

## Progress on data collection priorities in other tuna-RFMOs (IOTC)

Dr. Hilario Murua (Chair of IOTC WGEMS)  
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4th Workshop of an Electronic Monitoring  
System (EMS) in the EPO

## Introduction

- Observer data is key to compile, complement and verify fishery activity information,
- Ideally, scientific observer programs separated from those for compliance,
- Observer coverage in tunaRFMOs:
  - 100 % for PS IATTC-WCPFC-ICCAT
  - 5 % for LL in IATTC-WCPFC and 10 % for LL in ICCAT
  - 5 % of the operations for each gear type in IOTC (Resolution 11-04).
  - 100% for LL at-sea transshipment on the receiving vessels.
- Electronic Monitoring could be a good alternative, and complement or replace human observers

## Introduction

- EM pilot tests in different regions on PS/LL/SSF demonstrated the validity of EMS to improve the collection of fishery information.
- All tuna RFMOs are developing EM Minimum Standards.
- Before EM application, it is necessary
  - to assess the similarity between EM and observers-collected fishery data,
  - to ensure that observer minimum data requirements can be collected,
  - to develop EM data minimum standard for the installation, collection, analysis and storage of data.

# IOTC EM

- Objectives and Scope
- EMS definitions,
- EM Data Standards,
- EM Program Standards
  - Institutional structure and program management,
  - Data collection and review rate,
  - Roles and responsibilities,
  - Specifications and procedures,
  - Timeframe for implementation
  - Confidentiality
  - Cost and financial considerations.
- Expert WS

**All  
PENDING**

## APPENDIX IV

### TERMS OF REFERENCES FOR THE AD-HOC WORKING GROUP ON THE DEVELOPMENT OF ELECTRONIC MONITORING PROGRAMME STANDARDS (WGEMS)

To develop EM Program Standards (i.e., how the institutional structure and management of the program is organized) and EM Data Standards (i.e., the minimum data requirements to be collected and technical specifications and requirement of the EM system).

#### SPECIFIC OBJECTIVES

- To define the objectives and scope of the EM Program in the IOTC.
- Develop and agree on Electronic Monitoring related terms definitions.
- To draft EM Program Standards and EM Data Standards
  - For EM Program Standards: objectives of the programme, scope of the fleets, institutional structure and management of the programme, data collection and review coverage, roles and responsibilities of members, specifications and procedures, timeframes for implementation, accreditation of vendors, data confidentiality and access and use, coordination, observer training, cost and financial considerations, etc.
  - For EM Data Standards: minimum requirements for EM system and equipment, EM data collection and storage, EM data transfer logistics, EM data analysis and submission, EM maintenance and functioning, EM data validation and quality control, roles of EM users, including the collection of minimum data requirements.
- Identify and assess areas where EM could strengthen current IOTC collection and reporting processes.
- Develop a roadmap and workplan to progressively implemented an EM Program for IOTC fisheries including, but not limited to, fleet specific cost benefit analyses and capacity building.
- Consider how to ensure the compatibility of the data collected by EM programmes with other data currently collected through other programmes (VMS, ROS, etc.).
- Consider and review the best approach (e.g., through a Resolution) to implement the EM programme in IOTC.
- Develop tools, innovative strategies and collaborative projects for collecting, handling, processing and analysing fishery-dependent data from electronic technologies; for example, through machine learning and artificial intelligence and seek the collaboration from academia in joint-initiatives to progress on the matter.
- Consider how to ensure standards are flexible enough to not exclude or limit the use of future technological advances
- Hold an expert workshop(s) to review the draft EM Program Standards and EM Data Standards for IOTC Commission consideration.

