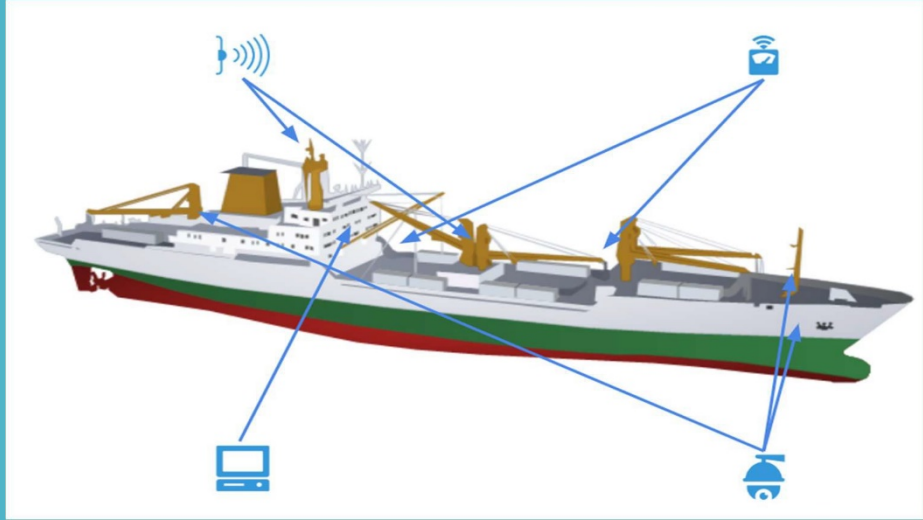


MEETING OF ICCAT IMM (14-17 JUNE 2021)

REMOTE ELECTRONIC MONITORING (REM),  
INCLUDING CLOSED CIRCUIT TELEVISION  
(CCTV) ON BOARD BLUEFIN TUNA  
PROCESSING VESSELS  
CONCEPT PAPER



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## ACRONYMS AND ABBREVIATIONS

BFT	Eastern Atlantic and Mediterranean Bluefin tuna	CCTV	Closed Circuit Television
CPC	ICCAT Contracting Party		
eBCD	Electronic Bluefin tuna Catch Declaration		
EFCA	European Fisheries Control Agency		
GPS	Global Positioning System		
PNC	Possible Non-Compliance		
REM	Remote Electronic Monitoring	ROB	ICCAT Regional Observer
UPS	Uninterruptible Power Supply	VMP	Vessel Monitoring Plan
3G/4G	The third and fourth generation of broadband cellular network technology		

During the ICCAT Working Group on Bluefin tuna (BFT) control and traceability measures, held in Madrid on 2-4 March 2020, the EU proposed measures to improve the control of processing vessels, operating in the BFT fishery in the Eastern Atlantic and Mediterranean Sea. These measures included the introduction of Remote Electronic Monitoring (REM), including Closed Circuit Television (CCTV), on board of these vessels.

ICCAT Panel 2 agreed to consider the proposal and the EU undertook to prepare a working document, which would be circulated among the different ICCAT Contracting Parties (CPCs) for possible comments and contributions, and which would serve as a basis for Panel 2 to make a decision on the possible implementation of the system during the next ICCAT intersessional meeting. Due to the strong technical character of the paper and the fact that other similar projects are being discussed in IMM, it has been considered more appropriate that its discussion is diverted to the IMM Group 14-17 June 2021.

The present document proposes the implementation of a remote monitoring system for BFT processing vessels through a pilot project. The technical aspects are largely based on the Technical Guidelines and Specifications for the implementation of REM<sup>1</sup>, prepared by the European Fisheries Control Agency (EFCA), as a result of the experience of several pilot projects carried out over several years. However, given the purpose of this working paper, the document does not elaborate on the technical aspects, but focuses on giving a global vision of the system and above all, its possible advantages and strengths, so that ICCAT Panel 2 can take a decision on its possible implementation.

