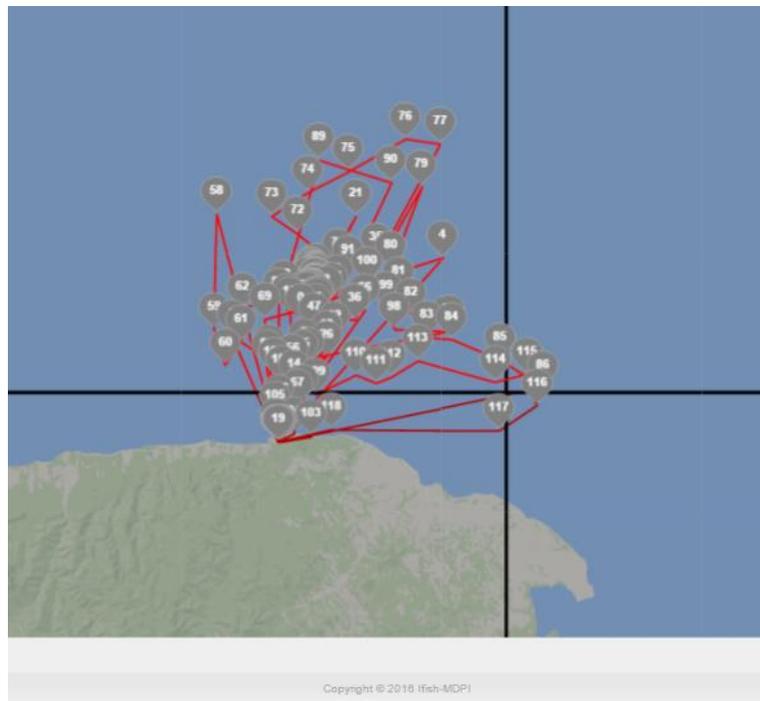


Protocol for deployment and online use of a vessel monitoring system for small-scale tuna vessels



**Yayasan
Masyarakat dan Perikanan
Indonesia**

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1. Introduction

The expansion of fishing fleets in number, capacity and geographic range, and the consequent Illegal, Unreported and Unregulated (IUU) fishing activities, has generated the development of Monitoring, Control and Surveillance (MCS) systems by national and international bodies. MCS systems usually employ a range of tools, such as onboard observers, logbooks and Vessel Monitoring Systems (VMS). These tools are used in various combinations depending on the fishery requiring monitoring. Observers are usually only required for the large purse seine vessels, with logbooks required for a range of gear types. VMS are used by many national governments and international bodies to monitor and document fleet capacity and activities (Anonymous, 2006; Salomon and Holm-Müller, 2013). A VMS system involves equipping a vessel with a satellite- tracking device, which can relay information on the ship's position at specified intervals (usually one hour). Some advantages of the VMS devices are that it requires little man power and the data is automatically generated and stored. A disadvantage is the opportunity for tampering and falsification of data. Depending on the transmission intervals of the tracking device, the information can be used to determine when a vessel is fishing and when it is traveling between locations and therefore obtain an estimate of fishing effort.

The European Common Fisheries Policy possibly has the smallest vessel limit with vessels >15m requiring the fitting of a VMS device (Salomon and Holm-Müller, 2013). The Western and Central Pacific Fisheries Commission (WCPFC) have a Conservation and Management Measure (2014-02), stipulating that all vessels fishing for highly migratory fish in the high seas are required to be equipped with an Automatic Location Communicator (WCPFC, 2014). The Indian Ocean Tuna Commission have a similar Resolution (IOTC, 2015), stipulating that all vessels >24m fishing in the high seas and all vessels <24m fishing outside the Exclusive Economic Zones are required to be equipped with a satellite tracking device. Indonesia officially became a member of the IOTC and WCPFC in 2007 and 2013, respectively. In doing so, Indonesia is obliged to implement Conservation and Management Measures (CMMs) of each body.

