OPTIONS PAPER
FOR STRENGTHENING THE IOTC
VESSEL MONITORING SYSTEM

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Contents

Executive summary

Pontus Consulting was contracted to provide advice and options for the enhancement of the IOTC Vessel Monitoring System (VMS). The contract was funded by WWF Mozambique and directly overseen by the IOTC Secretariat with the assistance of a steering committee made up of CPC and NGO representatives. The Objective of the task was:

To provide the Commission with options for strengthening the IOTC VMS, such that the VMS provides an effective platform for the monitoring and controlling IOTC fisheries, consistent with the Commission's management regime. Specifically, in monitoring and controlling the activities of vessels authorised to operate in the IOTC Area of Competence. The establishment of a regional or Commission VMS should also be considered, taking into account the costs and benefits, the existing national VMS approaches as well as regulatory framework, technical, confidentiality and Secretariat staffing requirements.

The current IOTC VMS was assessed through analysis of a comprehensive survey that was completed by 28 CPCs. The survey provides a relatively detailed insight into the way that Resolution 15/03 has been implemented, including some areas where CPCs have introduced arrangements that are more robust than the IOTC requirements. The results of this analysis are presented in section 1.

The survey analysis provides a picture of the similarities and differences in the way that CPCs have developed their national VMS' and this is supplemented by section 2 (and Attachment 1), which is a side-by-side comparison of the VMS' amongst several RFMOs/RFBs against a number of design criteria.

The findings and outcomes from sections 1 and 2 are used to draw overall conclusions about the current IOTC VMS in section 3 and to inform the development of specific options for enhancement and the consideration of additional elements in section 4.

Lastly, specific recommendations and a broad workplan for enhancement of the VMS are set out in section 5.

Findings at a glance

- The current IOTC VMS is subject to very large variability in the way that it is implemented by CPCs. While there are some areas of consistency, there are widely different standards that apply to most aspects of the system.

- The IOTC VMS is a "completely decentralised" system in that it does not require, facilitate or even encourage any degree of routine data sharing amongst CPCs or with the IOTC Secretariat.

- Practice amongst RFMOs/RFBs also varies widely, with a general progression from "completely decentralised" to "completely centralised", and several examples in between.

- There are immediate opportunities for IOTC to enhance the VMS through greater consistency of practice and enhanced scope of the VMS that will come at little to no cost to IOTC and only marginal cost to CPCs and should be undertaken regardless of any decisions for further enhancement.

- Further enhancement will need to include moving towards a "partially centralised" system over a timeframe of a few years, noting that this will present funding challenges to the Commission.

Summary of specific recommendations/recommendations/proposals

These are extracted from the body of the report below to provide readers with a brief overview of the nature of recommendations provided, however they do need to be read in context with the full report to properly inform policy decision-making.

Recommendations that should be progressed immediately

1. IOTC should consider proposing that VMS standardisation/best practice might be a useful candidate topic for any future Kobe process (p14).

2. Attention is required to actively assist developing States that have not yet been able to meet the obligations under the VMS. IOTC may wish to consider such direct support for implementation of obligations in the design of any ABNJ follow-on project (p24).

3. IOTC should implement immediate changes to Resolution 15/03 to foster greater consistency and strength in the current VMS (p27-29 and Attachment 2).

4. IOTC should consider an enhanced scope for the VMS by including additional vessel types (non-fishing vessels such as bunkers and support vessels) and some types of vessels smaller than 24m (p29-30 and Attachment 2).

Recommendations for adoption of an enhance VMS model

5. IOTC should agree on a specific Objective for the VMS to guide further policy decisions and investments (p26).

6. **IOTC should agree to move towards a partially centralised system over the next few years (p26).**

7. IOTC should form an intersessional working group in 2019 to develop specific rules for the sharing, protection and use of IOTC VMS data (p30-31).

8. IOTC should consider strengthening manual reporting arrangements by:

   a. reducing the allowable timeframe for manual reporting (currently 1 month); and

   b. developing IT solutions so that manual reports are provided in a consistent format that can be automatically uploaded and displayed alongside normal VMS reports on the common operating picture (p28-29).

9. In 2019 IOTC should agree to a 5% increase in financial contributions starting in 2020 to build necessary capacity, systems and infrastructure to manage a partially centralised system, noting that greater increases will be needed in subsequent years (p34-35).

10. IOTC should implement a two-stage process to test the market for a software solution provider, allowing time to develop a more comprehensive budget and increase contributions to meet that cost (p32 and 35).

11. IOTC should form an intersessional working group in 2020 to consider options for cost recovery of some elements of the VMS (p34-35).

1. Analysis of CPC survey

1.1 Introduction and broad summary

The information provided in this section analyses the CPC responses that were received to a survey developed and distributed well before this consultancy began. The responses provided a high level of detail and general insight and this has been used extensively in the development of options and construction of a proposed way forward. However, the information provided below comes with two caveats:

- This section simply reports on the information that was provided. There are a few instances where the information provided is not consistent with other information or advice obtained throughout the review, and no attempt is made to correct or interpret that here (although it is commented on in latter sections); and

- This is a general data summary of key aspects of the responses, more detailed examination, including of individual responses, was used in the consideration of options and recommendations.

The striking conclusion from the survey is that IOTC CPCs have established national VMS' with a relatively high degree of vessel coverage and reasonable consistency in many of the basic elements. Resolution 2015/03 and its predecessors have driven this development and set a basic framework upon which an enhanced VMS can be built upon.

Having said that, the basic framework is surrounded by a very high degree of variation and individualism (at least in as far as the responses can show) that create uncertainties and weaknesses. Examples of this include coverage of different vessel types and sizes, different reporting rates, different standards for non-reporting and failure, and unspecified and inconsistent data sharing. This is not a criticism of any CPC, nor of the current Resolution, but it does send a strong message that there is significant strengthening that could be achieved. This strengthening would be of substantial benefit to CPCs individually and collectively in progressing their fisheries objectives.