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<sup>1</sup>

<https://www.efca.europa.eu/sites/default/files/Technical%20guidelines%20and%20specifications%20for%20the%20implementation%20of%20Remote%20Electronic%20Monitoring%20%28REM%29%20in%20EU%20fisheries.pdf>

## 1. INTRODUCTION: THE NECESSITY AND DESIRABILITY OF A REM SYSTEM FOR BFT PROCESSING VESSELS

Most of the ICCAT BFT quota is allocated to purse seiners<sup>2</sup>, which cage the BFT in farms where it is fattened. When the fattening process is over, the vast majority of these fish is harvested in the farms and then transferred to the processing vessel, where it is processed and frozen. A similar situation occurs with fish caught by traps.

All this makes the processing vessels a critical point in the chain from a control point of view, since a large majority of the BFT that is caught passes through them. Effective control of these vessels is therefore essential in order to be able to detect, for example, possible irregularities in terms of the quantities harvested by farms and traps.

BFT harvesting from farms and traps are operations extremely difficult to effectively control. These operations take place at sea, underwater and can occur at any time. Processing vessels stay several weeks in the vicinity of the farms and although the presence of an ICCAT Regional Observer (ROB) is mandatory for all harvesting operations from farms, the observer is deployed on board the processing vessel at the request of the operator and depends on the operator's means to reach the farm/trap area. It therefore seems impossible for the ICCAT Observers to detect or deter possible non-authorized harvesting operations, to which the operator will obviously not request their presence.

The system also offers an opportunity to use control resources more efficiently, acting on those points where the activity is concentrated and where it is easier to control. Although this is something that should be determined by the Pilot Project, it is believed that the system would significantly **reduce the number of hours** and control **costs** (currently, at least in the EU, in each of the authorized harvesting operations to processing vessels, not only the observer but also the authorities are present during the operations, making control very expensive and still leaving significant gaps in this control).

The Regional Observer Programme (ROP) as well as the inspections carried out by the competent authorities on these vessels, are characterised by a lack of identification of potential non-compliances (PNC) related to harvesting operations, which is probably an indicator of the intrinsic difficulty of detecting illegal harvesting operations through the usual control means.

REM systems, including CCTV, could be an effective tool to control the activity of these vessels. The convenience and suitability for the implementation of REM on board processing vessels is based on:

- the need to have an effective control over processing vessels due to the significant amounts of BFT quota passing through them;
- the difficulty to control harvesting operations and associated transshipments to processing vessels with the current control tools;
- the characteristics of the processing vessels, ships of considerable size and equipped with communication technology, which have the capacity to easily accommodate and maintain this type of system;
- the fact that the system would provide coverage not only during authorised harvesting operations, but continuous monitoring 24 hours a day, 7 days a week;
- the fact that there is only one species, therefore the identification of species, one of the difficulties encountered by the REM system when implemented on other types of vessels, does not exist;
- the way BFT is transferred to the processing vessels and the size of the BFT, which would allow an easy, accurate and efficient control of the number of individuals loaded (see image 1);
- the fact that the analysis of the video footage would be simpler and less time consuming than for these systems applied to other fleets.