# IOTC Resolution 22/04 on a Regional Observer Scheme

- In the case of vessels covered by the Regional Observer Scheme, **EMS be considered as a complementing or substituting source of information to reach 5% coverage, provided that minimum standards for EMS developed and agreed by the IOTC Commission** are followed.
- It requests the Scientific Committee, in collaboration with the Compliance Committee, to **develop and agree on minimum standards for the use of EMS for purse seine, longline, bait boat (pole and line), handline and gillnet fleets by 2023 at the latest**, including modalities for the substitution of human observer coverage by an EMS;
- So, **WGEMS mostly focused on discussing EM minimum standards.**



Food and Agriculture  
Organization of the  
United Nations



Indian Ocean Tuna Commission  
Commission des Thons de l'Océan Indien

## RESOLUTION 22/04

### ON A REGIONAL OBSERVER SCHEME

The Indian Ocean Tuna Commission (IOTC),

TAKING INTO ACCOUNT the need to increase the scientific information, in particular to provide the IOTC Scientific Committee (SC) working material in order to improve the management of the tuna and tuna-like species fished in the Indian Ocean;

REITERATING the responsibilities of flag States to ensure that their vessels conduct their fishing activities in a responsible manner, fully respecting IOTC Conservation and Management Measures;

CONSIDERING the need for action to ensure the effectiveness of the IOTC objectives;

CONSIDERING the obligation of all IOTC Contracting Parties and Cooperating Non-Contracting Parties (hereinafter CPCs) to fully comply with the IOTC Conservation and Management Measures;

AWARE of the necessity for sustained efforts by CPCs to ensure the enforcement of IOTC's Conservation and Management Measures, and the need to encourage Non-Contracting Parties (NCPs) to abide by these measures;

# IOTC EM

- Objectives and Scope
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- **EM Data Standards,**
- EM Program Standards
  - Institutional structure and program management,
  - Data collection and review rate,
  - Roles and responsibilities,
  - Specifications and procedures,
  - Timeframe for implementation
  - Confidentiality
  - Cost and financial considerations.

**All  
ADOPTED  
by the SC**

## APPENDIX IV

### DRAFT TERMS OF REFERENCES FOR THE AD-HOC WORKING GROUP ON THE DEVELOPMENT OF ELECTRONIC MONITORING PROGRAMME STANDARDS (WGEMS)

#### OBJECTIVES

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# Scope/Objectives of IOTC EM PROGRAM

- The objective of the IOTC REMP is to collect, via EMS, **verified catch data and other scientific data related to the fisheries for tuna and tuna-like species in the IOTC area of competence and achieve the EM observer/review coverage to meet the requirements of IOTC Observer Resolution on Regional Observer Scheme.**
- IOTC's REMP or any National EMP, under IOTC's REMP, shall ensure that the **data collected through EMS are documented and that all ROS minimum data standard requirements** (e.g., "Mandatory Reporting"), if necessary complemented with any additional monitoring program (e.g., port sampling, biological sampling, etc.), **are collected by EMS.**

	Coastal fleets: EEZ vessels less than 24 m LOA	Industrial surface and longline fleets: Vessels with LOA ≥ 24 m and all high seas vessels		
Annual catches (Nominal catch + Discards)	Nominal catches (weight) by IOTC species, main species of pelagic sharks, other bycatch, per IOTC area, gear, species and year			
	Discard levels of IOTC species, sharks, seabirds, marine turtles, cetaceans per IOTC area, gear, species and year (in number and weight)			
Active fishing craft statistics	Number of fishing craft per boat gear type category, per year	Individual vessel data for all fishing ships catching IOTC species		
Catch-and-effort (CE)	CE data by fishery (type of boat gear), area and period	Surface fisheries: CE by fishery, 1° grid and month Longline: CE by fishery, 5° grid and month	FADs anchored and drifting: CE by 1° grid and month (PS- BB)	Supply vessels: Effort 1° grid and month
Size data	Individual lengths of IOTC species sampled by fishery, species, 5 ° area and month			
Scientific observer data	Samples of catches landed to cover at least 5% of vessel activities	Sample of catches at-sea to cover at least 5% of fishing operations		

# Regional Observer Scheme (ROS)

Regional Observer Scheme Program Standards, including **Minimum Standards Data Fields**, that the Commission endorsed in 2019.

