



# REPORT ON THE IMPLEMENTATION OF FISHING VESSEL MONITORING SYSTEM IN BELIZE

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# Introduction

Belize's fisheries and marine ecosystems are threatened by illegal fishing, overfishing, coastal development, climate change, and coastal runoff. In an effort to curb illegal fishing and overfishing the Government of Belize has legislated and implemented a wide array of management tools such as marine protected areas, seasonal closures, minimum and maximum size limits, gear restrictions, and licensing allocation to mention a few. The enforcement of these regulations is very expensive and often have very limited results. In an effort to improve the efficiency of patrols and improve the chance of detection the Belize Fisheries Department with support of the Wildlife Conservation Society has been researching the potential of using Vessel Monitoring System (VMS) to monitor its fishing fleet. There are some very important components that the Belize Fisheries Department needs to consider for the implementation of any VMS system.

The Wildlife Conservation Society in Belize has been collaborating with the Belize Fisheries Department, and local fisheries to identify a suitable technology for the Monitoring of fishing vessels during fishing voyages. This initiative is part of WCS efforts to combat illegal, unregulated and unreported fishing and supporting sustainable fisheries. Vessel Monitoring Systems (VMS) is used globally to track industrial fishing vessels with great success however, there has been a very little work done in this regards with small scale fishing vessels. There are three main types of VMS used worldwide, each with their own merits and limitation: Satellite Based Tracking, Automatic Identification System (AIS) and Cellular-based tracking.

A small committee composed of staff from the Belize Fisheries Department (FD), the Belize National Coast Guard (BNCG), Belize Port Authority (BPA), and Turneffe Atoll Sustainability Association (TASA) have been reviewing the testing results and making recommendations to design a way forward.

WCS has looked at all three systems via literature review and *in situ* piloting of hardware and software, in an effort to determine which system is best suited for Belize. WCS has concluded that there is sufficient evidence to implement Vessels Monitoring System in Belize.

Through funding from the Oceans 5 and the US Department of State, in 2019 WCS began the piloting of VMS in Belize and in 2021 and 2022 continued the pilot with via support other donors.

## BACKGROUND

Vessel Monitoring Systems are used world-wide on large industrial fishing fleets across the globe to track the activities of these fishing vessels with much success. Being able to accomplish the same on small-scale fishing (SSF) vessels would assist coastal states to better manage their fisheries. Furthermore, this technology is also applicable and could be valuable to other local sectors such as tourism and cargo as these may also conduct activities within the fishery waters.

Benefits of VMS:

1. Improve safety of fishers and mariners
2. Faster response time to emergency alerts
3. Reduce cost for search and rescue
4. Improve knowledge of resources use
5. Deterrence to illegal fishing
6. Reduce piracy at sea

## Vessels Monitoring System

According to European Union Fishing Commission Maritime Affairs and Fisheries (DG MARE) “vessel monitoring system (VMS) is a satellite-based monitoring system that provides data at regular intervals to the fisheries authorities on the location, course and speed of vessels.” VMS has been used by Regional Fisheries Management Organizations (RFMOs) as a tool to support the monitoring control and surveillance of the fishing fleets across the world. Vessel Monitoring System has evolved from strictly satellite based solutions to a mix of solutions that such Automatic Identification System (AIS) and Cellular Based Tracking Solutions.