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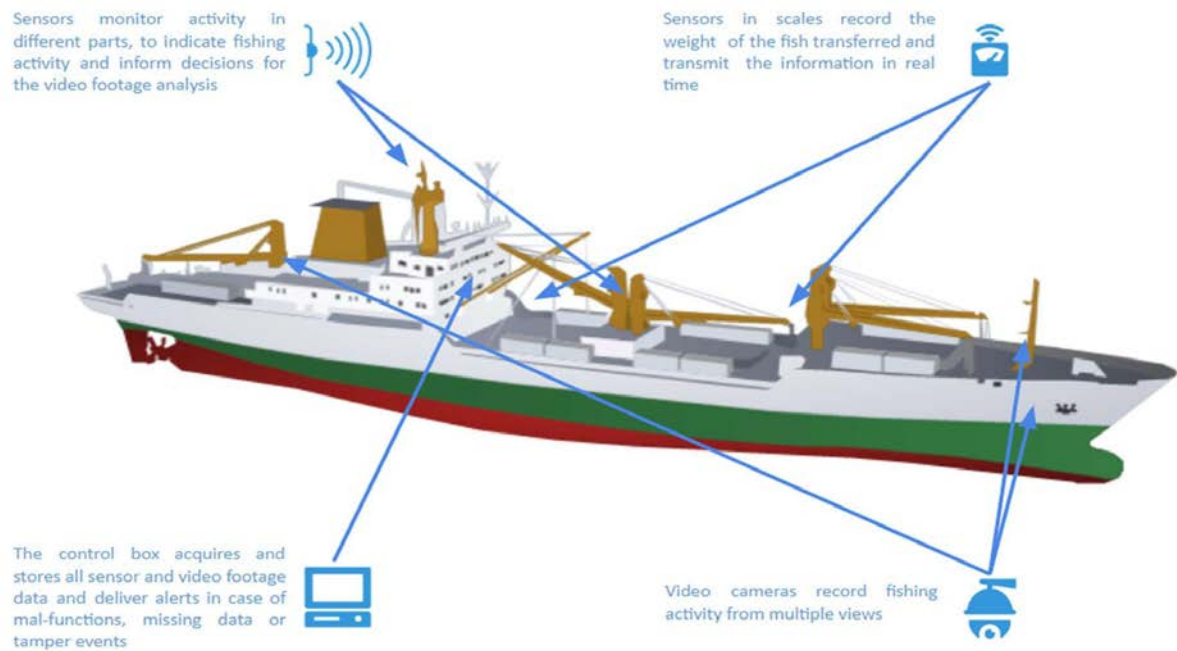
<sup>2</sup> The EU quota allocated to purse seine vessels in 2020 is 12051 tons, 61.9% of the total EU quota. All the quantities caught by these vessels end up in farms. In addition, the quota allocated to traps is 3158 tons (16.2% of the total quota) and a significant proportion of this BFT also ends up on processing vessels.



**Image 1.** Detail of how the BFT is lifted from the farm cages or traps and then transferred to the processing vessel, where the ease of counting transferred individuals is shown.

In addition, the system will cover the navigation periods, where illegal transshipments could occur, can trigger immediate control actions when the sensors indicates non-authorized fishing operations.

The system will also significantly assist in the control of the vessel landings in ports, helping effective control and enforcement also at this stage and provides an important **deterrent at all times** against illegal activities, thus promoting a culture of compliance.



#### Summary of characteristics of the REM system for BFT processing vessels

- Implementation in 2-3 processing vessels, out of the 10 vessels authorized. Pilot project for one year, with possibility to extend it one additional year.
- System capable of monitoring all the fishing activities on the vessel, tamper- proof, with the ability to issue warnings and alarms.
- Sensors (GPS, cranes, hold hatches, weighing scales, freezing tunnels) provide information, in a lightweight format, on potential fishing activity and is used to select the video footage to be analysed.
- CCTVs located covering both sides and main deck of the vessel, record the fishing activity.
- Roles and responsibilities of operator and authorities involved, and measures to respond to possible non-compliances.
- Approximate cost of the pilot project 200.000 euros.
- Potential economic savings and reduction in the time dedicated by the authorities to the control of these vessels and possible increase of efficiency



## 2. OBJECTIVES AND SCOPE

The purpose of the REM system is to ensure effective control and enforcement of the activity of processing vessels operating in the BFT fishery, in the Eastern Atlantic and Mediterranean.

The system must ensure that all processing vessel fishing activity can be effectively monitored remotely and in particular that the number of individuals and weight of all bluefin tuna brought on board can be determined.

It is recommended that the applicability and efficiency of the REM system be tested by a pilot project. The duration of this pilot project would be one year, with the possibility of extending it for a further year, if the results of the first year are considered not to be sufficiently definitive. The pilot project would be considered as a testing phase and the information collected in it may only be used to achieve the objectives of the project, but in no case for control or enforcement purposes.

There are currently 10 vessels<sup>3</sup> performing activities as BFT processing vessels. Annex 1 provides a list of the vessels concerned. The pilot should set the number of vessels on which the system should be implemented to ensure that the objectives of the pilot could be met.

ICCAT Panel 2 in March 2020, decided that the working paper would be presented at the intersessional meeting of Panel 2 in March 2021, however, due to the technical character of the paper and the fact that guidelines for the use of Electronic Monitoring in other ICCAT fisheries have already been requested to be developed by IMM by other panels, it would be more useful to divert its discussion to the IMM group meeting in June 2021. Prior to the IMM meeting, a correspondence period will be opened, where CPCs will be invited to provide written comments, in order to include their vision and develop more detailed technical specifications.