**IOTC Regional Observer Scheme (ROS) data fields requirements for COLLECTION AND REPORTING purposes**

Detailed fields and structure specifications by general and gear-specific sections

Internal version: 1.2.2  
Date: 18/10/21  
Author: [fabio.fiorelato@fao.org](mailto:fabio.fiorelato@fao.org)

**Colour codes**

Section	Field	Requirement
Mandatory for reporting		
Optional for reporting		
Optional for collection		

Fields marked as "Mandatory for reporting" under a Section as "Optional for reporting" have to mandatorily be collected / reported if information for the section is available (e.g. Waste category and the corresponding Storage/Disposal method, if information about Waste management is available / collected)

**Included worksheets:**

Vessel type	Worksheet
ALL	General vessel and trip info
LL	LL - Gear specs
LL	LL - Fishing events
PS	PS - Gear specs
PS	PS - Fishing events
PL	PL - Gear specs
PL	PL - Fishing events
PL	PL - Fishing events (bait)
GN	GN - Gear specs
GN	GN - Fishing events
PS / PL	Daily activity (surfaced)
ALL	Vessel transshipments info

Notes: General vessel and trip info, LL - Gear specs, LL - Fishing events, PS - Gear specs, PS - Fishing events, PL - Gear specs, PL - Fishing events, PL - Fishing events (bait)

## EM capabilities to collect ROS Minimum Data Standards

The agreed categories for assessing EM ability to collect ROS data minimum standards developed by (SPC-OFP, 2017) and (Emery et al., 2018).

R1	Ready now or require little work	P1	Possible, requires minor work
R2	Ready now but requires significant crew support	P2	Possible, requires major work
R3	Ready now but requires dedicated or additional work in the equipment	NP	Not possible
R4	Ready Now but inefficient/costly to analyze		

# EM capabilities to collect ROS Minimum Data Standards

From 24 IOTC ROS MR:

- 11 are ready to be collected
- 13 possible to be collected/reported with minor work.

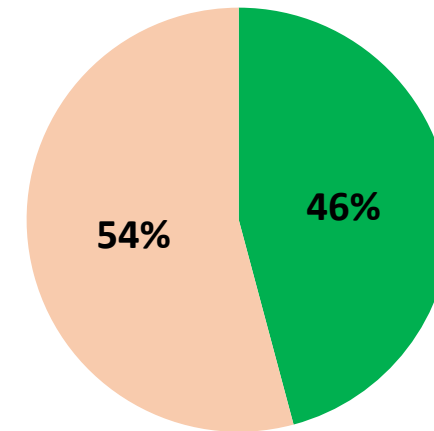
5 “optional for reporting” and 30 “suggested for collection”:

- 17 are ready,
- 7 are not needed (i.e. observer information),
- 8 could be collected with minor work and
- 3 are not possible to collect.

**It seems that EM is well suited to collect the current ROS data fields.**

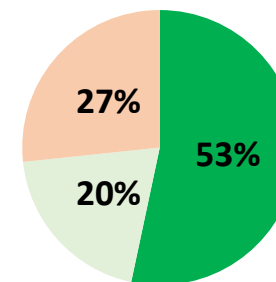
## GENERAL DATA FIELDS

Mandatory Reporting

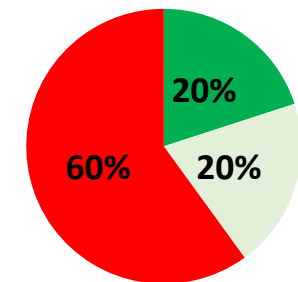


■ R1 ■ R2 ■ NULL ■ P1 & P2 ■ NP

Suggested



Optional



## EM capabilities to collect ROS Minimum Data Standards

## GENERAL VESSEL AND TRIP INFORMATION FOR ALL VESSEL TYPES

Data field name	Data field description	Reporting	EM	Source
Observed trip number	Record trip unique identifier. This is the observed trip unique identifier. This should begin with trip's start date (YYYY-MM-DD), followed by IOTC observer number, and vessel main gear code as per IOTC classification (E.g. 2018/01/23-IOTCFRA001-PS).	MR	R1	AG
OBSERVER IDENTIFICATION				
Observer IOTC registration number	Record observer registration number allocated by the IOTC Secretariat to be used on all observer data submissions.	MR	R1	AG
OBSERVER TRIP DETAILS				
Location of embarkation	Record the name and/or geographical coordinates of the port where the observer boarded the vessel – also include the country. If the observer embarked via a port launch within port limits, this is still recorded as a port embarkation. If the observer embarked at sea outside port limits via a vessel transfer, record “at sea” and record the position in Latitude and Longitude.	---	R1	AG