1.2 General information

Survey responses were provided by 28 CPCs. Members of the Commission (Commission Contracting Parties) that did not respond include Eritrea, Guinea, Pakistan, Philippines, Sierra Leone, Somalia, Tanzania, and Yemen. Three Cooperating Non-Contracting Parties did respond, three responses were received from EU flag States (France, Spain, and UK), and a response was also received from Taiwan.

The responding CPCs indicated membership of 19 other FAO recognised RFBs or RFMOs, the most common being WCPFC (8 CPCs), CCAMLR and ICCAT (7 CPCs each). Only one country is currently considering membership of an additional RFMO.
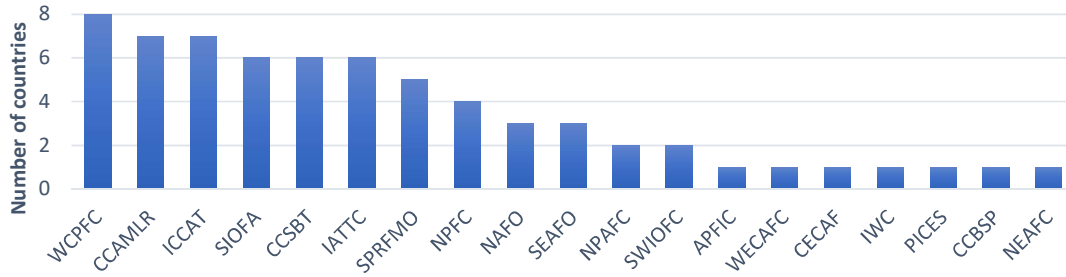
Figure 1 – Respondents membership of other RFB/RFMOs

Seven CPCs replied that they only belong to one RMFO, that being IOTC, 7 CPCs belong to 2 RFMOs, while 10 CPCs were members of between 3 and 18 different RFB/RFMOs.
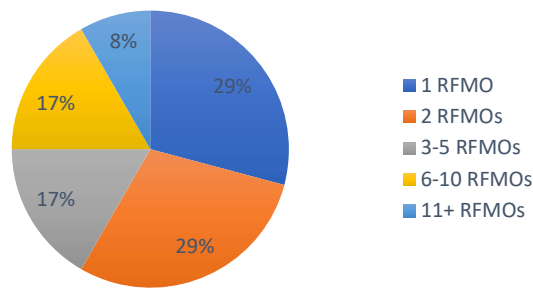
Figure 2 – Number of other RFB/RFMOs of which responding CPCs are members

Of the CPCs that provided a survey response, 24 had operational VMS's in place in 2018, 3 did not (India, Sudan, UK(OT)), and 1 had an operational VMS in the past (2015-2017) but it was not currently operational (Bangladesh).
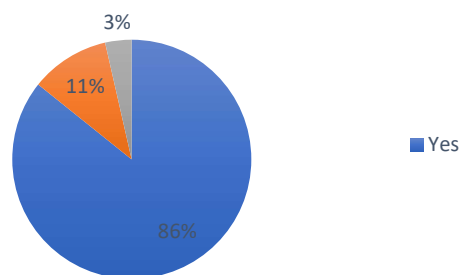
Figure 3 – Proportion of responding CPCs with an operational VMS in 2018

The first operational VMS among responding IOTC CPCs was put in place by Australia in 1991. Six operational systems were in place by 2000, 15 by 2010 and 24 in 2017. Bangladesh had an operational system from 2015-2017 but due to contractual termination it is not currently operational, however contract renewal is currently underway. Of the three CPCs that do not have a VMS system, one country (India) has plans to establish a system (date TBD) and two do not (Sudan and UK(OT)).
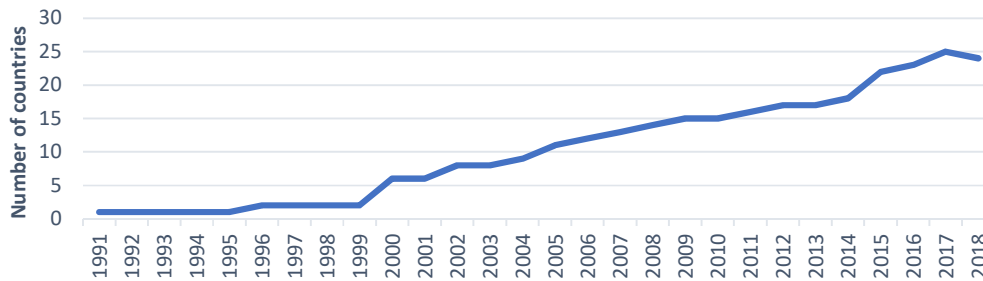
Figure 4 – Number of responding CPCs with an operational VMS over time

Nine CPCs require all vessels to use a VMS regardless of the vessels size or type, or the fishing area. The other 17 CPCs that responded varied their requirement to use the VMS on the basis of size (11 CPCs), area of fishing (7 CPCs) or type of fishing vessel (7 CPCs). The criteria for size varied with eight CPCs changing the VMS requirement based on vessel length (with the cut-off varying from 50m down to 10m), four based on hull volume, and one country using engine power as a criteria for VMS application. Most commonly the requirement to use VMS was based in national legislation (19 CPCs), followed by RFMO conservation and management measures (18 CPCs), bilateral / partnership agreement (7 CPCs) and safety requirement (4 CPCs).

