprehensive profile of violators. Recording and documenting this basic information on violations can develop a clear profile of the violator. This aids in predictive policing and the swift identification of recurring offenders. Additionally, the database can provide useful information for managers when scheduling and planning patrols to enable a more effective strategy.

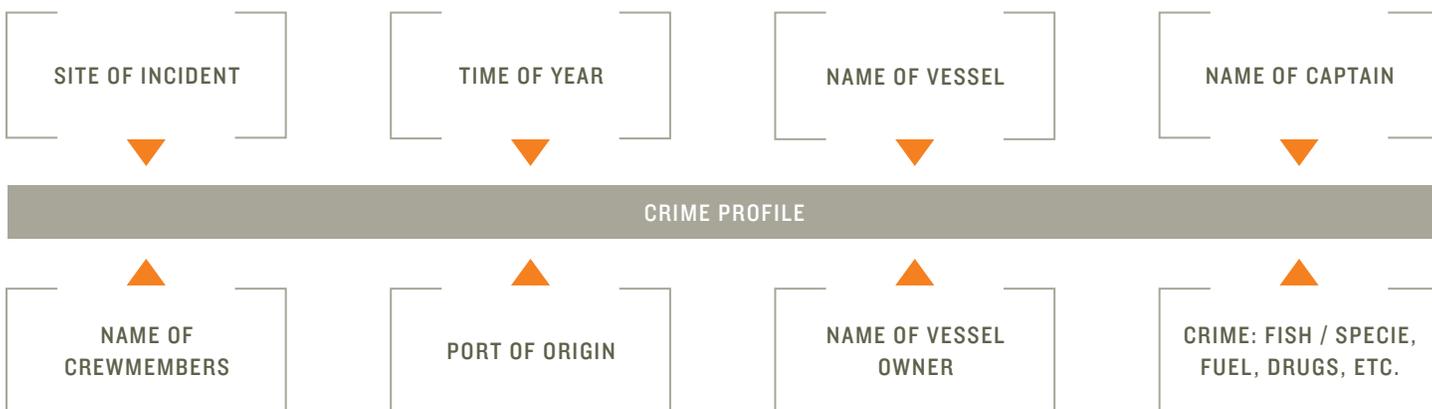


Figure 11: Essential Details for a Violation Database

EDUCATION AND OUTREACH: COMMUNITY BUY-IN AND DISSEMINATION OF REGULATIONS

Education and outreach is critical to foster community buy-in as well as to inform stakeholders of rules and regulations. Also, if fishers see that the sanctions are working, they will be more willing to report violations. Otherwise, if they report them and nothing happens, they lose faith in the systems and are not either encouraged to report, nor encouraged to follow the regulations themselves. Once fishery regulations are in effect, agency enforcement teams must develop a simple education and outreach plan directed towards local fishers, foreign fishers and the community alike. Simple fact sheet outlining zoning, regulations, restrictions, and fines should be widely distributed to all stakeholders. A phased approach to enforcement of laws should be implemented whereby violators are first warned about infractions over a 6-12 month trial period, but over time, officers should gradually impose hard enforcement sanctions. Activities to consider include:

- Develop and distribute simple fact sheets outlining zoning, regulations, restrictions, and fines. They should also include program benefits that will impact the local community.
- Engagement of enforcement officers in outreach activities.
- Erect bulletin boards near key ports and fishing cooperatives to disseminate regulations
- Radio and television spots
- Outreach to local primary and secondary schools with exhibits, video and informal discussions
- Community events
- Information at municipal offices
- Pamphlets provided at airports and tourism kiosks
- Branded merchandise (T-shirts, ball caps & bracelets)

SIMPLE EDUCATION AND OUTREACH PLAN STEPS

1. *Statement of the issue requiring community support*
2. *What is the outreach campaign looking to achieve?*
3. *Identify target audience*
4. *Craft a clear message*
5. *Identify incentives for engaging target people and agencies*
6. *Identify outreach methods*
7. *Identify your ambassadors*
8. *Monitor and evaluation of progress*
9. *Timeline for outreach and monitoring activities*
10. *Identify media outlets*
11. *Implement outreach plan*



KEY PERFORMANCE INDICATORS FOR MEASURING SYSTEM EFFICACY

KEY PERFORMANCE INDICATORS

KPIs are critical to ensure that teams are working for the right incentives. Reward impact, not process. Many Parks carry out 9-5 patrol patterns to satisfy targets, yet never stop illegal fishing.