## 3. CHARACTERISTICS AND TECHNICAL SPECIFICATIONS OF THE REM SYSTEM

### 3.1. MAIN TECHNICAL STANDARDS

An REM system is an integrated system of sensors, video cameras, and storage and transmission unit, which capture comprehensive video footage of fishing activity, with associated sensor and positional information and is used to remotely monitor fishing activities of a vessel.

A REM system consists of a control box (a modified computer that acquires and stores all sensor data and video footage). The system software is developed to handle and control sensors and cameras, store sensor data and video footage on embedded storage, and to display all information on a screen in the wheelhouse, allowing the crew to monitor the functioning of the system. Sensor data and video footage are stored on one or two on-board hard drives. Most systems can store data and video footage from several months or even a whole year.

The REM system should incorporate a self-test function including at least position check, memory status check, camera image check, and sensor operation check. The system should allow the master to test it and ensure it is fully functional at all times and meets all the requirements standards. The system should be able to deliver automatically, to the master and the competent authority, health messages and warnings, including warnings for missing data, malfunction or tamper events.

The system should be able to accommodate new sensors devices if needed or new technologies or expansions and for integration with general sensors and instruments already on-board the vessels.

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<sup>3</sup> The list of processing vessels is not exhaustive and must be completed. The list provided is based just on processing vessels for which there has been activity in the EU in the last few years.

The Remote Electronic System must comply with the following main technical standards:

- a. include a sufficient number of cameras to monitor the fishing activity (considered, for the purpose of this document, the loading of BFT, weighing, processing, storing, transshipment and landing),
- b. include sensors that monitor parameters to detect when fishing activity occurs or may be occurring,
- c. be capable of securely storing E-monitoring records and have enough storage and back-up storage, in accordance with the number of cameras and the duration of the trip,
- d. supports remote access/configuration and have Uninterruptible Power Supply (UPS) and controlled shutdown,
- e. be of sufficient camera resolution that allows the counting of the number of specimens,
- f. include a Global Positioning System (GPS) receiver to monitor vessel position, route and speed as well as provide information on operation times and location, even during periods of poor visibility or at night (i.e. may be supported by IR lighting),
- g. be capable of issuing real time automated alerts when the system is malfunctioning,
- h. be tamper evident and prevent any manual data input or external data manipulation,
- i. be robust and withstand rough conditions at-sea with minimum human intervention.

### 3.2. INSTALLATION OF THE REM SYSTEM

A certified REM Vessel Monitoring Plan (VMP) would be necessary in order to establish the layout of sensors and cameras and other relevant technical specifications to cover all monitoring needs. Following initial trials, after the installation and any agreed repositioning or adjustment of equipment is completed, the flag state competent authority shall approve the REM system before the vessel is authorised to start its fishing activities.

A picture of the camera shot for each camera, showing the field of view the camera should cover, shall be inserted in the VMP, which the vessel must keep on board.

Any physical changes on the vessel should be reported to the flag state competent authorities and to ICCAT and shall require the authorisation by the competent authority and the update and approval of a new certified VMP before the next trip can take place.

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#### 3.2.1. CCTV

The number and field of view of the cameras should be such as to monitor all areas where BFT can be loaded, processed or weighed and to ensure in particular that all areas where tuna can be transferred on board are covered.

As a general setup, the position of the camera should cover both sides of the vessel and allow the number of specimens transferred on board to be counted and to identify possible vessels that will be attached to the processing vessel. The use of one or two cameras to cover each side of the vessel will depend on the length of the vessel and the resolution of the cameras. Since all receiving and processing operations of tuna take place on the main ship's deck, a camera with a general overview of the deck would ensure effective control<sup>4</sup>.

An additional camera installed in the deck area where the fish is received and processed would make it possible to ensure a count of the number of individuals in a case where it was not possible to do so when the fish was lifted by the crane. The installation of a camera and an ichthyometer or graduated rule in this area, with an easily visible colour scale, would allow to control that the operator makes a size sampling that may be set for scientific purposes.