1.3 Nature of the fleet covered by VMS

Responding CPCs reported a total of 11,243 flagged vessels in their tuna fishing fleets (noting that some only reported those fishing in the IOTC and some reported vessels fishing worldwide). A total of 5,278 vessels were reported as being within the VMS programs of the responding CPCs. Of those in the VMS for which a size class was provided, the most common size classes were the 24-50m class (with 29% of the 4,249 vessels for which size was provided) and the 12-15m class (28% of vessels).
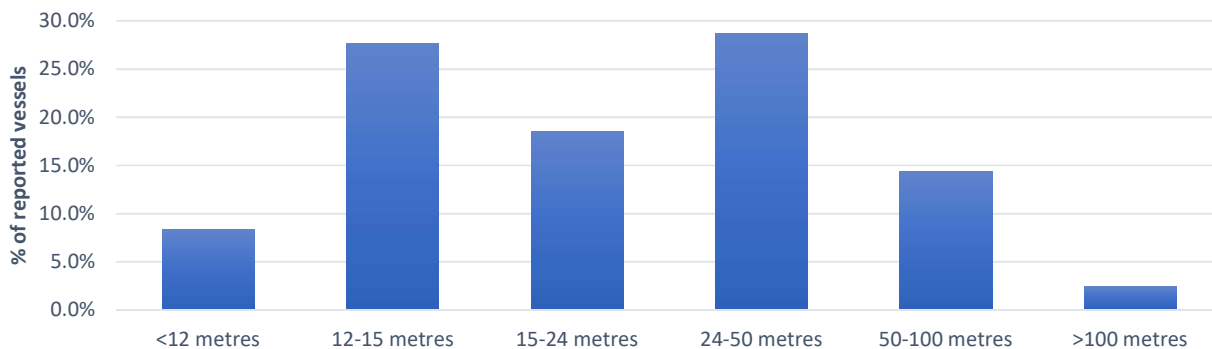

Figure 5 – Size class of vessels under a VMS program

Only 18 CPCs provided detail on the type and location of vessels in their tuna fishing fleets. The information provided by the responding CPCs showed that 91% of their tuna fishing vessels are fishing within their own EEZs, with only 8% fishing in the high seas and just over 1% fishing in the EEZs of other coastal states (see figure 6).

Within their tuna fleet, while only 2.4% of their vessels fishing in their own EEZs were under a VMS program, 99.5% of those fishing in the high seas are under a VMS program and 100% of those reported as fishing in other coastal States EEZs.

The vast majority of the tuna fishing vessels reported are gillnet fishing vessels fishing within the EEZs of India (20,257 vessels), Iran (3,225 vessels), Sri Lanka (1,174 vessels) and Oman (503 vessels). Of those vessels currently in a VMS program the most common fishing gear was frozen longline, most of which are fishing in the high seas, followed by gillnet and purse seine vessels (most of which are also fishing in the high seas) (see figure 7).
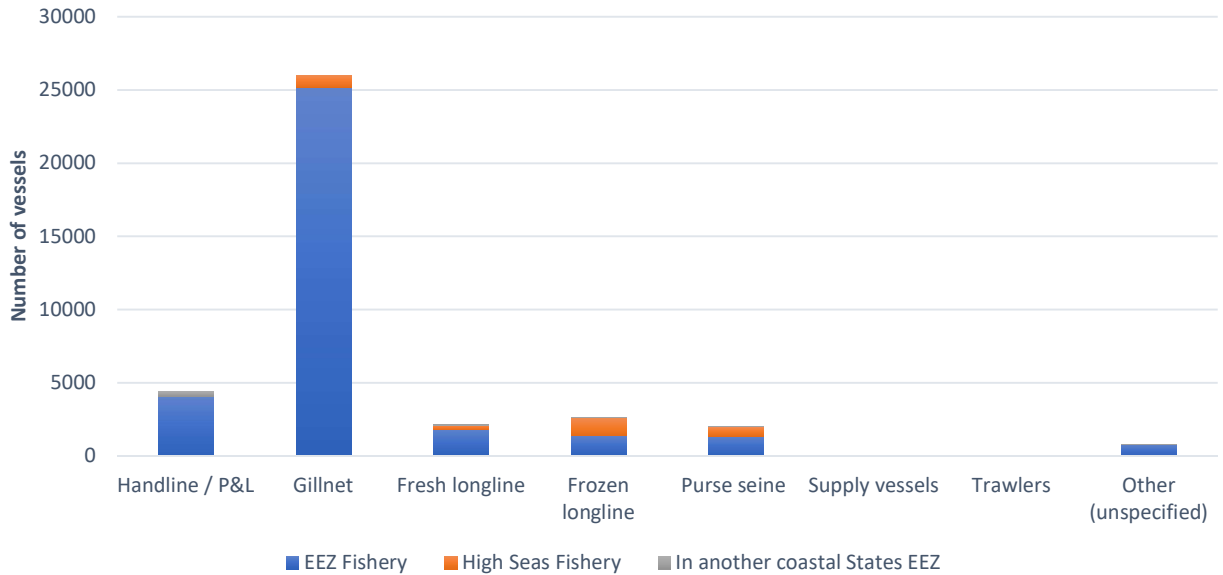
Figure 6 – Fishing gear (and location) of vessels (noting that this question was not completed comprehensively by some CPCs)
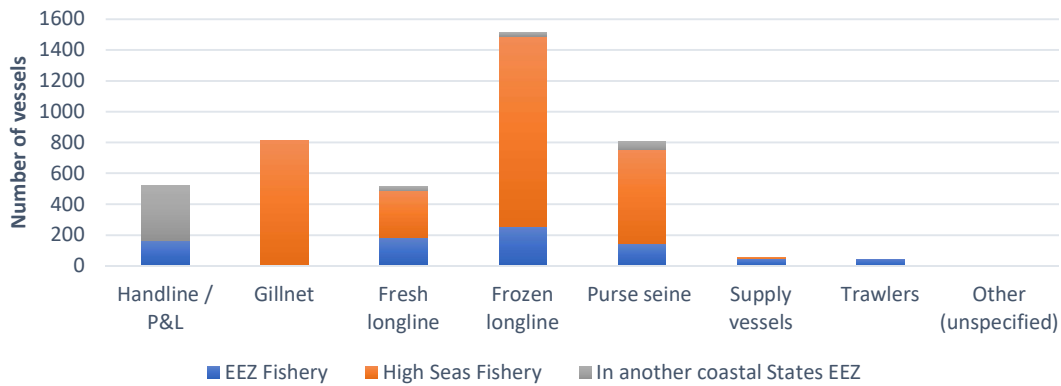
Figure 7 – Fishing gear (and location) of vessels in a VMS program