In this section, we briefly explore key performance indicators (KPIs) for monitoring enforcement system efficiency and efficacy. KPIs can help managers evaluate whether their MCS strategy is having the desired effect and whether staff is motivated and focusing on the right incentives or goals. KPIs have the added benefit of revealing trends over time allowing managers to carry out problem identification and strategy adjustment. When selecting indicators, we recommend quality over quantity as monitoring and evaluation (M&E) systems possessing too many indicators can be counterproductive and more of a burden than an asset.

In Appendix II, we've provided a sample patrol reporting format. We've classified information into three categories:

1. General: Date, departure-return time, crew, vessel, participating agencies, and coordination requests
2. Pre-patrol: Vessel availability and crew/departure punctuality
3. Patrol Strategy and Impact: Area and distanced covered, fuel consumption, and results: sightings, boarding reports and sanctions. It is also to note compliance results. Not finding violators does not mean a patrol is ineffective. It can be a great leading indicator of when/where people are complying and thus direct patrol efforts elsewhere.

An M&E system will only be useful if enforcement and patrol officers routinely fill out standard reporting formats and upload the information into a personal computer. Often times, the less sophisticated the system, the better. In the table below, we list several field-tested indicators aimed at measuring overall enforcement performance and impact.

INDICATOR	DESCRIPTION	ASSUMPTION
PROCESS/ OPERATIONAL INDICATORS		
BOAT AVAILABILITY	Number of days each patrol vessel is available per month.	On an annual basis, a vessel should be in operating condition at least 75% of the time. Boat disrepair is common in many protected areas.
ABSENCE OF PARTNER AGENCIES ON PATROLS	Number of patrols where key partners did not participate.	Inter-institutional participation is mandatory in routine patrols. Simple logs help demonstrate whether partners are honoring commitments acquired via cooperative agreements.
RESPONSE TIME	Time that authority takes from alert until reaching the perpetrator.	Quick response time demonstrates effective institutional or community response capacity.
TOTAL OPERATIONAL COSTS	Total monthly expenses on fuel and maintenance.	Fuel and maintenance costs should decrease as VHF marine radio network, vigilance posts, and community surveillance informants come on line. Managers must monitor fuel and maintenance line items.
MILES PATROLLED PER MONTH	Total sum of miles patrolled on a monthly basis per the patrol boat GPS and the logbook.	Active patrolling does not always equate to better enforcement. Presence equals deterrence. However, it is important to ensure that miles patrolled correlate with fuel consumption.
IMPACT/ PATROL INDICATORS		
SIGHTINGS	Monthly report of vessels detected yet not intercepted.	Base camps and small patrol vessels serve as a deterrent.
INTERCEPTIONS AND INSPECTIONS	Monthly report of vessels and fishers intercepted and inspected at sea and at the dock.	A significant percentage of recurrent interceptions and inspections firmly establishes the enforcement agency's presence and reduces the perception that illegal activity will remain undetected.
SEIZURES	Monthly report of vessels interdicted classified by the type of infraction, fishing gear, origin of fishers & resulting sanction.	Seizures should decrease over time as local and foreign fishers become aware of constant enforcement presence.
SANCTIONS	Total number of sanctions vs. administrative and criminal cases initiated.	A ratio of 1 reflects that violations are being sanctioned effectively.

PROCESS FLOWCHART FOR THE DESIGN AND IMPLEMENTATION OF A MARINE LAW ENFORCEMENT SYSTEM

In this section, we created a process flowchart to walk managers through the design of a marine enforcement system. Given the numerous components and tools explored throughout this guide, we have attempted to map out the key factors, which ultimately will help managers determine the type of MCS system and tools to be considered in their particular context. We've identified the following four key factors:

1. Geographical Analysis
2. Fisher Profile
3. Legal Framework
4. Monitoring & Control System

GEOGRAPHICAL ANALYSIS

Here we are interested in two characteristics of an area: size and coastal topography. Both the size of an area and its coastal topography will help determine the characteristics of patrol vessels, surveillance technologies, communications equipment and minimum personnel needs. We have classified areas into three sizes:

<p>SMALL X < 514 KM² (150 NM²)</p>	<p>A small area is less than 12NM squared and can be monitored via non-collaborative technologies in combination with patrol vessels. Typically, there is little need for technological sophistication nor extensive communication systems: vigilance posts equipped with binoculars and a VHF hand-held radio can often cover the area.</p>
<p>MEDIUM 514 KM²–6,860 KM² (150.3 NM² TO 2,000 NM²)</p>	<p>A medium area ranges from 12–44NM squared and will typically require a series of investments including:</p> <ul style="list-style-type: none"> • Patrol Assets: Vessels with greater endurance and larger O/B motors • Surveillance: Location and establishment of vigilance posts with a minimum height of 30-60 meters for the installation of radars, video cameras and/or other technology. • Communications: A robust VHF network including base radios, handhelds and perhaps the placement of repeaters. • Personnel: Additional personnel and increased specialization
<p>LARGE X > 6,860 KM² (2,000 NM²)</p>	<p>A large sized area is greater than 2,000NM squared and will also require additional investments including:</p> <ul style="list-style-type: none"> • Patrol Assets: High endurance semi-oceanic vessels, larger O/B motors, and possibly aircraft or UAVs. • Surveillance: A combination of non-collaborative sensors (radars and high power cameras) and collaborative monitoring systems (AIS or VMS) may become cost-effective options for reducing operational expenses. • Communications: A more robust VHF/HF network including base radios, handhelds and perhaps the placement of repeaters. • Personnel: Additional personnel and increased specialization (offshore navigation)

FISHER PROFILE

An accurate fisher profile will help enforcement personnel determine types of surveillance equipment as well as when and where to coordinate patrol operations. The following information is critical:

- Number of fishers and level of organization
- Primary ports and fishing routes
- Vessel and motor type
- Fishing gear and target species
- Time and spatial distribution
- Role of traditions & customs

LEGAL FRAMEWORK

The legal framework is critical as it specifies competencies and jurisdictions of agencies as well as the regulations that govern maritime activities. The legal framework can help determine the best type of surveillance technology and ultimately has huge implications on whether an enforcement system is effective or not. The following three key factors should be analyzed for the design of an enforcement system:

1. Vessel registry: By law, a vessel registry should be mandatory and renewed on an annual basis.
2. Zonification: Use or access areas should be clearly delineated and classified.
3. Regulations: Licensing should be required for all activities: fishing, tourism, transport and investigation.