The minimum requirements for the cameras, image resolution or digital/optical zoom will depend on the location of each individual camera and what each camera is intended to capture.

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<sup>4</sup> All fish receiving, and processing operations take place on the main deck. Once the fish has been made into loins or fillets it is thrown down a slide in the hatch to the freezing area.

The cameras and the camera housing need to be constructed of material that can resist the environment on board the vessel, be tamper-proof and that camera closure fittings are robust and durable.

Due to the large size of the video footage, the possibility of using on some or all cameras, photographs taken every few seconds instead of continuous video, could also be evaluated during the pilot project, since this alternative would allow to reduce very significantly the size of the files and facilitate its management.

The master shall be responsible for ensuring that the REM system is fully functional and that CCTV systems provide clear, unobstructed footage during operation. The cameras would not need to be recording when the vessel is sailing above a certain speed.

The installation of a camera with measuring capability (lens dependable) in the area where the BFT is received on board, would allow the automatic determination of the sizes of the individuals taken on board and assist in the collection of fish size data to be used for scientific purposes, supporting at the same time weight control.

Masking capability, with the possibility to blank out parts of images to protect persons and to select region of interest, should be possible for personal protection purposes.

Digital signature (date and time stamp, vessel name, vessel registration and GPS coordinates), will be necessary to be able to associate the video footage with a particular event in time (i.e. to check that the operation was authorized or that it has been correctly recorded).

### 3.2.2. SENSORS

The purpose of sensors is to provide information, in a lightweight format, on the possible occurrence of fishing activities. These sensors would be placed on those devices or mechanisms that are active when the vessel is or may be carrying out fishing activities, such as fish loading, processing, freezing or landing. This information is mainly used to select the video footage to be analysed.

The sensors would also collect and send real-time information on weighing operations, which will make it easier to monitor activity and allow automatic data crosschecks.

The REM systems should be able to support all types of sensors needed and a data-bus connection should be available for possible future expansions.

The following sensors are recommended:

1. GPS;
2. opening of hatches or other access to the hold;
3. activation of the cranes;
4. on the scales used to weigh the BFT(\*).

Other sensors whose usefulness can be assessed are:

5. activity in the freezing tunnels (introduction of fish) or motion sensors;
6. temperature in fish hold;

(\* ) The use of scales attached to the cranes, method already used by most of these ships, is considered of great interest because it would allow to record and transmit the weight of all the fish taken on board. It should be assessed whether the currently available scales can be adapted to the REM system.

Although it is not the objective of the system, it can also be used by the authorities of the CPC where the vessels is landing to support its control (allowing for example to monitor the weight of the fish being landed, that the vessel does not unload when it is not authorized or an easy data crosscheck with the data recorded in the eBCD or other documents).

The image below offers some examples of certified scales, with data transmission capacity. The price of these scales with a capacity of 1000Kg can be around 4000 euros.



**Image 2.** Some examples of hanging industrial scales with the ability to record and transmit data.

### 3.3. DATA STORAGE AND TRANSMISSION

The REM system must be able to communicate with the land based competent authority both ways. All the information shall be stored in the control box and the requested data shall be secured to prevent possible deletion or tampering. A backup must be made automatically. All data being stored or transmitted could be compressed and securely encrypted. The video footage and sensor data must be available at all times to authorities who may inspect the vessel, in particular flag authorities, coastal or port authorities, as well as CPCs authorities inspecting the vessel in international waters under a Joint Inspection Scheme.

Because in case of use of different systems there could be problems of data compatibility, the format of the data, both from sensors and video footage, should be unique or compatible, so that the different authorities involved in their analysis would have no problem reading and analysing them. It is highly recommended that all vessels in the pilot project use the same REM provider (single procurement for one single system), as this will ensure the best possible data exchange and facilitate data analysis.

Providing that storing large volumes of data and especially video footage by the competent authority is not considered manageable, minimum and a maximum period for the storage of sensor and video footage data by operators and authorities should be specified. These retention periods by the authorities can be extended when necessary, to allow the follow up of a complaint, a possible infringement, an audit or ongoing judicial or administrative proceedings. In these cases, video footage could be stored as long as necessary.