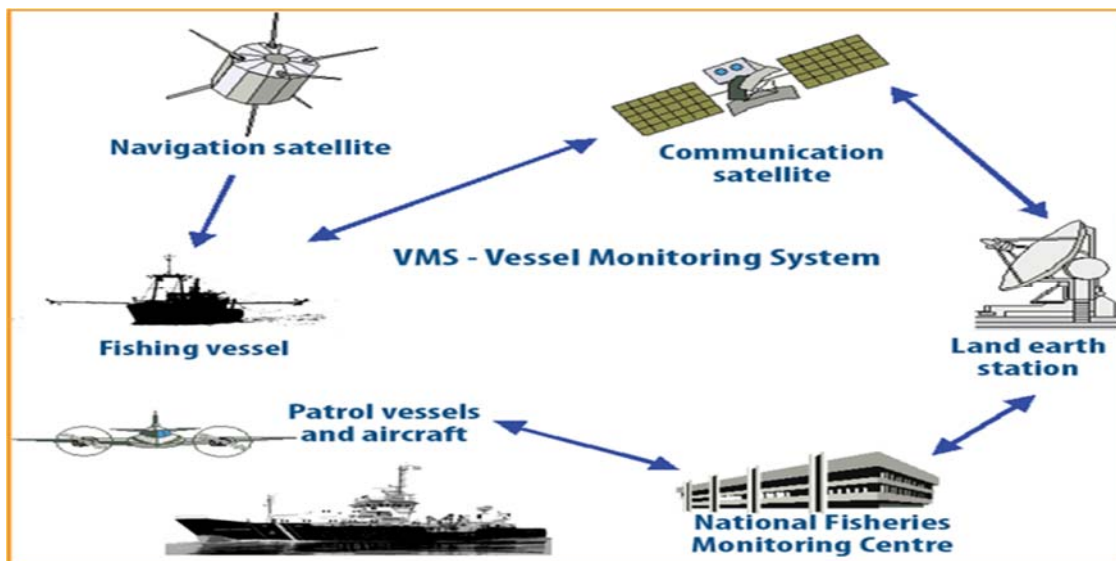


FIGURE 1: VMS DATA FLOW CONCEPTUAL DIAGRAM<sup>1</sup>

<sup>1</sup> The Innovative Application of Vessel Monitoring Systems for the Effective Fisheries Monitoring Control and Surveillance,

## Objective

To continue to pilot the use of VMS in Belize to provide to fishers, government and protected area managers with technical data on VMS technology.

## Device Piloted

WCS conducted three VMS test over the course of three years, between June 2021 and December 2022 (Table 1).

Table 1: Summary of WCS's VMS Tests in Belize:

	Cellular Tracking using Off the Shelf tracking units	Cellular Tracking using Cell phones	CSSI (Satellite based)	Spot X Satellite Based
Type of Units	Generic Chinese Asset Tracking Solution	GPS Enabled Cell-phones	Standalone Tracking Unit Fixed	Stand Alone(Mobile)
Battery	45 Days/ Solar Charged	8 hours charged by Fishers	45 days battery, solar charged	6 days
Tracking mechanism	GPS, GPRS Data upload	GPG, GPRS Data Upload using SMART Connect Platform	GPS Satellite based data upload using CSS tracking platform	GPS Satellite data uploads
Data transmission	Active when in Data access only	Active when in data access only	Active every 15 minutes	Active every 5 Minutes
SOS enabled	Yes	Yes	Yes	Yes
SOS real-time	NO	NO	Yes	Yes
GPS accuracy	Standard	Standard	Standard	Standard
Durability	6 months	6 months to 1 year	7 years warranty	1 year
Tamper button	No	No	Yes	No
Tracking platform	Yes	Yes	yes	yes
Cost of Device	US 130.00	US 150.00-400.00	US 700.00*	212.00*
Data transmission	US 15.00	US 15.00	US 30.00	19.00 per month
Tech support	Limited	Limited	Provided by supplier	yes

\* Cost does not include taxes and shipping to Belize

# VMS Implementation Mechanism

WCS supported the creation of a 5 member task force the supported the implementation of this pilot. This team was composed of the BPA, BCG, FD, TASA, and WCS. All of the partners had access to the monitoring platform.

The following were the roles of each organization;