Of the vessels reported, 100% of supply vessels and trawlers were under VMS, although this only represented a total of 52 and 41 vessels respectively and it is unclear whether the trawlers reported catch IOTC species. The frozen longline sector (representing 2,640 vessels) has the next highest level of VMS coverage, with over 57% of reported vessels part of a VMS program. Only 3% of the largest fishing sector, gillnet, is covered by VMS.
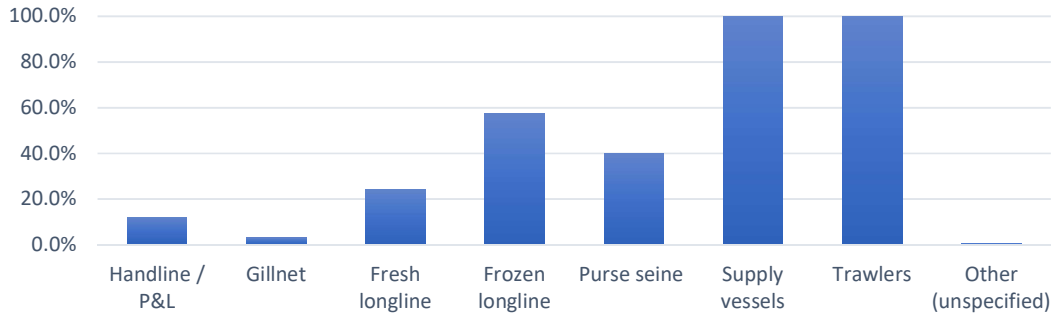
Figure 8 – Proportion of each vessel type that is operating within a VMS program

Of the 28 CPCs that responded, 19 indicated that they have vessels that operate outside of their EEZ. Unsurprisingly the most common area for operation was the Indian Ocean with 14 CPCs indicating that they fish outside of their EEZ in the Indian ocean (four of which identified fishing in the western IO (FAO area 51) only, while three identified fishing in both the western and eastern IO (FAO area 51 and 57)). Of those fishing in other areas, six CPCs responded that they have vessels fishing in the Atlantic, 5 in the Pacific, two in other EEZs, and one has vessels operating "worldwide".

1.4 Configuration of VMS systems

In regards to the type of VMS system that responding CPCs have in place, of the 25 CPCs that have (or have had) VMS systems, 19 have standalone systems, and nine have shared systems. Some responding CPCs have both a shared system and a standalone system in place, for example a standalone system for fishing vessels within their EEZ and a shared system for those outside their EEZs. Of the nine shared systems, four are shared through a private company, and the other five involve sharing with other CPCs or entities (e.g. other Government bodies such as Coast Guard of Navy). Three CPCs indicated that they share their VMS with IOC.

CPCs on average use three satellite systems for their VMS, with one country indicating that they use 21 different satellite systems. The most commonly used satellite system is Inmarsat C which is used by 19 CPCs, followed by Argos and Iridium which are both used by 14 CPCs. The most common communication method used from Land Earth Stations to the VMS is Https, which is utilized by 17 CPCs, while the next most common was email (eight CPCs). Fifteen CPCs utilize terrestrial communication systems including cellular systems (used by 80% of respondents), VHF/UHF (60%) and MF/HF (40%).

* Note that 1 CPC responded that they use 16 "other" systems but did not identify whether IsatDataPro, Thuraya, or Vlink Kannad systems were included in those "other" 16.

Figure 9 – Number of responding CPCs using different satellite systems

All of the responding CPCs with VMS systems reported that they are configured for automatic procedures, including the following:

- Warning if a vessel is not reporting according to the prescribed schedule (23 CPCs)

- Warning if a vessel enters a prohibited area/zone by comparing the area with the vessel certificates (20 CPCs)

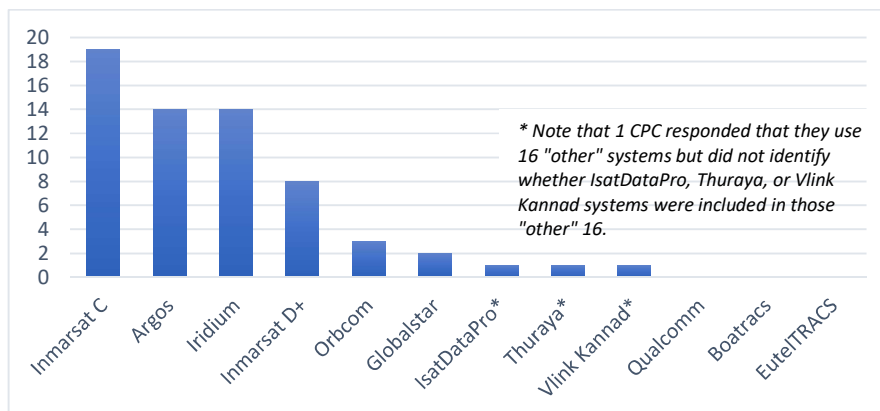- Generation of reports if a vessel crosses boundaries (19 CPCs)

- Checks the quality of the data (18 CPCs)

- Checks the validity of information for vessels outside designated harbour areas and generates a report (13 CPCs)

- Fishing licences (14 CPCs)

- Seaworthiness certificate (8 CPCs)

1.5 Reporting frequency

Twenty CPCs require all of their vessels to provide VMS reports at the same frequency. Although the frequency of those polls wasn't asked of respondents, a few CPCs provided additional information suggesting that polling frequencies varied between one hour and 4 hours. For those CPCs that have different frequencies applying to different vessels, the variation was either due to different requirements according to where they were fishing (e.g. fishing within a certain EEZ), changes in fishing activity (e.g. less reporting while at anchor), or different reporting periods depending on the satellite system being used.

Procedures for VMS breakdown or faulty systems are in place in 21 of the responding CPCs. Of those CPCs that specified, nine require manual reporting every 4 hours, four require reporting at periods greater than 4 hours, and three require reporting at periods of less than 4 hours. When a vessel's VMS system fails, CPCs had a range of different requirements for how long manual reporting is allowed, from requiring vessels to immediately return to port to fix their system through to allowing vessels to fix their system on their next return to port regardless of timing.

1.6 Catch and activity reporting

Of the responding CPCs, 11 indicated that they have an active electronic reporting system associated with their VMS, with an additional three CPCs indicating that they have some electronic reporting system capability available (including one which has an electronic Port States measures system) or under development. Ten of those electronic systems provide entry and exit reporting, and nine of them report on catch on entry and exit.