The storage and management of the video footage should take into account technical options, possible legislation on privacy and data protection and comply with the relevant Personal Data Protection Regulations.

The data would be transmitted via mobile data networks, via Wi-Fi (when the ship approaches the coast and enters WiFi or 4G coverage) or via satellite system (it is believed that the processing vessel will remain under 4G coverage for most of the time during it is engaged in fishing activity (transfer of fish from the farm/trap, processing, landing)).

In case of technical failures in the transmission system, information could be shared through the exchange of hard disks. The possibility that the video footage is collected by the competent authorities is considered feasible since during the time of operation of these vessels, the competent authorities where the vessel operates are, or can easily be, present for all these operations.

The transmission of data between authorities in different countries has been one of the most challenging parts of the implementation of REM systems. For the implementation of this project it is proposed that the data and video footage would be forwarded to the ICCAT Secretariat or flag CPC and the auditing of the REM data would be delegated to an **independent body or company**, which should handle the REM data in accordance with the data protection laws and share the results with the relevant CPC's. This would minimise the risks of having to share data with several different CPCs.

In case the authorities want to test the system first-hand, the sensor data and video footage would be made available, upon request, to the flag CPC of the processing vessels and/or the coastal CPC where the vessel is carrying out the fishing activities.

Preparation of technical possibilities and protocols for data exchange under a common data format are advisable.

## 4. DATA ANALYSIS

REM systems on board the vessels should be able to deliver the sensor data and video footage in a specified common format for exchange (output). The land based analysing software (REM analyser) allows to associate the data of the sensors with the video footage, facilitating and speeding up the analysis of the video footage. Providers usually manage both stages, the software on board the vessel and the analysing software, which gives them the possibility to innovate and develop, for example in the field of automatic recognition.

The analysis of the video footage for BFT processing vessels would be based on:

1. Risk analysis, using at least:
  - analysis of sensor data (i.e. crane activity or opening of hatches at times when the vessel is not authorized to transfer fish);
  - the weight or numbers of individuals (number of weighing events) transmitted by the scale sensors do not correspond to the quantities recorded;
  - vessel detention while in navigation (possibility of transshipment at sea);
  - system alerts for malfunction, missing data or tampering attempts;
  - VMS information indicating activity by other vessels in the vicinity of the processing vessel or non-receipt of auxiliary vessel positions associated with the farm;
  - other intelligence information held by the authorities; and,
2. Random examination:

Random analysis of some of the operations would allow to verify that the amounts declared by the operators correspond to those shown in the video footage (number of individuals) and in the weighing sensor data for these operations.

The REM system has traditionally been used on board fishing vessels (mainly trawlers) to verify the existence and nature of discards. In these cases, the implementation of the system is much more complicated and challenging, since a significant number of different species are captured that need to be identified and quantified and where fishing operations extend for several hours a day. In the case of BFT processing vessels the species is only one and of a size that allows it to be easily counted. Furthermore, the critical fishing operation where video footage must be analysed (i.e. lifting of tuna on board) is limited in time.

It is estimated that the analysis of the video footage for this type of vessel would be relatively fast and simple. The vessel will receive fish coming from the farm or trap every certain time<sup>5</sup>; sensor data will identify these events and the analysis software would automatically indicate the video footage associated with these moments. Analysers will only have to count the number of individuals for these particular events.

For the analysis of sensors data and video footage, protocols can be established setting risk indicators, the minimum activity to be reviewed and which events can trigger the mandatory viewing of the footage. The analysis of the data based on risk analysis would imply that the control authorities where the processing vessel is operating should make available to the company in charge of auditing the data, certain information such as periods in which authorization has been given to do harvesting or quantities reported by the processing vessel.

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<sup>5</sup> Although operations obviously depend on the capacity of the auxiliary vessels, on the size of the tuna harvested and on the freezing capacity of the processing vessel, the processing vessels may be working with 2-3 auxiliary vessels that would make 2-3 trips per day. On average, a processing vessel would receive 40 tons of BFT per day, which could involve the transfer of 200 individuals. These individuals are transferred aboard the processing vessel in lifts of between 2-8 individuals, depending of its size, yielding up to 50 transfer operations.