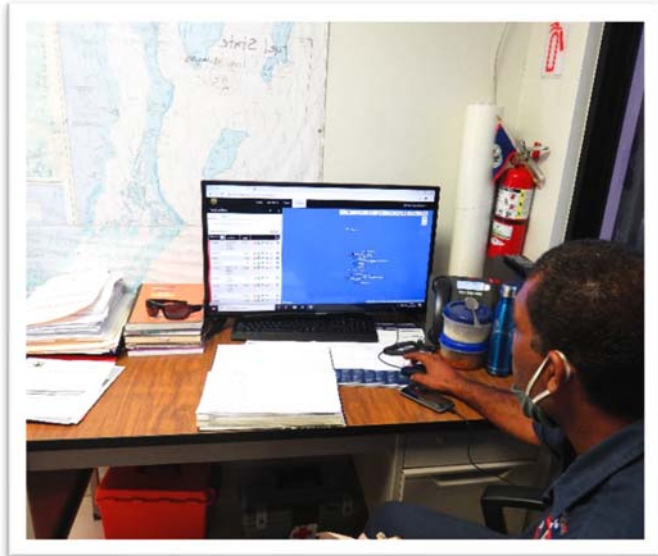


FIGURE 1 REMOTE MONITORING OF VMS

1. Fisheries Department – SOS support and tracking of any illegal fishing activity.
2. Belize Port Authority- 24 hrs Monitoring of platform an Monitoring Centre and coordinating SOS response
3. Belize Coast Guard- Monitoring Platform and SOS response
4. TASA- Monitoring Platform for illegal fishing and SOS response.
5. WCS- Administration of Platform, Trouble Shooting, SOS response monitoring

The Belize Port Authority provided the use of their 24 Hrs monitoring centre to monitor the VMS platform. SOS alerts were coordinated by their monitoring

officer. The VMS platform had mapped out the name of all ranger and conservation post along the Belize coast, along with the contact number for each locations. This was crucial in providing timely SOS response.

All partners had access to monitoring platform however it the Belize Port Authority was the lead to coordinate SOS response.