# EM capabilities to collect ROS Minimum Data Standards

From 51 IOTC ROS Mandatory Reporting:

- 28 are ready to be collected (55%)
- 7 ready but require little work,
- 3 ready but require specific work and/or costly,
- 5 possible with minor/major work,
- only 8 not possible.

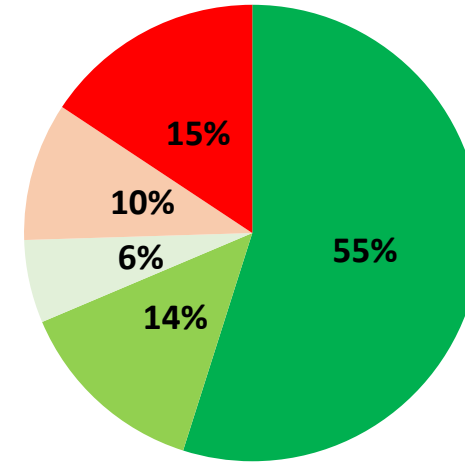
22 “optional for reporting” and 21 “suggested for collection”:

- 20 are ready,
- 6 ready but require specific work and/or costly,
- 2 possible with minor/major work,
- 15 not possible.

**It seems that EM is well suited to collect the current ROS data fields.**

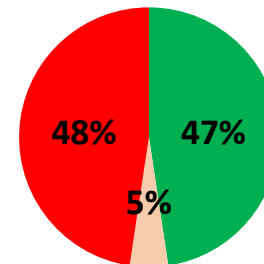
## PURSE SEINE

Mandatory Reporting

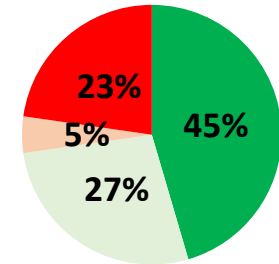


■ R1 ■ R2 ■ R3&R4 ■ P1 & P2 ■ NP

Suggested



Optional



# EM capabilities to collect ROS Minimum Data Standards

## PURSE SEINE

Data field name	Data field description	Reporting	EM	Source
SETTING OPERATIONS				
Set Number	Record set number. This should be a four digit numerical code beginning 0001. Set numbers should be consecutive from the start of the first line set to the last line set of the observed trip. A unique number is to be allocated to each individual set.	MR	R1	AG
Set type	Free school set, FAD set, etc. (Table 34)	MR	R1	AG
Start setting date and time	Record the date and time the skiff is launched to start the setting operation.	MR	R1	AG

# EM capabilities to collect ROS

## Minimum Data Standards

From 54 IOTC ROS mandatory reporting:

- 24 are ready to be collected (44%),
- 2 ready but require little work,
- 7 ready but require specific work and/or costly,
- 5 possible with major work, and
- 16 not possible to be collected.

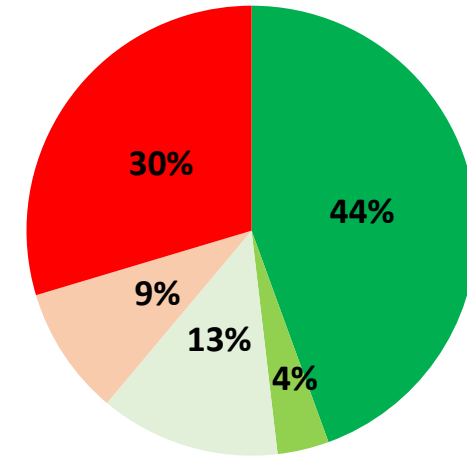
19 “Optional” and 34 “suggested for collection”,

- 22 are currently *ready*,
- 13 ready but require specific work and/or costly,
- 2 are *possible with major work* and
- 16 *not possible* to be collected.