However Indonesia had regulations for VMS systems prior to officially joining the RFMO bodies. A ministerial regulation from 2007 stipulates that vessels >30GT are

required to be equipped with a satellite-transmission tool (MMAF, 2007). This regulation was based on previous surveillance measures from 2003. To date, there are no requirements for small-scale vessels to be equipped with VMS. Implementing such a program would be demanding in Indonesia, given that accurate estimates on the number of active vessels operating in the EEZ are not available, these vessels often operate in remote areas meaning meeting with the fishermen to deploy the device would be difficult. Additionally the cost of such VMS devices is not viable for many small-scale operations. In general, it is often seen as a task not worth the effort and with little returns for the small-scale vessels. This protocol describes a device (Spot Trace device) and the procedure for deploying it efficiently on small-scale tuna vessels in Indonesia. The aim is that the data collected from the Spot Trace recordings will help verify the fishing ground location reported in port sampling activities (www.ifish.id), will help provide a better understanding of the spatial range of small-scale fishing activities and will provide information on whether such a system is both affordable and acceptable in small-scale fisheries.

2. The *Spot Trace* device

Spot Trace is a device for tracking items to which it is attached (Figure 1). The device uses satellite technology to track an asset in near real-time, with location displayed using Google Maps. The data is sent to the *Spot Trace* website and then redirected to the I-Fish website. Tracking intervals can be set at either 5, 10, 30 or 60 minute intervals (the quicker the interval the more demanding on the battery life). The device sends an email to a chosen server (MDPI in this case) whenever once movement has been detected on the tracked asset. The devices are relatively cheap in comparison with other options: US\$99.99/year for each *Spot Trace* device. More information on the device can be found on their website www.findmespot.com.



Figure 1. *Spot Trace* Device.

Length:8.72cm, width: 5.13cm, thickness: 2.14cm, weight: 87.9g

3. Deploying the *Spot Trace* device on vessels

Informing fishermen and random assignment to vessels

1. The *Spot Trace* devices are randomly assigned to vessels in a site. This is to ensure there is no bias or preference in selecting a vessel. All vessels in the I-Fish data collection sites are linked with unique Vessel Identifier Codes (VIC). The list of available VICs, in ascending order, is downloaded from the I-Fish website in the VIC section (see Vessel Registry Protocol). The *Spot Trace* devices are assigned to vessels following the VIC list. If the next vessel in the list is not in port on the deployment day then the next vessel on the list is chosen instead.
2. For a vessel available from the VIC list, inform the fishers or boat owners about the objectives of the installation of the device on their vessel and what kind of data is expected to be generated from the activity. Inform also about the confidentiality of the data (the data will not be shared with external stakeholders).
3. Each fisherman/vessel owner who is willing to cooperate should declare their willingness and cooperation and that he/she will return the *Spot Trace* after their turn is completed in the Receipt and Statement of Consent Form (Appendix 1). If a fisherman is not willing to participate the next vessel in the VIC list is chosen.

4. *Spot Trace* will be installed on a vessel and stay with the fishers for about 2- 4 weeks.
5. SS/SF should fill out the *Spot Trace* Utilisation form (Appendix II) in after handing over *Spot Trace*. SS/SF should fill in: MDPI asset number, Vessel Identifier Code (VIC) based on the I-FISH database, name of fisher, location, and the signature. SS/SF should ensure that fishers sign the form when they receive and return the device.
6. After each *Spot Trace* handover, SS/SF has to input the data from the *Spot Trace* Utilisation Form to the I-FISH database (I-Fish website -> Extra -> *Spot Trace*, see section 2 below for more details).
7. SS/SF is responsible to assist fishers during the installation, uninstall, transferring process and the battery replacement of the device
8. After the device is uninstalled, SS/SF is responsible to provide an explanation of the *Spot Trace* data to the fishers.
9. Once the *Spot Trace* device is finished with a vessel, it is assigned to the next vessel in the VIC list, with the steps above repeated with the fisherman and completing the forms.

Setting up the *Spot Trace* device

The following section describes the general use of the *Spot Trace* device and how to attach it to a vessel.