Devices Deployed

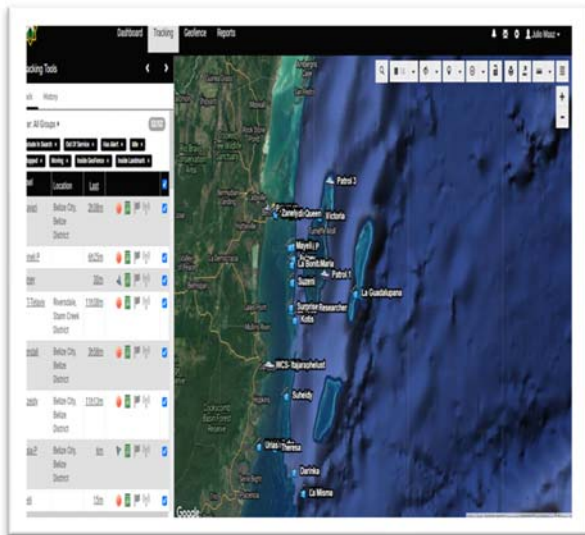


FIGURE 3 VMS PLATFORM

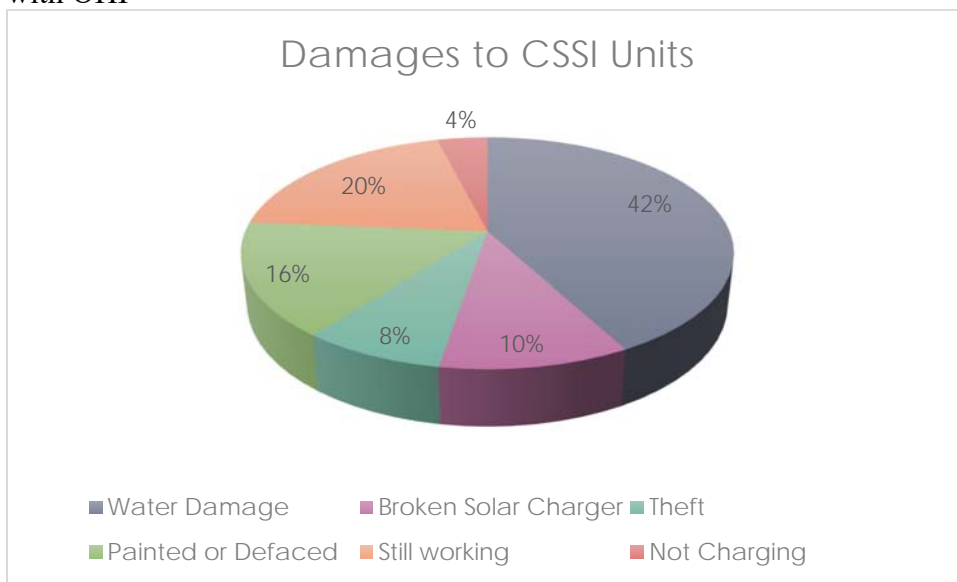


FIGURE 2 SPOT X UNIT

FIGURE 4 CSSI AP3 UNIT

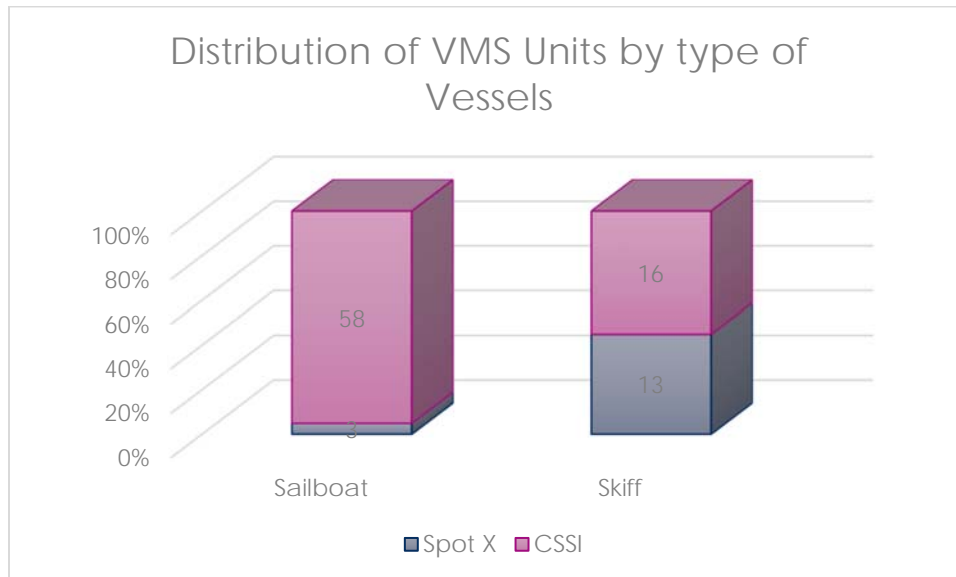


Installation, Troubleshooting and Maintenance of Tracking Devices WCS with support of the Fisheries Department and the Belize Coast Guard did the installation and deployment of all units. A total of 76 Units were originally installed, however as the test progressed units became damaged and stopped working. An additional 16 Spot X units were distributed to fishers with the support of another project and 3 to patrols vessels were equipped with OHF



For SPOT X units, only two have been damaged by water and all others are functional.

The VMS units were distributed to fishers across Belize who were willing to participate in program. The chart below shows the distribution of device by type of tracking unit and vessel type.

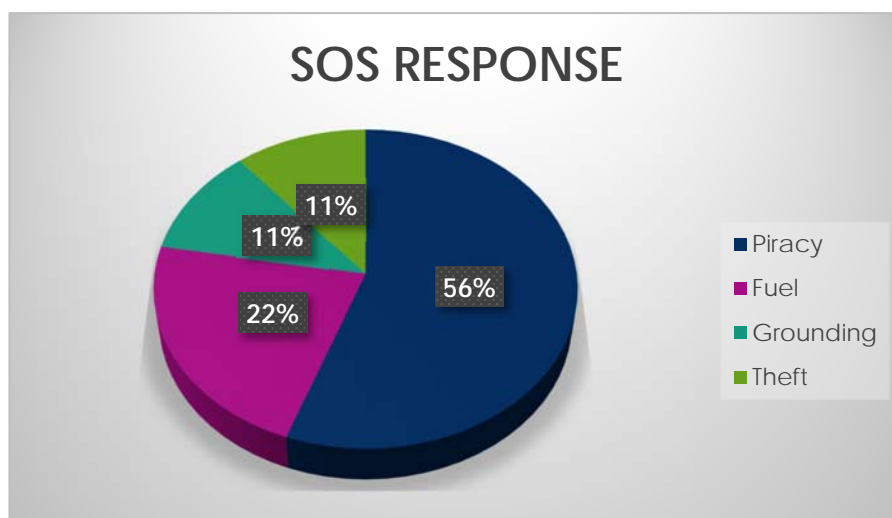


The CSSI unit was installed on fishing vessels taking into consideration location for charging of device, interference with every day operation and accessibility to crew for SOS triggering. The Spot X did not require installation.

## Results

At the conclusion of the VMS pilot there were a total of 15 CSSI units and 13 Spot X units still functional. During the life span of the project WCS provided maintenance, and troubleshooting support to fishers and officers monitoring the platform. The following are key findings.