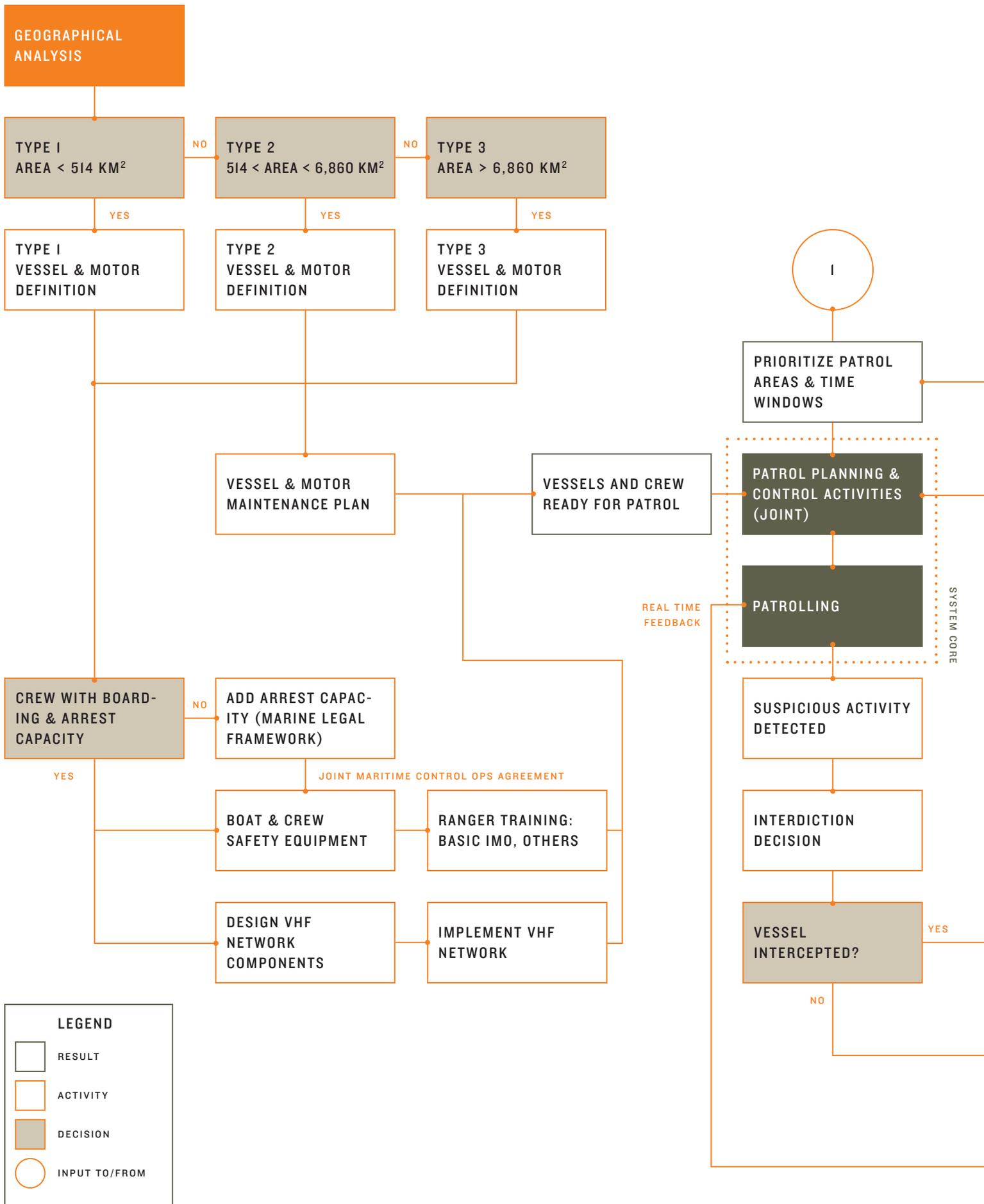
MONITORING, CONTROL AND SURVEILLANCE

Once analysis of the geographical characteristics, fisher profile and legal framework is carried out, a manager can determine the most appropriate MCS system for a particular area. While core components of the enforcement system are the control center and patrol staff, the flow chart helps managers determine the most cost-effective suite of sensors and patrol assets. If there are deficiencies in the legal framework i.e. weak regulations or no vessel registry, collaborative technology may not be an option or further work may be required on legal reform or inter-intuitional agreements in order to correct structural issues or fill gaps. In this scenario, managers must do the best they can and focus efforts on establishing presence, use simple surveillance equipment and carry out education and outreach efforts. When a clear legal framework exists, collaborative technology can also be considered if the size of the area warrants the use of a more sophisticated technology. Ultimately, the control

center and patrol crews carry out enforcement activities and enforce regulations to their best ability with the resources and tools at hand according to standard operating protocols.