Thirteen CPCs indicated that they required catch reports, although the reporting frequency widely differs between CPCs, from hourly through to annually. Daily reporting was the most common frequency reported, with 5 CPCs indicating a daily report requirement.

Transhipment reports are required by 12 of the responding CPCs, with 10 CPCs requiring it from both the offloading and receiving vessels. Reports from the port of landing are required by 16 CPCs and observer reports are utilized by eight CPCs (with an additional country able to get observer reports "when required"). Nine CPCs also utilise surveillance data, all of which allow data exchange in both directions for all or some of the data. A few CPCs also identified other data systems including distress alarm reports.

Electronic logbooks are used in 9 CPCs, with 4 additional CPCs currently implementing pilot programs or developing electronic logbook programs at present. Six of those CPCs require all vessels to utilise electronic logbooks and 3 programs involve automatic transmission of data. Automatic reporting of position, data, time, speed, course and direction information, is in place in 16 CPCs, although many of these are not through electronic logbook systems. Automatic reporting of a range of other information and data was also reported including water temperature (8 CPCs), wind speed (6 CPCs) and water current and air temperature (5 CPCs), although again these were not all transmitted via electronic logbooks.

1.7 Data exchange

Ten CPCs indicated that they have data exchange systems in place with other IOTC States. The five CPCs comprising the IOC (COM, MDG, MUS, SYC, FR) share data, three EU states (FR, SP, UK) share data with other EU states, Sudan shares their data with a FAO research centre, and 4 states share their data with other individual states. Of the 10 CPCs that share position reports, three of them only do it on request, while the other seven CPCs share it every one or two hours (depending on the fleet and VMS type). Of the five CPCs that share entry and exit reports, one shares reports automatically and three share the catch on entry and exit. One additional country shares entry and exit reports with another State for some vessel destinations. The other information shared by CPCs includes catch reports (5 CPCs), Port of landing (3), surveillance data (3), observer reports (2) and transhipment reports (2). The format used to transmit the data varied, with no two CPCs providing the same response. In terms of the communication protocol used in the data exchange systems, three CPCs advised that they use Https, and two CPCs use email. The reports are transmitted directly to the VMS/FMC by four CPCs, and four CPCs transmit reports directly to a third party.

Twelve CPCs have in place data exchange systems with RFMOs. These CPCs share their data with 13 different RFMOs, the most common being IOTC (8 CPCs), ICCAT (5 CPCs) and CCAMLR (5 CPCs). Seven CPCs share position reports with RFMOs, with the frequency of those reports ranging from hourly (3 CPCs) to annually (2 CPCs).

Again, the format used to transmit the data and the communication protocol used varied significantly between CPCs, sometimes dependent on the RFMO that data was being exchanged with. Responses on the type of information exchanged with RFMOs were limited, but suggested that CPCs share position reports (7 CPCs), entry and exit reports (6), catch reports (6), transhipment reports (5), port entry reports (5), port of landing reports (5), observer reports (5) and surveillance data (3).
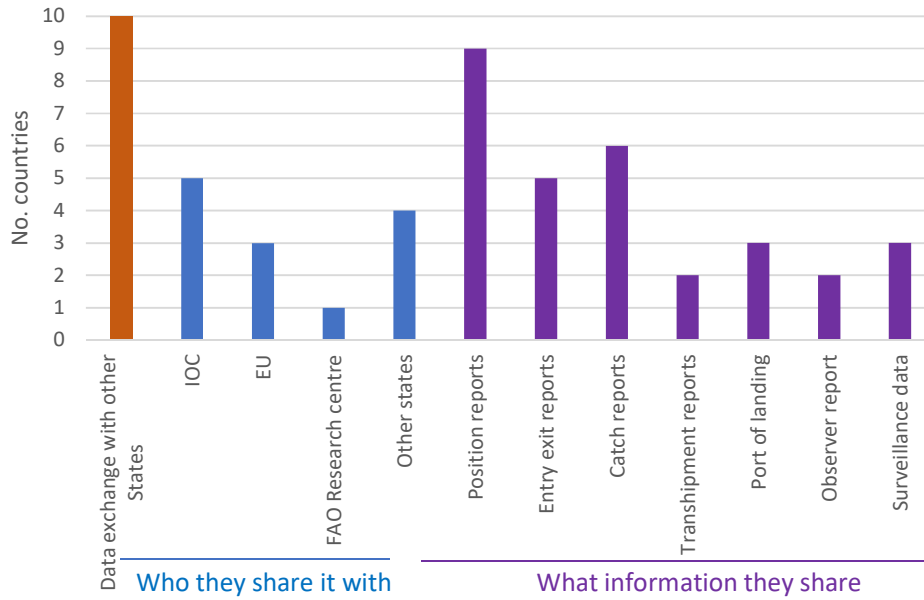
Figure 10 – Data exchange with other States: The number of CPCs that exchange data with other States, who they share it with and what information they share
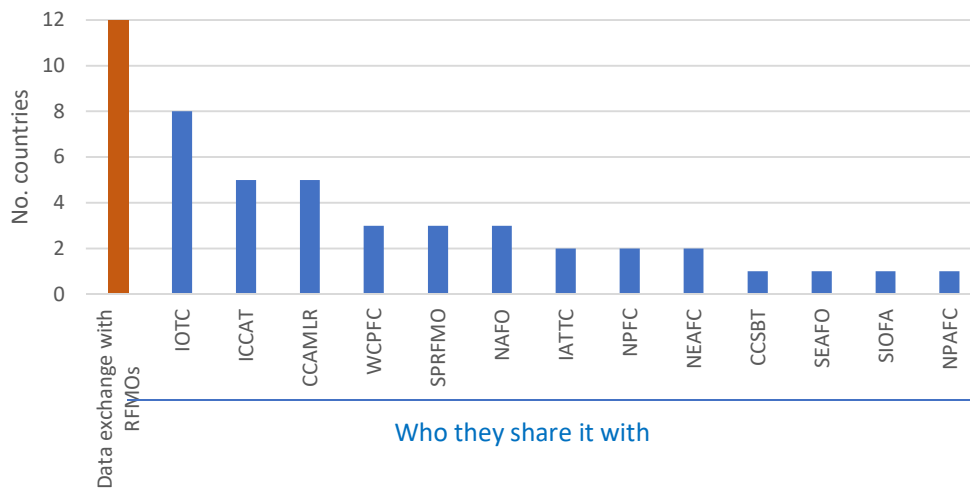
Figure 11 – Data exchange with RFMOs: The number of CPCs that exchange data with RFMOs and who they share it with.