**In general, EM is well suited to collect longline ROS mandatory data fields**, however, for the collection of more detailed information on line material/hook type e-reporting mechanisms from a pre/post-trip, interviews are needed.

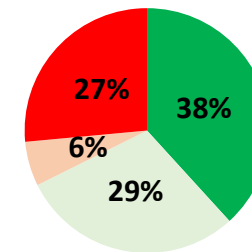
## LONGLINE

### Mandatory Reporting

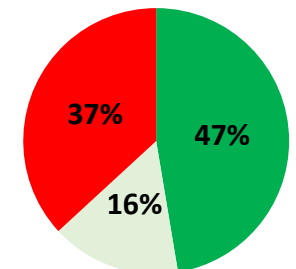


■ R1 ■ R2 ■ R3&R4 ■ P1 & P2 ■ NP

### Suggested



### Optional



# EM capabilities to collect ROS Minimum Data Standards

## LONGLINE

Data field name	Data field description	Reporting	EM	Source
SPECIAL EQUIPMENT OR MACHINERY				
Line setter	Indicate Yes if on board No if not sighted.  Many long line vessels will be fitted with equipment or machinery that regulates line setting speed allowing the line to be set at uniform depth.	<b>MR</b>	<b>R3</b>	<b>AG</b>
SETTING OPERATIONS				
Set number	Record set number. This should be a four digit numerical code beginning 0001. Set numbers should be consecutive from the start of the first line set to the last line set of the observed trip. A unique number is to be allocated to each individual set.	<b>MR</b>	<b>R1</b>	<b>AG</b>

# EM capabilities to collect ROS

## Minimum Data Standards

54 IOTC ROS mandatory reporting data fields,

- 39 are *ready* with EM (72%),
- 2 *ready but require little work*,
- 1 ready but require specific work and/or costly,
- 12 *not possible* to be collected.

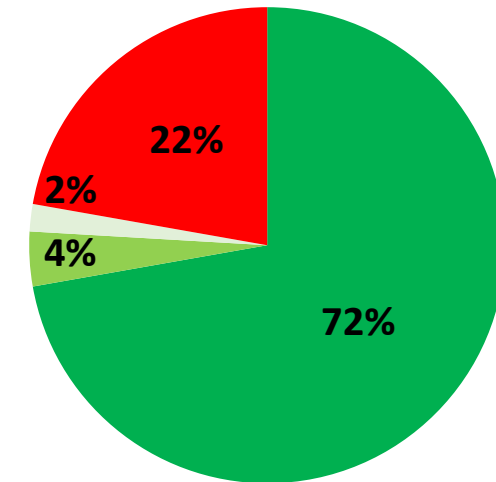
33 IOTC ROS “optional for reporting” and 12 “suggested for collection”,

- 18 (40%) are *ready to be collected*,
- 4 ready but require specific work and/or costly,
- 23 *not possible* to be collected.

**In general, EM is well suited to collect pole and line ROS mandatory data fields**, however, for the collection of more detailed information on line material/hook type e-reporting mechanisms from a pre/post-trip, interviews are needed.