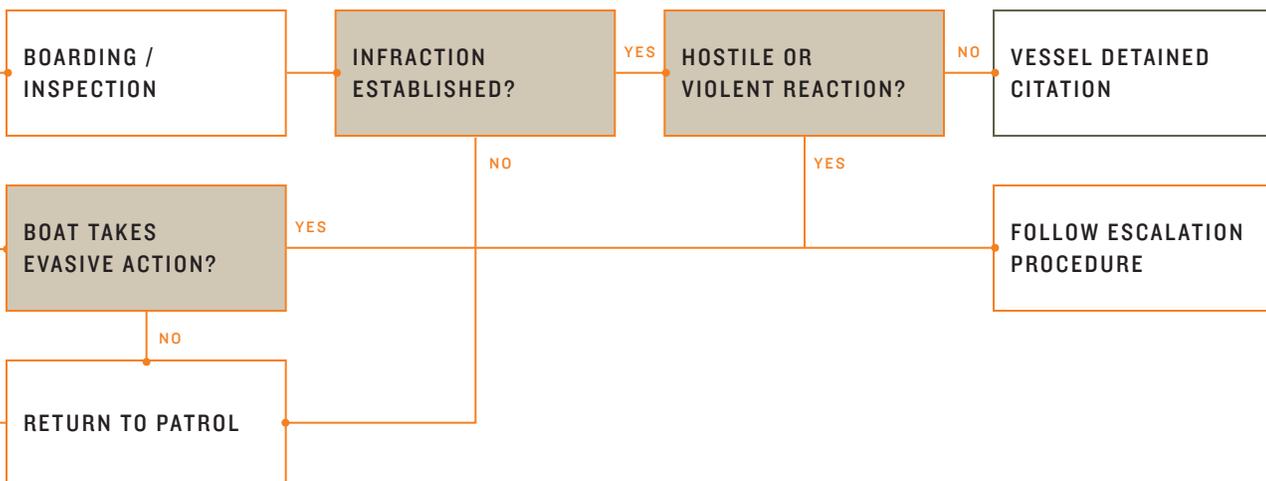
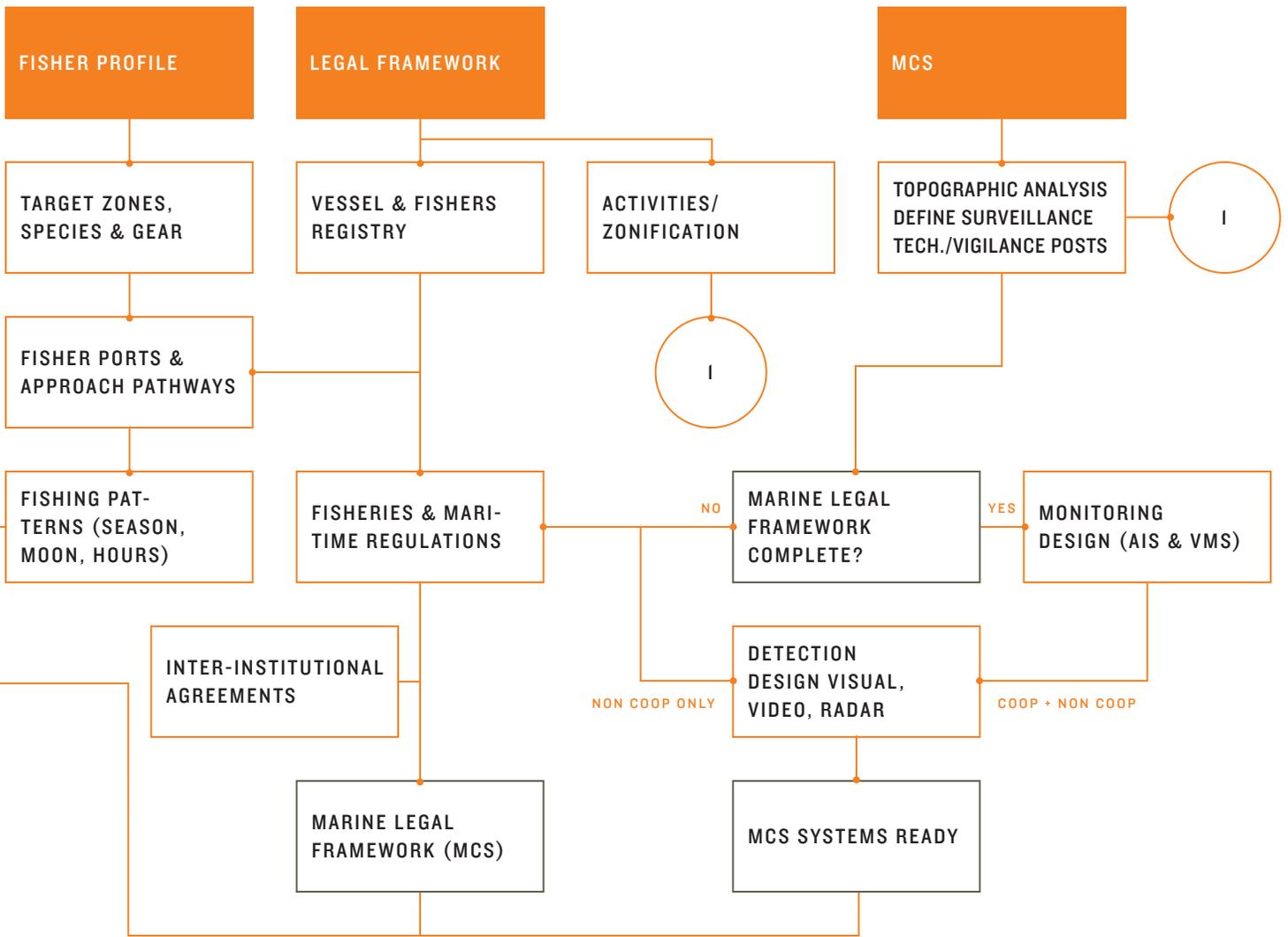
CONCLUSION