## 5. IMPLEMENTATION, ROLES AND RESPONSIBILITIES

Experience gained during the last 10 years of trials using REM systems advises that the REM system should be the property of the vessel owner. This experience demonstrated that the ownership of the systems has an effect on instances of tampering and therefore plays an important role in the effectiveness of the system.

Although during the pilot the system will only be in a testing phase, the roles and responsibilities of the different actors during a potential implementation of the system could be as follows.

The master of the vessel should be obliged to ensure the system is running in accordance with the rules of operations. This includes the maintenance of the equipment and the replacement of components that had ceased to function, whether at sea or in port, to ensure the system to be operational again. Other responsibilities of the master would include the routine cleaning of cameras, ensure that the sensors and cameras collect information in accordance with the VMP, that the sensor information is transmitted in real time, send or deliver storage devices or adequate responses to mechanical or technical failure of the REM system, including immediately inform the authorities of such failures.

The flag CPC competent authorities will be responsible for ensuring that the REM system is installed on board in accordance with the specifications of the vessel monitoring plan and will ensure that REM system is operational before a vessel departs port, and that the system is kept functioning at all times according with the specifications. The flag CPC competent authorities will also ensure that they receive the data from the REM system, the monitoring of activities that may take place in international waters, that the alerts issued by the system are followed up and will take all necessary measures to follow up on any irregularities detected or reported by the authorities where the vessel operates, including taking the appropriate enforcement measures.

The competent authorities of the CPC where fishing activities are taking place shall ensure that before the vessel leaves its waters, they have the sensor and video footage data related to the activity taking place in its waters. The authorities will also be responsible for analysing this information, crosscheck this information with the information reported by the master and immediately reporting to the flag authorities of the processing vessel any irregularities or non-compliance detected.

The pilot project phase would be considered as a testing period that would not trigger enforcement measures. If the system were to be implemented, the information collected by the REM systems must constitute a valid evidence, accepted by both the CPC flag authorities and the authorities of the CPC where fishing activities are taking place.

The potential role of the ICCAT Commission, subsidiary bodies or its Secretariat or other ad hoc structure created for the purpose of the pilot project within their respective mandates, should be established. This role may include the coordination, monitoring and supervising of the implementation of the REM pilot project, agree and review the minimum standards to support implementation of the REM, or assess the results of the REM pilot project<sup>6</sup>.

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<sup>6</sup> This task could be entrusted to another organization, body or company with sufficient guarantee of its independence and technical capacity.

## 6. ACCOMPANYING MEASURES

Additional measures that would help complement the role of the REM system and make the control of processing vessels more effective are:

- *Prior notification* to the authorities where the processing vessel intends to operate, allowing proper planning of possible control activities.
- *Harvesting/processing authorisation* and a landing authorisation from the CPC authorities where the vessel is going to operate.

This authorisation will be subject to the correct functioning of the REM system and will include the times when the vessel is authorised to carry out the operations. This will allow the authorities to detect through the information from the sensors, if the vessel may have been operating outside these authorised periods. Other information on whether the vessel contains, on arrival in the area of operation, BFT from another CPC and supporting documents would assist in the decision and planning a possible inspection.

- *Daily electronic communication*, to the flag authorities and authorities where the vessel is operating, of the quantities processed (live weight and processed weight).

Communications in electronic specified format are considered suitable and necessary for vessels of this size. Reports in electronic format facilitate the mandatory crosschecking<sup>7</sup> of such significant amounts of fish, with data from the REM system, but also with other relevant documents, such as eBCD.

- *Copy of all eBCDs* (sections 2, 3, 4 and 6) related to the BFT processed/maintained on board the processing vessel.

The master of the processing vessel, must be aware of and responsible for the legitimate origin of the quantities the vessel receives. As part of a traceability system it is desirable that documents justifying the origin of the fish are kept on board as basic documentation required in case of an inspection.

- *Separate stowage* by farm or trap of origin.

The separation can be done by means of nets or canvas and will allow, in case of inspection at sea and at landing, to verify the traceability of the tuna declared in the different eBCDs and other documents as processing logbook and stowage plan.

- *Registration in the eBCD*, of the quantities processed and kept on board by the processing vessel.

It is not clear how processing vessels are required to record in the eBCD the quantities of BFT they receive.