The *Spot Trace* device has a logo on the front of the device (Figure 2). On the back of the device there is a mounting bracket for attaching the device to the vessel and an MDPI asset number (Figure 3). A power button and two indicator lights can be found on the top of the device (Figure 4). These indicate the status of the battery and of the GPS connection (Table 1).



Figure 2. The *Spot Trace* device with *Spot Trace* logo on the front.



Figure 3. The back of the *Spot Trace* device. Left: the mounting bracket, right: the device asset number from MDPI.

Table 1. Meaning of the green and red lights for the GPS and Power indicator lights.

Indicator	Green light flashing	Red light flashing
GPS	<ul style="list-style-type: none"> - Looking for GPS signal - In the process of sending message/information 	<ul style="list-style-type: none"> - The device could not receive any GPS signals, move the <i>Spot Trace</i> to new location.
Power	On	<ul style="list-style-type: none"> - Battery power is weak

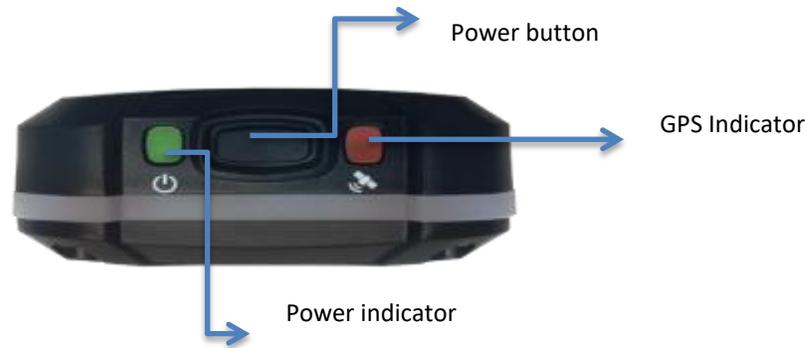


Figure 4. The *Spot Trace* device from above showing the power indicator, power button and GPS indicator

Battery

1. Each *Spot Trace* needs four (4) AAA batteries.
2. The battery will last for about 35-45 days in the standby position. SS/SF need to check the batteries' power before moving the device to the next fisherman on the list. When the power is on and the red light is flashing it means that the batteries' power is weak.
3. MDPI will provide the batteries.
4. How to replace the battery:
 - a. Make sure that the power is off before opening the backside of the *Spot Trace*.
 - b. Loosen the bolts by using a small screwdriver to open the back shield (Figure x).
 - c. Remove the batteries and install new 4 AAA batteries (Figure 5).
 - d. Put the screw back using the small screwdriver. Make sure that the bolts on back shield are tightened securely to ensure the device remains waterproof.



Figure 5. Opening the device (left). The device open with the batteries installed (right).

How to install the device on a vessel

1. Before installing the device, the SS/SF should ensure that the device is working properly.
2. The device should be installed under fiberglass, fabric or glass. Do not cover the surface of the device using metal because it could interfere with receiving signal and the data transfer.
3. There are several ways to install the device on the vessel. Discuss with the fisherman where is the most appropriate position before starting to install the device.
4. If the vessel has another GPS-based device, make sure that the distance between the other GPS-based device and the *Spot Trace* device is at least 30cm.
5. Make sure that the device is located at least 20 cm from where the fisher/helper sits and make sure that the *Spot Trace* is placed in a safe position. Do not sit on the device.
6. Install the mounting bracket on the vessel horizontally (Figure 6). The mounting bracket should be installed using bolts, adhesive tape, adhesive grip pad or Velcro.
7. When installing the device, make sure that the *Spot Trace* logo is facing upward so that the device can communicate with the satellite. Fishermen should ensure that the device is turned on and functioning before and during the trip.



Figure 6. *Spot Trace* bracket attached to vessel.

How to turn on and turn off the device

1. To turn on the device, press and hold the power button for about three seconds until the power indicator lamp blinks green (Figure 7). The *Spot Trace* device will do a self-test when the power is turned on. During the self-test, the green light will blink both on the GPS indicator and power indicator. If the red light blinks instead of green, it shows that the self-test failed. Please contact Nandana (phone: +628113886785 or email nandana@mdpi.or.id).
2. The *Spot Trace* device will automatically be on track mode when the power is on.
3. How to turn the device off: press the power button for 3 seconds. The indicator lamps will flash green for 3 seconds, and the device is off.