In closing, we hope that this guides serves as a useful tool for fisheries managers and conservation practitioners on how to think about and evaluate the development of enforcement systems for near shore fisheries. Fisheries enforcement requires a holistic approach that accounts for surveillance, interdiction, systematic training, education and outreach and lastly, meaningful sanctions. Although we explored many surveillance technologies and management tools, we more importantly provided a blueprint for the capacity building and professionalization of enforcement officers, who truly are the core component of any fisheries enforcement program.



LEGEND

- RESULT
- ACTIVITY
- DECISION
- INPUT TO/FROM



APPENDIX I

READY FOR OPERATIONS BOAT CHECKLIST AND JOB AID

BOAT:

DATE:

INSPECTOR:

SAT	UNSAT	ITEM	STATUS	REMARKS
		Fuel (Percent amount or gallons)	95%	Clean and Bright? Sufficient for planned mission
		Oil Level	100%	Verify before each mission
		Navigation Lights		Must be available for night or low vis operations
		Mooring Lines		
		Fenders		
		Anchor with Chain and Line		Sufficient for planned transit / operating area
		Life Rings		
		Type III PFD's		One undamaged PFD with safety gear per person
		Boat Hook		
		Binoculars		Verify clean and functional prior to departure
		Charts for Local Area		Include operational patrol and float plan
		Fire Extinguisher		Per boat standard, verify on board and within test
		Horn		Test
		Test Radar		
		Test GPS		Verify at known location, include coordinates
		Test Radio		Per C3 procedures on planned channels
		Test Engines (5 minute warm up)		

SIGNATURE:

APPENDIX II

PATROL PLANNING AND REPORT FORMAT

Purpose: Use this patrol planning checklist to prepare your boat crews and boarding teams for patrols in your local area of operations. The checklist identifies typical planning elements that a mission planner should use to ensure each patrol can safely meet operational mission goals. However, it is not designed to plan for every potential contingency or mission need. Mission planners should use this checklist as a guideline while focusing on the particular needs, constraints, safety, and other factors associated with each operational mission.

Completion Frequency: Complete this checklist prior to beginning a patrol. Update the patrol plan with mission results after the boat crew and/or boarding teams return from the patrol. The Director should retain this document for at least one year. Key data should be retained for aggregation and analysis within a patrol performance data base or similar data capture program. Directors should review and update this format at least annually.

Completion Responsibility: It is the responsibility of the Director to complete this plan prior to a patrol unit getting underway or conducting a patrol mission. Each boat commander / boarding team leader must acknowledge and agree with the plan prior to departure. Both parties will complete the patrol results section after the completion of the patrol or mission. The Director will retain the final document per SOP.

Planning Process: Plan each patrol using the SMEAC planning process. Key elements include:

- 1. Situation (S):** What is the situation the patrol is designed to address? For example, if the Director learns that there are out of state people fishing in a closed area the situation is: "There is illegal fishing in a closed area by out of state individuals".
- 2. Mission (M):** What is the specific mission the patrol will perform? Examples include inspecting boats and catch to stop illegal poaching in a closed area, establishing a more visible law enforcement presence in a fishing area, supporting fisheries data collection or other specific missions based on the situation.
- 3. Execution (E):** What are the specific actions and activities the patrol team and support staff will perform to complete the mission? This includes the specific actions the boat crew,

boarding team, watch section, etc. will perform during the patrol (i.e., departure / return times, patrol area, desired / actual activity while on scene).

- 4. Administration and Logistics (A):** What support does the patrol require to safely execute the mission? This includes material, support, equipment and other elements.
- 5. Command, Control and Communications (C):** What command support, communications and control center actions are needed to support the patrol team while they execute the mission? This has a heavy focus on required elements (i.e., communications check-ins and monitoring, operations status reports) plus potential ones (i.e., additional legal or Police support for a potential seizure).