1. Web based Monitoring platform operates with minimum or no issues. Changes of operational managers at the various organizations needs to be informed in a more timely manner as there is a high staff turnover at many of the partner organization. SOS alerts were coordinated well and a total of 9 SOS alerts are responded to. The partner agencies were able to respond to the SOS alerts on a timely manner and provide assistance to crew of the vessels.





2. The Equipment installation for CSSI is a very easy setup, however the location for setting up on both sailboats and skiffs is limited and often installation were made in less than suitable locations. Devices installation required a flat surface with clear view of the sky which was limited. We tried two basic locations and all locations had its challenges.

- a. Placing unit on flat surface of vessel resulted in unit being covers or stepped on.
- b. Placing unit on side of vessel cabin resulted in device not properly charging and unit getting wet on a more regular basis resulting in water damage.

3. At the beginning of the program the data transmission was coming in well however as time elapsed the data

transmission became inconsistent. The following are the main reasons why the transmission of data was not consistent:

a. Power Failure of Equipment

- i. Fishers would cover their boat when the return from fishing trip covering the VMS unit resulting in unit discharging while in port. When they would return to sea, the unit would not be able to fully charge and position data transmission was never sent.
- ii. Placement of unit was not in ideal place and cloud cover resulted in device not charging

b. Equipment Damage

- i. Equipment we intestinally damaged by vandals at docks
- ii. Equipment was painted over during maintenance. The persons painting the vessels during repairing painted over the solar panels and damaged the charging ability of the equipment.
- iii. Water Damage was the most prevalent issues. Water damage was as a result of the solar panel coming apart from device and breaking the waterproof seal and watering coming into device via the SOS cable.