Figure 7. Pressing the power button to turn the device on and off.

4. Spot Trace data online on the I-Fish website

The *Spot Trace* data can be viewed online via the I-Fish website. Users granted I-Fish log-in access can view the data by navigating to the 'Extra' tab in the menu and then clicking on the image under the *Spot Trace* heading. The user will be redirected to the Spot Trace home page. Here the user can see four buttons, each with a different viewing option (Figure 8). The first button 'Spot Trace Monitoring' displays the list of Spot Trace devices available in the system and their details (i.e. location, current use, etc.). The user can choose to see only the devices deployed in a specific site using the site names menu at the top (currently Bone, Buru Utara, Kupang, Labuhan Lombok, Seram Selatan and Sorong). In the 'Map it!' column, clicking on the text 'Trace Terpinjam' brings up a map of the device's current location.



Figure 8. The four options available in the Spot Trace menu.

The table in the 'Spot Trace Monitoring' section will contain the following data for all listed vessels:

- Map it! : Shows the track recorded by a Spot Trace device for a vessel. I-Fish will get data from the port sampling data and get the daily average location of the Spot Trace device on particular date. Note: there will be two data: one from port sampling (if there is any), one from *Spot Trace*.
- Name : Shows the Spot Trace device name
- Inventaris : MDPI asset number
- ESN : Unique number from the Spot Trace company
- Lokasi : Site location of *Spot Trace*

- Landing Site : Landing site from vessel number
- Supplier : Supplier name from vessel number
- Vessel Name : Name of the vessel
- Fisherman : Fisherman name
- PIC : Regional Supervisor that has responsibility to monitor the device
- PIC in Field : Site Supervisor that has responsibility to update data and monitor the device in the field
- Date of Start : Date the device was assigned to a vessel
- Date of End : Date the device was returned from the vessel. If the device is late to be returned, the date will appear in red
- Last Contact : Date when I-Fish last got an update about the device via GPS. If three days pass and there are no updates from the device, the most recent date will appear in red. In this case the PIC and PIC in the field must try and locate the device by contacting the fisherman associated with the device.
- Device Status : The status received from the Spot Trace device, can be one of three options: Movement, Stop, or Power Off
- Report Status : User can add the report of the device, the status will be shown in this section.
- Battery Device : the status of the battery power reported from the Spot Trace device, can be one of two options: good or low
- Report Battery : the user can add a note relating to the battery, i.e. when most recently changed batteries, etc.
- Session : User can add or update the data.

The coloured buttons in the 'Session' column allow the user to Add, Delete or Update the data for a specific Spot Trace unit (Figure 9). When the user chooses to Update or Add data, a pop-up box will appear on the screen with the information to be completed by the user.

All Location

Data Monitoring Lokasi Spot Tracer MDPI Semua Wilayah.

Show entries

No	Session	Map it!	Name	Inventaris
1	<div style="text-align: center;"><input type="button" value="UPDATE DATA"/> <input type="button" value="DELETE DATA"/></div>	Trace Terpinjam	ST 8	474
2	<div style="text-align: center;"><input type="button" value="ADD DATA"/></div>		Trace 007	484

Figure 9. A section of the table containing available Spot Trace devices. Users can update, delete or add data and check the recordings on a map.

To link a Spot Trace recording with a vessel, the SS/SF must choose the vessel from the 'Data Completed' list. The SS/SF can type the name into the search box on this page, or else scroll through the list to find the right vessel. Once the correct vessel is found, the SS/SF clicks on the green button, 'Add Data' to the left of the vessel listing. This brings up an 'Add Data' box and the SS/SF must enter the following details about the Spot Trace recording:

- fisherman name
- start date – end date
- a photo of a document, if available
- landing site of the vessel (should match VIC data for that vessel)
- supplier name (should match VIC data for that vessel)
- vessel name

The orange box, 'Update Data', will inform the user whether a Spot Trace device is still assigned to a vessel or not. The data required when clicking on this orange box is:

- Return date (actual, not forecasted)
- Device Report
- Battery Report
- Upload Document

An authorised user can delete the data associated with a vessel by clicking on the red box associated with each vessel listing.