Patrol Results Section: Complete the Results section to collect information, lessons learned and other data that can inform subsequent patrol planning efforts and activities, including assessing enforcement action effectiveness, logistics needs and performance gaps.

RESOURCE PROTECTION PATROL PLANNING CHECKLIST

DATE:

SITUATION: *Select a listed situation or select "Other" and provide a short description:*

	Local fishers need to see officer presence in a fishing area or zone
	Local fishers are unaware of new/changed regulations or rules.
	Poaching is occurring in a closed area
	Fishers are taking out of season, short/incorrectly sized species, or other catch violations
	Fishers are using restricted gear or catch methods.
	Other (describe situation):

INTELLIGENCE/INFORMATION BASIS (IF KNOWN):

MISSION: *Select the Mission for the patrol or enforcement action by choosing a mission or missions from the list. Add additional items or create a different mission by selecting "Other" and providing a short mission description:*

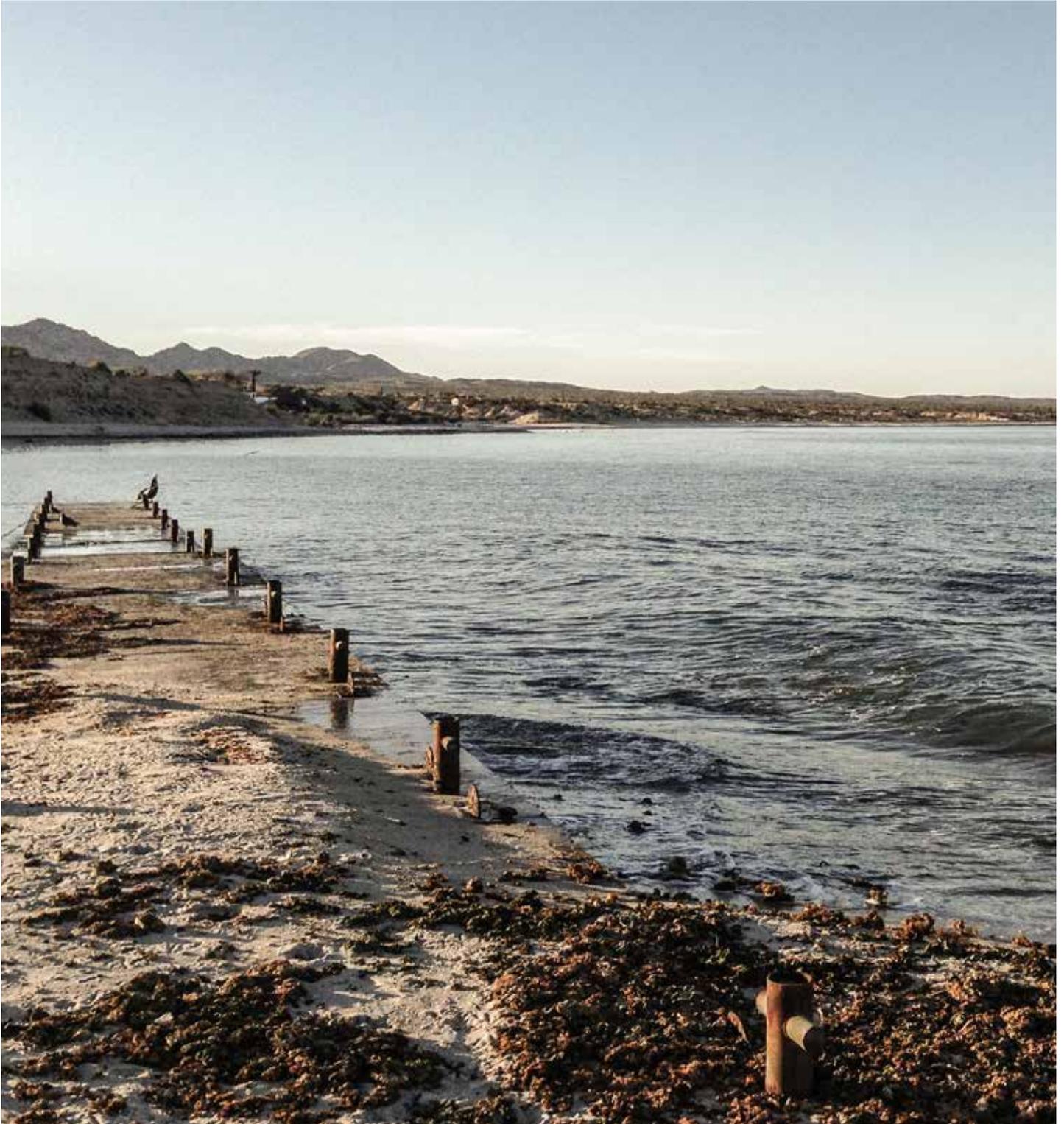
	Conduct a visible and overt "presence" patrol to demonstrate officer intent and willingness to enforce regulations in the patrol area.
	Conduct an overt "enforcement" patrol to intercept and inspect fishers in the patrol area
	Conduct a covert or stealthy "enforcement" patrol to catch fishers operating illegally
	Other (describe situation):