1.8 Onboard requirements for VMS equipment

Regulation of the approved type of VMS equipment were reported in 20 CPCs, however the regulated specifications varied between CPCs with only one country (Australia) recording requirements for all of the specifications listed in the survey. The most regulated specifications re tamper proofing (17 CPCs) and requiring a capacity for power on/off reporting (16 CPCs), while only 3 CPCs required inbuilt navigation systems and five CPCs require VMS units to have the ability to send catch and activity reports.

Procedures for installation and functionality testing of VMS equipment are in place in 19 CPCs, and commissioning procedures are in place in 16 CPCs. The frequency of testing equipment varies across CPCs, with the most frequent being those CPCs that continuously monitor the function of equipment as they report, while other CPCs only test equipment on installation.
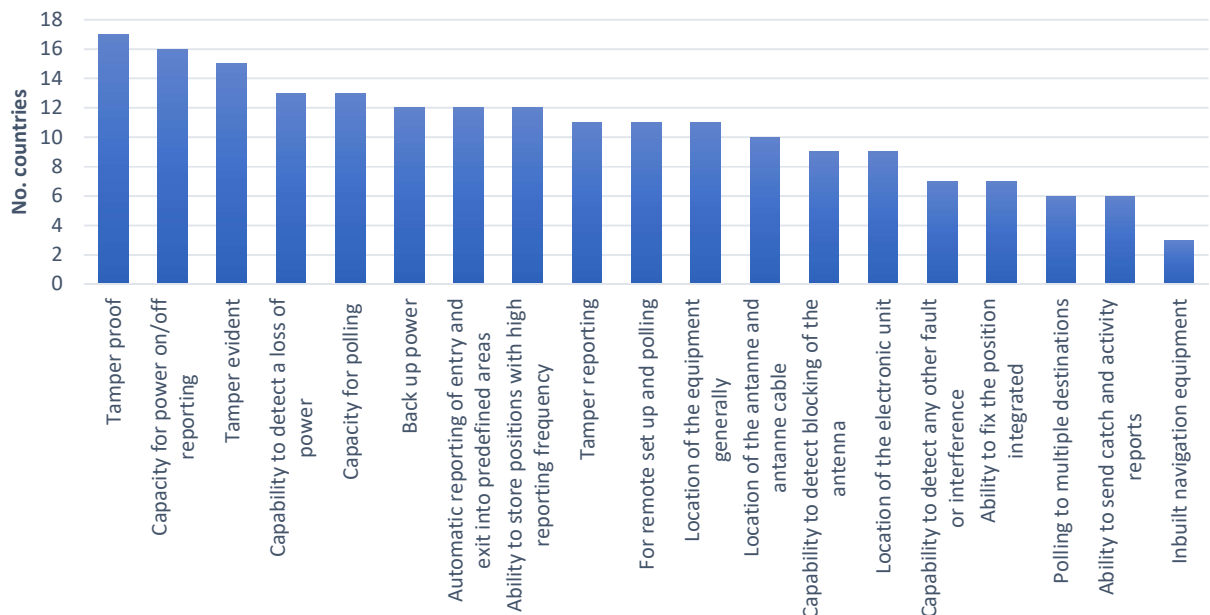
Figure 12 – The number of CPCs that regulate different onboard requirements for VMS equipment

1.9 FMC information

The FMC in 13 of the responding CPCs is manned 24 hours a day. Of those that are not open 24 hours, the opening times were all different and the number of hours open varied from 6-10 hours (with shorter hours on weekends in some cases), with most open for either 8 or 9 hours. The number of people staffing the FMCs ranged between 1 and 12, with over 75% of responding CPCs advising they have 1-3 staff on each shift. The total number of VMS FMC staff varied widely from one (in Mauritius) to 84 (in Thailand), with the most common response being around 3-5 staff. The qualifications of FMC staff covered a significant range across and within CPCs, from high school graduates, to basic in-house training and certificates, through to post graduate qualifications and PhDs.

Information on the total cost of running the FMC was provided by 12 CPCs, with the highest cost being around USD 3 million for year. The lowest cost reported was $37,000 for an FMC with a staff of 3, manning the centre for a 6 hour day. Four CPCs FMCs cost around USD 500,000 a year and five other responding CPCs ran their programs for USD 59,000 – 200,000. Information on how that budget was split across the different costs was limited, but suggested that the greatest cost is the hardware – representing almost 45% of the costs reported. Staff, software and VMS reports also represented a significant cost (each representing between 10-20% of the reported costs), while training, overheads and other communications only represented a very small fraction of what was reported.

The responses made it clear though that the cost of running FMCs differs significantly between CPCs, with the cost of some being absorbed by, or shared with, other government agencies and functions. Some CPCs also reported recovering some costs from industry payments, for example by imposing fees for VMS reports and installation of hardware on vessels.

1.10   Regulation and use of VMS data

Regulations/legislation or policies govern how the data is used in 14 CPCs, who has access to the data in 12 CPCs, and the storage of data in 11 CPCs. Of the seven CPCs that outlined their rules and policies governing data use, three indicated that they use regulatory instruments (e.g. legislation, regulation or ordinances), two CPCs use agreements between government agencies and two have policies in place that allow the use of the data for search and rescue purposes only.

In regards to data rules, 21 CPCs reported having general rules for the security and confidentiality of data. Specific rules were in place in:

- 23 CPCs for use of VMS data,

- 22 CPCs for communication security, access to the VMS FMC, and access to the system,

- 21 CPCs for data security, access to information and storage of VMS data, and

- 18 CPCs had specific rules for security procedures.