The 'Spot Completed' page redirects the user to a list of vessels, on which Spot Trace has already been deployed. These vessels are now finished using the Spot Trace device. The layout is the same as the 'Spot Tracer Monitoring' page. Clicking on the text in the 'Map it!' column brings up a map of the recorded movements on that vessel (Figure 10). The track with the number balloons shows all recordings from the device when it was deployed on that vessel over the specified time-period. In the menu on the left of the map, there is an option to 'Show Daily Average'. Clicking this removes the track lines and just shows one dot per day. The user can click on the red dots that appear and the date of the recording will be displayed.

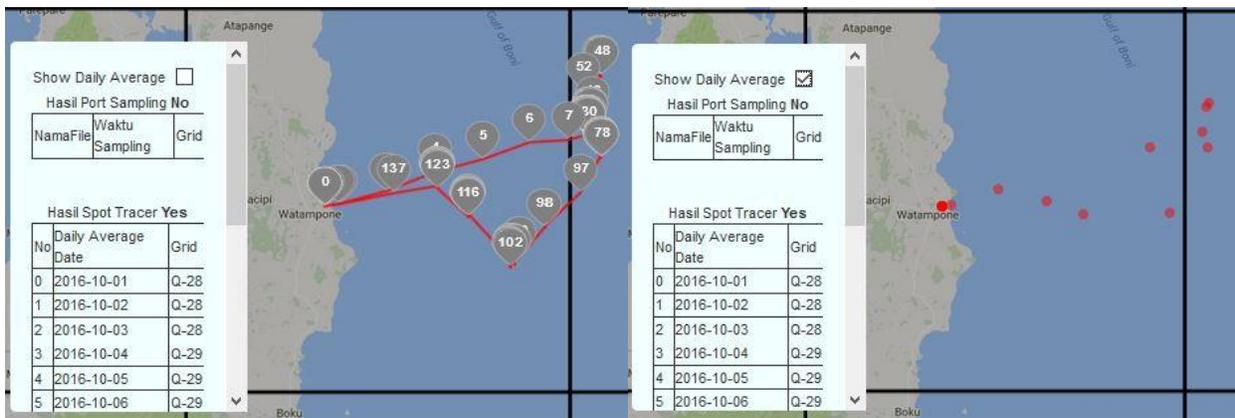


Figure 10. The map and menu from the 'Map it!' column. The left panel shows all recordings from the device during the deployment period, the right panel show the daily average locations over the time period.

The 'All Maps' page redirects the user to a Google map, with a menu on the left-hand side (Figure 11). From the menu, the user can choose a specific Spot Trace device and the date of deployment. Once the choice of Spot Trace device and date of deployment have been chosen, the landing site, supplier name and vessel name will appear in the menu window. The user can select to see the Spot Trace device recordings from a specific date with the 'Choose Tanggal' box. The user can also choose to see the daily average location, and to overlay the Fisheries Management Areas and 1 degree grid map on the device recordings. Users can check if the grid

square recorded in the port sampling form matches with the grid recorded by the Spot Trace device.