EXECUTION: *Identify planned and expected patrol actions and activities including likely risks.*

Patrol Area:	
Expected activity by enforcement team:	
Expected activity by watch center:	
Departure Date/Time:	Planned Return Date/Time:
Mission Commander:	Watch Center Staff:
Mission Crew:	
GAR Risk Assessment Results:	

ADMINISTRATION AND LOGISTICS: *Identify boats, materials, support, equipment, and other items required to execute the patrol. Note: Assigned or standby boats must be equipped for the patrol and ready for sea:*

	One boat operation, no other boat in standby
	One boat operation, other boat or boats available in _____ hour standby from _____
	Two boat operations, designate senior boat/mission commander:
	Support teams or resources if needed (Police, legal, on call staff):



RESOURCE PROTECTION PATROL PLANNING CHECKLIST

ONE BOAT KIT PER BOAT (ADJUST FOR ANY OTHER LOCALLY REQUIRED ITEMS):

Hand tools, batteries, flashlights, line, fenders, binoculars, report/citation books, pens, anchor/line, gas, megaphone (if available), foul weather clothing, water/food, flares, PFD (per person) with signal mirror and marker/chem light
Portable GPS with spare batteries, tested/calibrated at known location prior to departure
GPS patrol coordinates provided (track line points, sweep area, etc.)
Portable VHF radios with spare batteries, radios tested prior to departure
Digital camera with "clean" data card, battery 100% full and a spare battery
Copy of regulations and public information materials
Water / Food (if needed)

COMMAND, CONTROL AND COMMUNICATIONS: *Describe these functions for this patrol:*

COMMUNICATION PLAN (RADIO CIRCUITS, PHONE NUMBERS, OR OTHER MEANS):

Primary:

Secondary:

Tertiary:

"Lost Communications" procedures for this patrol (describe actions including when to shift circuits):

PATROL STATUS REPORTS (SELECT ALL THAT APPLY):

Every _____ minutes while on patrol

After arriving in the patrol area and when departing the patrol area to return to base/next mission

Starting a boarding or inspection

Completion of a boarding or inspection

Upon encountering any difficulty, unusual situation, or event

Other:

WATCH CENTER MONITORING AND REPORTING ACTIONS:

Watch center live watch or on call starting at:

Use sensors (radar, camera) to monitor activity:

Director reports (missed comms, seizure/violation, accident, external support request, legal action):

Log/Record all normal and special reports/events in watch center log book:

SIGNATURES:

DIRECTOR:

MISSION COMMANDER:

WATCH CENTER OPERATOR:

REPORTING CHECK LIST

DATE:

PATROL RESULTS: *Describe results including lessons learned related to SMEAC and other plan elements:*

Watch center live watch or on call starting at:

Use sensors (radar, camera) to monitor activity:

Watch center live watch or on call starting at:

Use sensors (radar, camera) to monitor activity:

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Patrol starts at (hh:mm)

Patrol ends at (hh:mm)

Hours patrolled (hh:mm)

Fuel Consumed (gal)

Changes (if any) to the Patrol Plan during the patrol:

Equipment issues (if any):

Training issues (if any):

Support issues (if any):

Command, Control, Communications issues (if any):

FILED BY

MISSION COMMANDER:

WILDAID

The Nature
Conservancy 



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