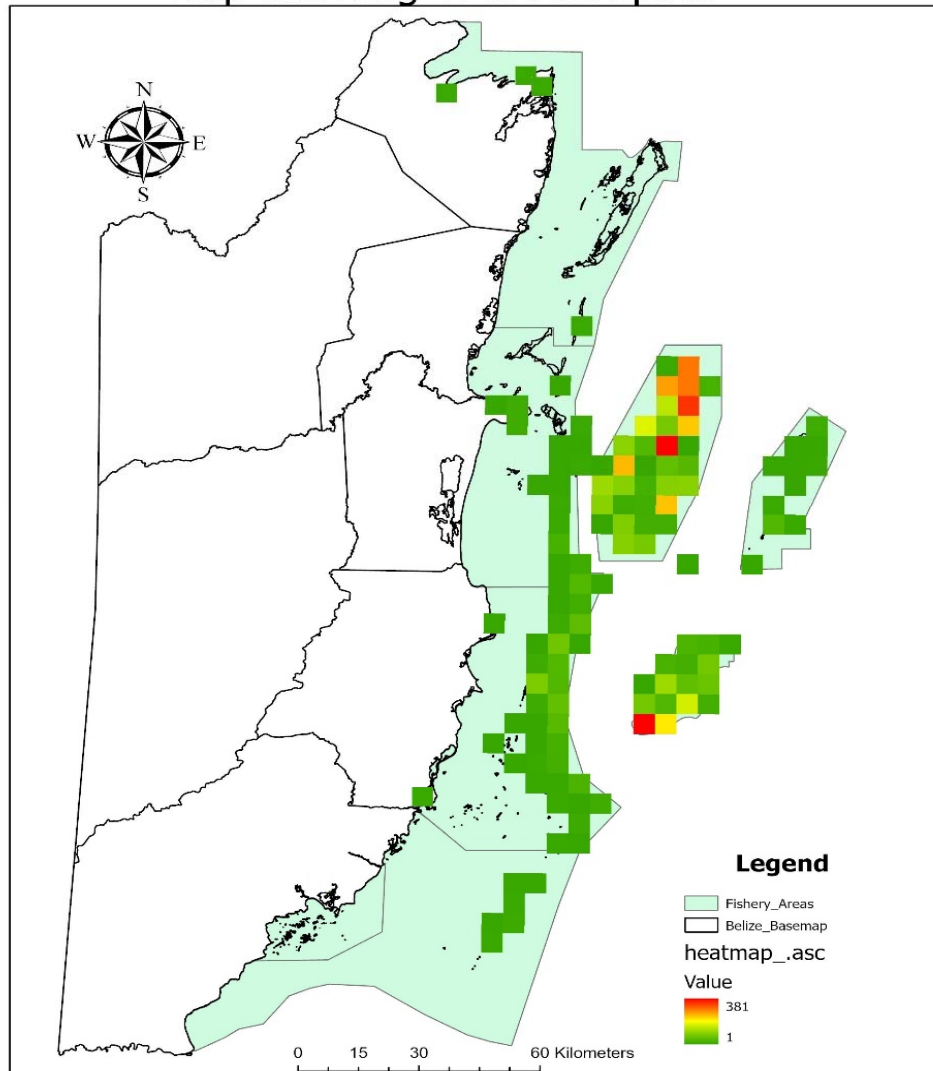


4. In regard to Emergency Response, There were initially many issue with SOS alerts being triggered without cause. We had 4 instance of crew pressing button just to see if SOS responders will come to assist. In one instance a fisher left his child unattended and the child kept pressing the button over and over until we were able to get a hold of fisher and advise him of the situation. We also had an instance of some boys playing around with SOS buttons when a vessel was in dry dock. We were able to identify these issues and did not triggered at SOS response, however if we would have triggered a response these would have been costly to the organizations. In addition, We must note that out of the 9 SOS response only two were non-emergency situations which did not merit an SOS response. Despite the challenges the SOS was one of the most important and appreciated feature of the VMS. Fishers family members would contact the monitoring centre to check up on family members on board vessels with VMS.
5. Patrol tracks were not consistent due to several factors including intermittent reporting by devices due to power failure or damaged equipment however we were still able to create heat map of vessels most frequented locations. Most vessels on this pilot were licensed to fish in area 2,3,6,7 and 8. Turneffe and Glovers Reef had the most position reports.



FIGURE 5 STOLEN VESSEL RECOVERED BY USING THE VMS

## Map Showing VMS Hot Spots



## Recommendations

VMS in Belize can be scaled up however there are policy, financial, educational and legal strategies that need to be employed in order to make scaling up feasible.

There are several ways to increase uptake of Vessel Monitoring Systems (VMS) among small-scale fishers:

**Financial incentives:** Government and organizations could offer financial incentives to small-scale fishers to encourage them to install VMS on their vessels. These incentives could include subsidies for the cost of equipment and installation, or reduced fees for fishing licenses or access to fishing grounds. Subsidize for small scale fishers can be secured via the High Seas Fishing Fleet operating in the high seas.

**Education and outreach:** Small-scale fishers may be more likely to adopt and take care of VMS equipment if they understand the benefits of the technology, such as improved compliance with

regulations and management strategies, and increased access to fishing grounds. Education and outreach programs can help to raise awareness and understanding of VMS among fishers.

**Collaboration with fishers' organizations:** Collaboration with fishers' organizations can help to ensure that the needs and perspectives of small-scale fishers are taken into account when designing and implementing VMS programs. These organizations can also help to disseminate information about VMS and provide support to fishers who adopt the technology potentially with financial incentives.

**Making the VMS mandatory:** Governments could make the use of VMS mandatory for all fishing vessels in a specific area or for specific types of fishing. Provisions for this is within the Aquatic Resources Act of 2020. This could increase the uptake of VMS among small-scale fishers.

**Making the VMS affordable:** Governments and organizations can work with manufacturers to make the VMS affordable for small scale fishers, thus making it more accessible to them. This includes the identification or development of local VMS service provider that would be able to provide equipment, service, troubleshooting and collection of fees for services. The absence of a local service provider makes cost prohibitively expensive for small scale fishers.

A comprehensive approach that takes into account the socioeconomic, cultural, and technological factors that influence the adoption of VMS by small-scale fishers would be more effective in increasing uptake of VMS.

## Conclusion

The pilot was successful in testing equipment and mechanism to monitor, vessel monitoring system in Belize. Despite challenges due to the COVID-19 pandemic, our team was able to better understand the nuances of implementing a vessels monitoring system for small scale fishery. The Fisheries Department announced to partners that they will be deploy a small pilot of a different types of units in 2023 via the Central America Fisheries And Aquaculture Organization (OSPECA). In addition, in late 2022, a local tracking services provider added satellite-based tracking as part of the services they provide to locals. VMS has a great potential to support the safeguarding of Belize Marine Resources if adequate resources, policies and educational programs are put in place.