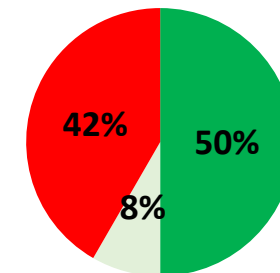
## POLE & LINE

### Mandatory Reporting

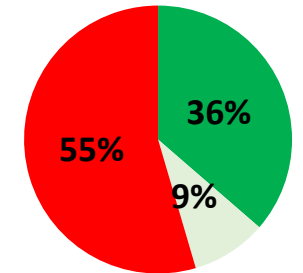


■ R1 ■ R2 ■ R3&R4 ■ P1 & P2 ■ NP

### Suggested



### Optional



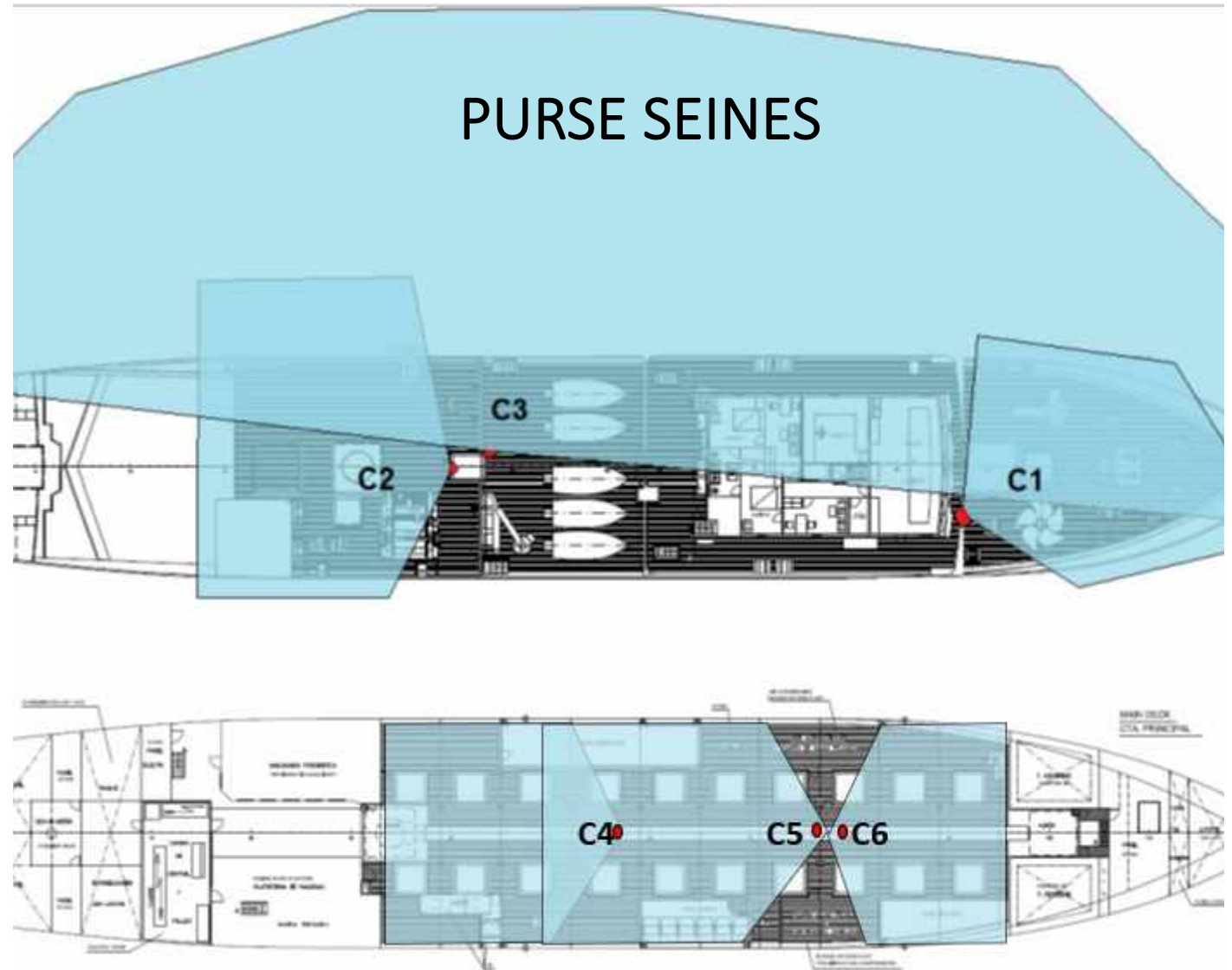
# EM capabilities to collect ROS Minimum Data Standards

## POLE & LINE

Data field name	Data field description	Reporting	EM	Source
SPECIAL EQUIPMENT OR MACHINERY				
Line setter	Indicate Yes if on board No if not sighted.  Many long line vessels will be fitted with equipment or machinery that regulates line setting speed allowing the line to be set at uniform depth.	MR	R3	AG
SETTING OPERATIONS				
Set number	Record set number. This should be a four digit numerical code beginning 0001. Set numbers should be consecutive from the start of the first line set to the last line set of the observed trip. A unique number is to be allocated to each individual set.	MR	R1	AG

