Food and Agriculture Organization of the United Nations

Indian Ocean Tuna Commission
Commission des Thons de l'Ocean Indien
iotc ctoi

VESSEL MONITORING PLANS (GUIDE)

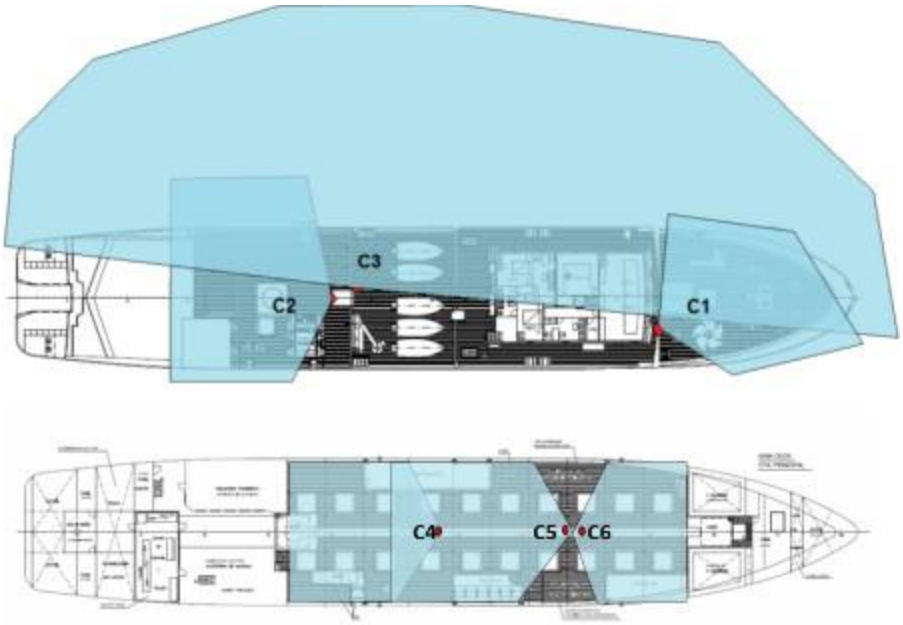
Each vessel should develop a "Vessel Monitoring Plan" so as to define how many and where cameras are located to collect the required ROS minimum data fields. Vessel Monitoring Plans should be reviewed by the CPCs fishery management agency and presented to the WGEMS/WPDCS to ensure it meets IOTC REMP Program and EM System and Data Standards.

On purse seine vessels, the minimum areas that cameras are recommended to cover:

- the working deck (both port and starboard sides),
- the net sack and the brailer,
- the foredeck or amidships (e.g., FAD activity),
- and the well deck and conveyor belt (Murua et al., 2022; Restrepo et al., 2018): for the conveyor belt, in more than one place (e.g. at the beginning and at the end of the conveyour belt as a minimum). If a discard conveyor belt exists, it should also be covered.
- Cameras must cover the following actions: fishing set, brailing, net hauling, FAD activities, total catch, catch well sorting (process of putting the catch in the hold or wells), bycatch handling and release, and tuna discards (Figure 1 and Table 1).
- In large purse seines, at least 6 cameras are needed to cover fishing and fish-handling operations; however, less fewer cameras (e.g. 4 cameras) could cover the activity to collect the data required of smaller purse seines (e.g. 300-400 tonnes capacity).

The preferred EM equipment configuration would be the one that allows a greater number of images (frames) of higher quality/resolution. Digital video is generally preferred, but still images can also be a viable option to capture information during the various phases of the vessel activity. However, considering that storage capacity is limited, an optimal configuration may have video on certain areas/cameras/moments, while still photos on others. In the case of photographs, the minimum requirement should be that a picture is taken by the camera with viewing angle fully covering the fish management areas at least every 2 seconds when fishing action occurs (Restrepo et al., 2018). Image quality should also be adequate enough to allow accurate collection of all required data field, such as species ID, FAD materials and design, or bait used and, hence, achieve the monitoring objectives.

A


C3
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B


Panoramic camera:
Surrounding activity
Crows nest camera:
Fishing deck
Starboard camera:
Bycatch and discards
Bow camera:
Crane activity.
Partial view of seine
Brailing camera:
Brailing and purse.

Figure 1. (A) An example of a 6-cameras EM system installed in a purse seine covering main areas of fishing and fish handling operations (from Murua et al., 2020b) and (B) 7-cameras EM system (4 in the upper deck and 3 in the well deck) installed in a purse seine covering main areas of fishing and fishing handling operations including 1 more camera in the conveyor belt: (B1) 360˚ Panoramic view camera (e.g port side view), (B2) Crows nest stern view camera, (B3) Working deck crane camera view , (B4) Foredeck view camera, (B5) Conveyor belt stern camera view, (B6) Conveyor belt middle camera, and (B7) Conveyor belt bow camera (source: Digital Observer Services).

Table 1. Minimum areas and actions that should be monitored (adapted from Murua et al., 2022; Ruiz et al., 2017).

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 tuna
	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 set	Number of individuals and species ID
In-water purse 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 no entangling)
Well deck and conveyor belt	Catch well sorting	Species composition	Weight, size and species of retained tuna.
	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

On longline vessels, the minimum areas and activities that cameras are recommended to cover (Table, 2, Figure 2):

- The area of setting the longline (usually vessel stern site camera),
- the area of hauling the longline,
- the working deck where catch is handled,
- and the surrounding water area for those discarded species not brought onboard

- Cameras must cover the following actions: setting of the longline, bait type information, whether mitigation techniques are being used (e.g. tori lines for seabirds), hauling of the longline, all hooked species (both retained and discarded), the fate of the catch, and the size of the specimens.

- On most tuna longlines, at least 3 cameras are needed to cover fishing activities and fish handling operations: one capturing images when setting the longline, one to record the hauling and boarding of the catch, and other mounted over the processing deck to record species, size of specimens and fate (Murua et al., 2020a). And additional camera to cover the surrounding
  water area for those discarded species not brought onboard is also recommended.

Figure 2. An example of a 3-cameras EM equipment installed on a longline covering main areas of fishing and fish handling operations. View of the 3 cameras: (left panel) Stern camera - setting longline providing information on hooks, floats, mitigation techniques and bait; (middle panel) Fishing deck 1 - hauling information, captures and discards, species ID, size and fate; and (right panel) Fishing deck 2 - fate of the species, size, species ID (source: Digital Observer Services).

Table 2 – General configuration and areas/activities covered by the EM system onboard tropical tuna longline vessels

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[5] 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 weight1 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 composition
		Species condition and fate

[5] Estimated through length-weight relationships.

On pole and line vessels, the minimum areas that cameras are recommended to 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 (Figure 3).

Figure 3. An example of a 3-cameras EM equipment installed on a Bay of Biscay (Atlantic Ocean) pole and line vessel covering main areas of fishing activity and fish handling operations. View of the 3 cameras: (left panel) Vessel bridge camera stern view – pole and line activity; (middle panel) Fish handling - catch storage; (right panel) Vessel bridge camera bow view - bait and pole and line fishing activity (source: Marine Instrument.)