Over half of the responding CPCs do not have in place specified timeframes for which they must and/or can store data. For those that do have explicit timeframes, the time for which they are required to store data ranges from one day up to 10 years, with the most common response being either three or five years (three CPCs each). In terms of how long they "can" store data for, for those CPCs where there are specified timeframes they are diverse, ranging from three months up to 99 years, with again the most common response being 3-5 years (six CPCs).

All CPCs that have (or have had) a VMS system reported using it for compliance monitoring of vessels. The other uses varied across CPCs, as per the table below:

Table 1 – Use of VMS data

Use	No. CPCs using it for this purpose
Compliance monitoring of the vessel	25
Management	23
VMS positions	22
Compliance risk assessment	21
Broader maritime security purposes	20
Safety (search and rescue)	18
Science	15
Catch and activity reports	15
Environmental monitoring	10
Vessel security (in the context of the Ship Security Alert System)	9
Immigration and customs	6

Of the 18 CPCs using the data for search and rescue purposes, 11 have a direct link with the Search and Rescue Coordination Centre.

Surveillance/inspection platforms are provided with position data in 20 CPCs and catch and activity reports in 16 CPCs, with reports and warnings automatically generated in 10 CPCs. VMS data is complemented by other data sources in all CPCs with a system except three. The most common complementary data source used by CPCs is national vessel and licence registries (18 and 17 CPCs respectively), international and RFMO vessel registries (14 CPCs) and aerial or surface patrols, RFMO licence registries, and AIS (13 CPCs each).

VMS data has been used as evidence in legal proceedings by 15 CPCs. Seven CPCs have used VMS as the sole evidence and it has lead to a conviction in all of these CPCs. VMS data has been used as supplementary evidence in 15 CPCs, and it has contributed to a conviction in all but one of those CPCs. Of those CPCs who provided information on the number of times VMS has been used in court, 1 reported using it greater than 100 times, while others reported using it only twice. Of those CPCs it had been used in successful prosecutions 100% of the time in 6 CPCs and around 50% of the time in two CPCs.

2. Brief assessment of other RFMOs/RFBs

Attachment 1 presents a brief assessment of the Resolutions/Recommendations, Measures that describe the VMS' currently being implemented in a number of RFMOs/RFBs. This analysis is based mainly on a review of the documentation. A follow-up survey was sent to several RFMOs but there was limited response.

As with the CPC survey, the table in Attachment 1 indicates a very high degree of variation amongst RFMOs. It is interesting to note that there is a relatively high degree of overlap in the membership of many of the RFMOs assessed (as supported by figure 11 above). The fact that VMS' have evolved quite differently despite that common membership is an indication of the strong need to tailor MCS programs generally and VMS specifically to the needs of the region.

As a general conclusion, Attachment 1 shows a range of VMS set-ups from complete decentralisation (essentially a collection of national VMS') in some, to complete centralisation (a single centrally administered VMS) in others, with several at various stages in between.

There is a general degree of consistency in many of the VMS requirements, such as reporting rates and broad actions on unit failure, tamper-proofing etc, but even here there are differences that create inconsistent environments for CPCs and vessels that participate in multiple RFMOs. **While beyond the scope of this study, IOTC should consider proposing that VMS standardisation/best practice might be a useful candidate topic for any future Kobe process.**

The range of issues (differences and similarities) identified in Attachment 1 directly inform the identification of options in section 4 below.

3. Conclusions about the existing IOTC VMS

The IOTC VMS under Resolution 2015/03 is best described as "completely decentralised". CPCs monitor their own vessels and have sole access to the data. Standards, specifications and procedures are very broad to cater for the different national set-ups, with only general guidance provided on issues such as MTU capability and actions (vessel and FMC) on unit failure.

The Resolution does not require, nor even encourage flag States to share the data with any other stakeholder, and while several CPCs indicate that they share data with other CPCs and/or the Secretariat, very little evidence was found to support this, other than amongst the IOC countries.

The survey responses also show that while there is broad commonality in approach amongst CPCs, as guided by the Resolution, there are also substantial differences. This could perhaps be rectified through minor amendments to the Resolution to provide greater guidance (transforming it to a "guided decentralised" system). However, given that some differences exist in areas that are already covered by guidance under the Resolution, only limited benefits would be expected from greater guidance or specificity. The IOTC VMS is therefore weakened both by its design and by incomplete implementation, and this needs to be accounted for in designing an enhanced system.

Attachment 1 shows that there are several RFMO/RFBs that have implemented VMS' that address some or all of these issues in a more comprehensive way than Resolution 2015/03.

The progression of national VMS' shown in Figure 4 indicates that the series of IOTC Resolutions have been useful in encouraging increased monitoring by flag States, and it is likely that this has contributed substantially to the management of IOTC stocks. However, at the RFMO level, the lack of data sharing, consistency and transparency all represent significant weaknesses. The current VMS is not able to contribute to wider MCS programs, does not facilitate coastal State monitoring and does not provide data for science.

Under the current set-up, costs are completely borne by flag States, and there is little to no expense incurred by the Secretariat. However, the potential benefits of this as a low-cost option are substantially outweighed by the missed opportunities for a VMS that enhances compliance, science and management in the region. Satellite

As such, the conclusion is that the IOTC VMS has likely driven improvements in flag State monitoring, but is not strong as an RFMO-wide management or MCS tool.

4. Potential options for strengthening the IOTC VMS

4.1 Brief introduction to available options

The technical proposal stated that four options would be selected for detailed review and comparison as anything larger would introduce too much variability to be useful for consensus decision-making. This section briefly describes the identified options for enhancement. The next section provides detailed analysis and evaluation.

1. **Cooperative decentralised** – Similar in construct to a completely decentralised system, but with *requirements* for the flag State to share information with others in specific circumstances. For example, to share with:

   - coastal States when vessels are located in their EEZ;

   - port States when undertaking inspections; or

   - the Commission Secretariat for specific purposes (such as monitoring any time/area closures and science).

   Costs completely borne by flag State, but perhaps with minor costs to Secretariat to handle/use the data. ICCAT is an example of a cooperative decentralised system.