## EM SYSTEM AND EQUIPMENT

The minimum areas that cameras should cover are the working deck (both port and starboard sides), the net sack and the brailer, the foredeck or amidships, and the well deck and conveyor belt (Restrepo et al., 2018).



source: Digital Observer Systems (DOS)

# PURSE SEINES

## EM SYSTEM AND EQUIPMENT

Cameras must cover the following actions: brailing, net hauling, FAD activities, bycatch handling and release, tuna discards, catch well sorting (process of putting the catch in the hold or wells). In large purse seines, **at least 6 cameras** are needed to cover fishing and fish handling operations.



source: Digital Observer Systems (DOS)

Area covered	Action covered	Purpose	Minimum data requirements to be monitored
Work deck (port side)	Brailing	Total catch by set Species composition	Number of brails & fullness by brail. Weight, size and species of retained t
	Tuna discards	Total tuna discards by set	Weight, size and species of discarded tuna
	Bycatch handling	Bycatch estimation	number of individuals handling mode Species ID
Work deck (starboard side)	Bycatch handling	Bycatch estimation	Handling mode
	Bycatch release	Total bycatch by	Number of individuals and species ID
In-water course seine area	Brailing	Total catch by set	Number of brails & fullness by brail
	Bycatch handling and safe-release of individual animals (whale sharks, manta rays...)	Total bycatch by set . Application of handling and safe-release best practices	Handling mode
	Bycatch release of big species (whale sharks, manta rays...)	Total bycatch by set Application of handling and safe-release best practices.	Number of individuals and species ID
Foredeck or amidships	FAD activity (deploying, replacement, reparation...)	Total number of FAD deployments, FAD design and FAD activities by trip	Number, material (natural or artificial) and FAD characteristics (entangling or entangling)
Well deck and conveyor belt	Catch well sorting	Species composition	Weight, size and species of retained t
	Bycatch handling	Best practices	Handling mode
	Estimation of bycatch discards, releases or retention	Total bycatch by set Species composition Application of handling and safe-release best practices.	Number, size or weight of individuals, species ID and fate

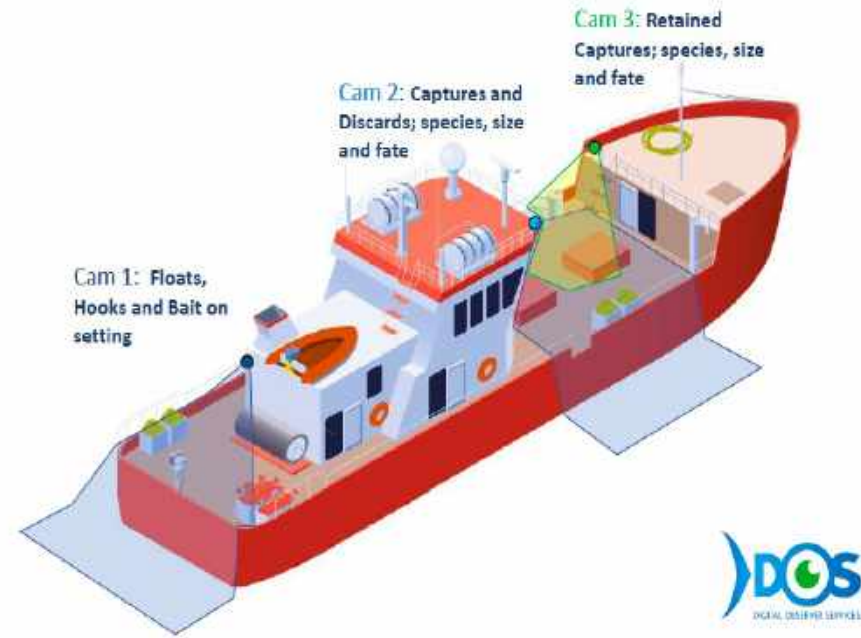
# Vessel Monitoring Plan (VMP)

**Table.-** Minimum areas and actions that should be monitored (adapted from Murua et al., 2022; Ruiz et al., 2017).

## EM SYSTEM AND EQUIPMENT

On longlines, the cameras should provide a view of the setting of the longline, bait information, whether mitigation techniques are being used (e.g. tori lines), hauling of the longline, all hooked species (both retained and discarded) and the size of the specimens. On most of tuna longlines, **at least 3-4 cameras** are needed to cover fishing activities.