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<sup>7</sup> In accordance with paragraph 76, Recommendation 19-04.



## 7. COST OF THE REM SYSTEM

There are **no known past experiences** of the implementation of this technology in this type of vessels, which is why the estimates are based on information from REM systems implemented on board catching fishing vessels and is also why a significant amount of money has been allocated to the item of unforeseen costs.

The costs related to the REM system can be divided into costs of acquisition, installation costs, maintenance costs, including potential updates of hardware/software, data exchange costs and fees and resources for control and monitoring purposes.

In addition, the costs related to the management of the project should be added to this, including video reviewing, data analysis and reporting and project management, if it is considered that an external or independent entity should take over these tasks. However, the video reviewing and reporting could be taken over by the control authorities of the CPC where the vessel operates, which could analyse the video footage according to agreed benchmarks and report using predefined templates, thus eliminating the cost of this phase. This approach would have the added value that it would enable the authorities to test the system first hand and assess its advantages and disadvantages directly.

The price for a *REM equipment* varies depending on the provider. For a typical system consisting of a control box, 4 cameras, 4 sensors and 1-year software license the price of the system is €6,800- €8,000. The cost of a REM system software license is between € 250 - € 500 annually.

The *installation costs* of the REM system on board varies depending how complicated the installation and especially the cabling is. For a medium size vessel (18 - >40 m), the price varies between € 2,500 and € 3,500, but for a larger vessel such as processing vessels, the cost could be around €5000.

*Maintenance cost* of a REM system is very dependent on the activity of a vessel and on the conditions in which it is operating, which in the case of processing vessels are considered favourable conditions. An estimate is €700 annually. If the system is of good quality, the maintenance costs may be lower.

The costs of the *analysis software* (licenses), for a single user is around €2,700 per year and for unlimited number of users around €20,000 per year.

The table below shows some estimates of the costs for running a one-year pilot project where three *processing vessels* are participating.

ITEM DESCRIPTION	COST
<b>On vessel</b>	
REM hardware (4 camera, 4 sensors)	€21,000
Installation costs	€15,000
Annual maintenance costs	€2,000
<b>On land</b>	
Analyser software	€15,000
Drawing up VMP	€6,000
Control of installation of REM systems and VMP's	€1,500
Data transmission costs	€1,500
Data and video reviewing (200 days » 200 hours) (*)	€13,000
Data analysis and reporting (*)	€10,000
Project lead and project management ½ man year (*)	€25,000
Unforeseen cost	€90,000
<b>TOTAL</b>	<b>€200,000</b>

Costs given in this analysis for the REM systems are estimations and are based on currently known prices in the EU. The costs have been based on a pilot project for large trawlers and adapted for the case of processing vessels. The costs indicated with an (\*) could be saved if the authorities of the CPC where the vessel operates take over these phases and if ICCAT or another body can lead the project.

## ANNEX I

List of BFT processing vessels authorised by ICCAT to operate for BFT in the Eastern Atlantic and Mediterranean Sea. [The list is not exhaustive and must be completed. The list is based on processing vessels for which there has been activity in the EU in the last few years].

Name	ICCAT No	IMO	Flag	Tonnage (GT)	LOA (m)
ASTRAEA (*)	AT000PAN00234	9832523	PAN	2164	71,1
GOUTA MARU (*)	AT000JPN00653	9746827	JPN	4865	97,45
KENTA MARU	AT000JPN00660	9788772	JPN	5846	122,2
KURIKOMA (*)	AT000PAN00153	9145920	PAN	4177	105,5
LADY TUNA	AT000PAN00199	9453418	PAN	4538	113,4
PALOMA REEFER	AT000PAN00032	9309681	PAN	1267	62,6
PRINCESA GUASIMARA	AT000PAN00155	9442237	PAN	1877	72,1
REINA CRISTINA (*)	AT000PAN00154	9011301	PAN	1176	61,33
TUNA PRINCESS	AT000PAN00185	9314612	PAN	4522	113,4
TUNA QUEEN (*)	AT000PAN00145	9278612	PAN	4449	113,4

Note: vessels marked with (\*) do not act continuously as a processing vessel, but act as BFT processing vessels occasionally.