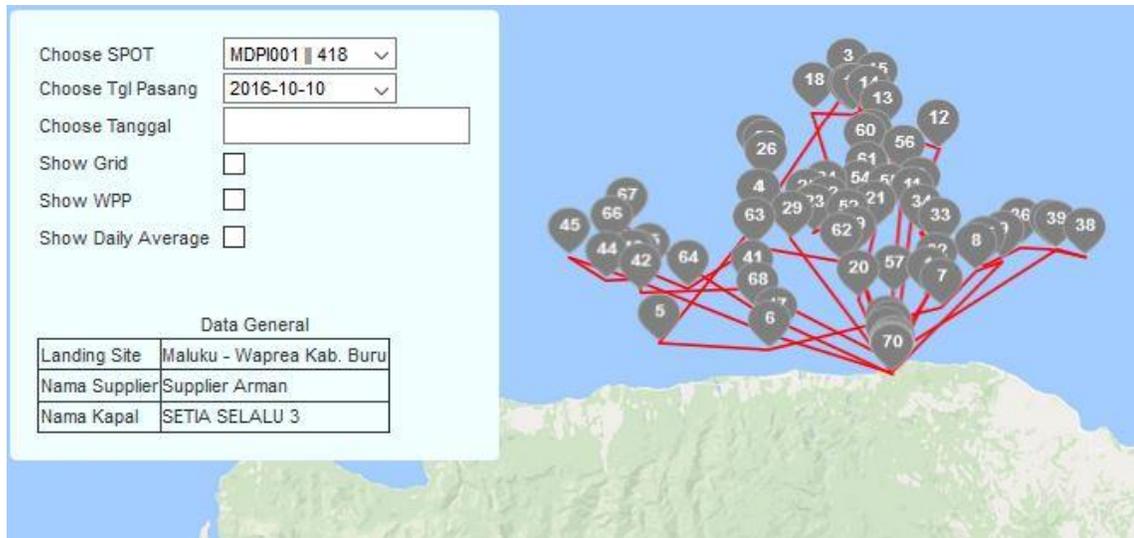


Figure 11. The map from a completed deployment with a fisherman. Users can view the tracks differently by checking various boxes in the menu.

Sometimes, when an enumerator follows the random deployment list procedure, there may be a vessel on which the Spot Trace device cannot be deployed. There are a number of reasons for this: the vessel is still at sea, the vessel is no longer active, the fisherman is taking a break and will not be going fishing for a few months, or maybe the fisherman disagrees to have the device on his vessel. If the enumerator must skip a vessel in the order of the deployment list, the reason must be recorded (Figure 12).

All Location

Data Kapal Yang tidak dapat diserahkan disemua wilayah .

Show entries

No	Check	Vessel Number	Landing Site	Supplier	Nama Kapal	Alasan
1	<input type="checkbox"/>	520301/047	NTB - Labuhan Lombok Timur	CV. Versace	AIR ZAM - ZAM	Sedang melaut dan belum di ketahui kapan kembali
2	<input type="checkbox"/>	520301/048	NTB - Labuhan Lombok Timur	CV. Versace	BERLIAN 02	Kapal Sudah Berangkat

Figure 12. An example of the table with the reason why a device was not deployed on a vessel.

If a Spot Trace device will be moved from one location to another, the SS/SF must submit a request to the programmer in the Bali office and inform him of the proposed change.

5. References

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Appendix I



**Yayasan
Masyarakat dan Perikanan
Indonesia**

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Website: www.mdpi.or.id email: info@mdpi.or.id

Tanda Terima Alat dan Pernyataan Persetujuan

Nama :
Nama Kapal :
Beroperasi di :
Alat tangkap :

Menyatakan telah menerima 1 (satu) unit “SPOT TRACE” dari Yayasan Masyarakat dan Perikanan Indonesia (MDPI).

Saya telah menyetujui untuk menerima unit yang telah dilekatkan di kapal saya dan memberikan akses hanya kepada MDPI untuk melacak pergerakan kapal saya sebagai bagian dari uji coba untuk mempelajari kegunaan alat demi mendukung kebutuhan data nelayan skala kecil.

Saya akan menjaga alat tersebut selama berada di bawah tanggung jawab saya dan akan mengembalikan alat kepada MDPI pada batas waktu yang telah disepakati.

Setelah pengembalian alat, MDPI akan memberikan data hasil dari alat SPOT TRACE yang dipasang dikapal saya.

Demikian pernyataan ini saya buat dengan sebenarnya.

Hormat saya,
Tanggal:
Tanda Tangan

Mengetahui,
Tanggal:
TandaTangan

Nama Terang

Nama Terang