## ANNEX

### Recommended Legal Framework for VMS

#### 1. Fisheries Act –Chapter 201 Laws of Belize Revised Edition 2003

The Fisheries Act as it currently stand provides no explicit or otherwise implied regulation for the tracking of fishing vessels with the fishery waters. Section 13 1 (j) ii provides the Minister with the regulation making to power to provide conditions of license that the license holder must abide by.

#### 2. Port Authority Act- Chapter 233, Laws of Belize Revised Edition 2003

The port Authority Act deals with the regulating of vessels being used in Belize’s Maritime space. It makes no provision for requiring vessel to have VMS or any equipment that can be used for the transmission of vessel location.

#### 3. Evidence Act- Chapter 95

Provide the condition in which evidence gathered can be used in the proceeding of any court. The definition of computers is very broad.” “computer” means any device or combination of devices used together or in succession for the purpose of storing and processing information;”

It also defines documents to be “document” includes:-

(a) books, maps, plans, graphs, drawings and photographs;

(b) any disc, tape, sound track or other device in which sound or other data (not being visual images) are embodied so as to be capable (with or without the aid of some other equipment) of being reproduced therefrom; and

(c) any film, negative, tape or other device in which one or more visual images are embodied so as to be capable (with or without the aid of some other equipment) of being reproduced therefrom;

This would allow the use of the data generated from the VMS equipment in Court.

#### 4. Electronic Evidence Act Chapter 95 1

The electronic evidence act is a fairly recent piece of law that provide the use of electronic evidence in court.

It defines data to means representations, in any form, of information or concepts;

It also defines

“electronic record” means data that is recorded or stored on any medium in or by a computer system or other similar device and that can be read or perceived by a person or a computer system or other similar device and includes a display, print out or other output of that data;

“electronic records system” includes the computer system or other similar device by or in which data is recorded or stored, and any procedures related to the recording and preservation of electronic records;

Section 3 of this act also provide for the admissibility of electronic evidence in court

“3. Nothing in the rules of evidence shall apply to deny the admissibility of an electronic record in evidence on the sole ground that it is an electronic record.”

#### 5. The Highs Seas Fishing Act of 2013

The High Seas Fishing Act was done in 2013 and applies only to vessels fishing in the high seas or EEZ of countries which they are licensed. Part V “Monitoring Control and Surveillance” section 39 requires all vessels fishing in the High Seas to be equipped with Vessel Monitoring System and provides sanctions for the failure to comply with the request, tampering or destroying equipment, altering of data. This act goes further to require the state to have a 24 hours monitoring centre for the VMS.

#### 6. Fisheries Bill 2018 (Pending)

There is a fisheries bill that has been drafted in which it provides the minister with the Regulation making powers for required the use of Mobile Transmitters Units (MTU) which is to be VMS.

“mobile transceiver unit” or “MTU” means a device placed on a vessel that transmits either in conjunction with another device or devices or independently information concerning the position, fishing and such other activities of the vessel as may be required

It provides the minister to make the regulations for “providing for the installation and use of mobile transceiver units on an individual vessel or a category of vessels authorized to fish under this Act;”

The act does not provide the details but the necessary regulation has already been drafted to provide for the use of MTU, and the data generated by such units. This regulation would be passed upon passage of the parent Bill.

In conclusion, Belize does not currently have the legal framework for implementing a Vessel Monitoring System, however it does have some legal elements that would allow the introduction of VMS data in court proceeding. It must be important to note that the VMS data cannot be the sole evidence of the illegal activity being prosecuted.

The Fisheries Bill needs to be passed that will provide the Minister the powers to require the use of the VMS. There will also be the need to provide the regulation for the use of the VMS, and provide the sanctions for non-compliance. The adoption of this legal framework will put Belize in a position to track the small-scale fishing vessels in national waters.

It will be important to train fishery officers to be able to implement the use of the tool starting from the development of a monitoring centre and protocols. They will also require the development of evidence gathering procedures, certificates developments, and using the data for

planning of patrols. Therefore implementing from a voluntary basis would be the best way of getting this started in Belize.