## LONGLINE



C1: Stern camera



C2: Fishing deck 1



C3: Fishing deck 2



source: Digital Observer Systems (DOS)

# Vessel Monitoring Plan (VMP)

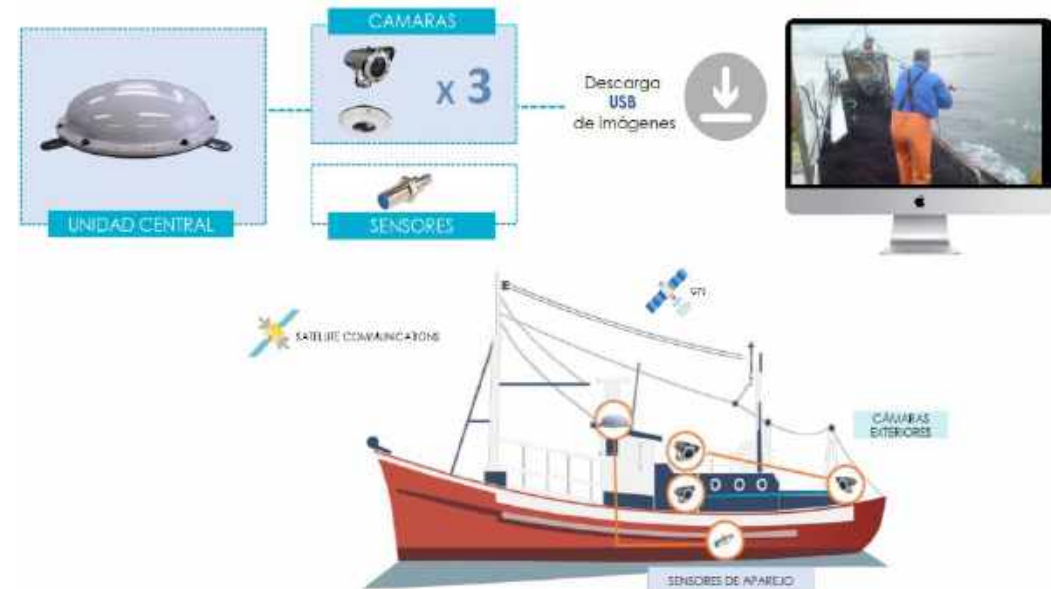
**Table.-** General configuration and areas/activities covered by the EM system onboard tropical tuna longline vessels (adapted from Murua et al., 2022).

Area covered	Action covered	Minimum data requirements to be monitored
Stern camera of the boat	Start and end setting operation	Position, date, and time
		Total number of hooks set and between floats
		Total number of floats set
		Bait type
		Bait species
		Bait ratio (%)
		Mitigation measures/marine pollution
Work deck	Catch onboard	Length and weight by capture
		Condition
		Fate
		Predator observed
	Bycatch discarded, released, or retained	Total bycatch by set and species composition
Processing area	Catch	Total catch by set
		Length and weight <sup>1</sup> by capture
		Sex
		Fate
Surrounding water area	Start and end hauling operation	Position, time and date
	Estimation of bycatch discards, releases or retention	Total bycatch by set and species compos
		Species condition and fate

## EM SYSTEM AND EQUIPMENT

On pole and line vessels, the minimum areas that cameras should cover are the area of bait fishing activity, the area of the fishing set and pole and line fishing activity (vessel stern site camera) and the working deck where catch is handled. On a typical Indian Ocean pole and line vessels, this will require at least 2 or 3 cameras to cover main fishing activity areas, fish handling operations and bait fishing.

## POLE & LINE



source: Marine Instruments

Q & A



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