2. **Shared decentralised** – as per 1, but with *automatic* sharing of data from the CPC's FMC to the Commission Secretariat and specific rules in place for how and when other CPCs can access it and what they can use it for. Costs of monitoring vessels, data transmissions etc borne by flag State, Commission will incur costs for receiving, storing and disseminating data to be funded through Commission budget, noting that this would be relatively minor and could be achieved in a number of ways. NAFO is an example of a shared decentralised system.

3. **Partially centralised** – similar to 2, but with data to be sent *directly* to the Commission Secretariat by the VMS satellite service providers contracted by each CPC (not through the CPCs' FMCs). This involves a greater degree of prescription on the operative elements of the VMS than earlier options – for example, being a centralised system means that the data received needs to be consistent, necessitating more formal type approval of MTUs (as opposed to general guidance on capability). Cost structure similar to 2. WCPFC is an example of a partially centralised system – data for vessels covered by the FFA VMS is passed directly from the Mobile Communications Service Provider (MCSP) to the Secretariat without going through FFA[1].

4. **Completely centralised** – The RFMO has complete autonomy over the system including direct administration of registration procedures, direct receipt of data from its own service providers and centralised control over data access, actions on failure etc (under rules agreed by the Commission). Costs completely borne by the Commission (although flag States may continue to incur costs if they choose to also maintain a national VMS). FFA is an example of a completely centralised system.

Figure 13 below shows a simplistic comparison of the four options and the *status quo*.

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[1] The WCPFC system is actually a hybrid of both 3 and 4:
- partially centralised for vessels that are authorised to fish in FFA EEZs; and
- completely centralised for vessels only authorised to fish in WCPO high seas.

Status quo – Completely decentralised
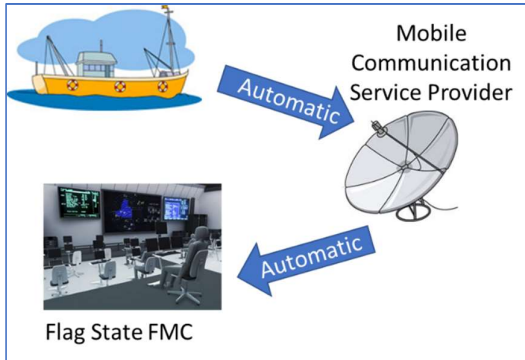
Option 1 – Cooperative decentralised
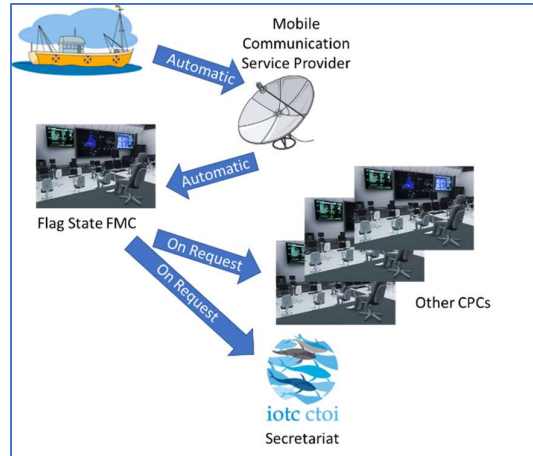
Option 2 – Shared decentralised
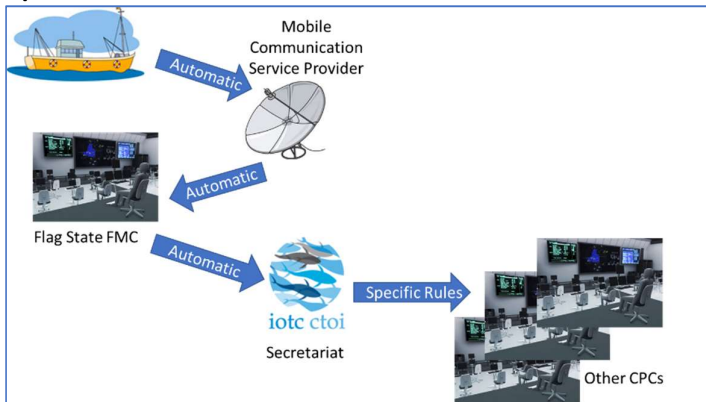
Option 3 – Partially centralised
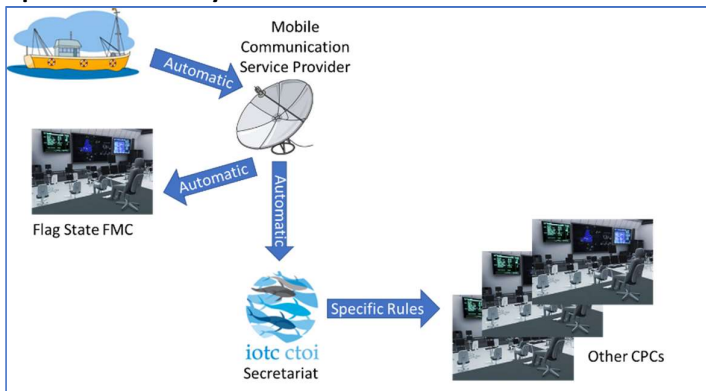
Option 4 – Completely centralised
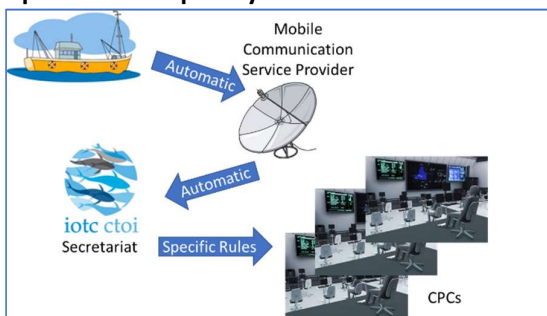
Figure 13 - Options

4.2 More detailed assessment of four potential options for IOTC

This section examines each potential option in greater detail. The criteria used below show the trade-offs that will be required for any enhancement of the *status quo* – with the most obvious being the costs associated with each.

It is useful to note that the options (at this level) all have similar questions of scope, data sharing and access and ancillary riles that would need to be answered. Some of these are answered by the nature of the option itself, while others will need to be determined regardless of which option is chosen; these are addressed in the next section (recommended actions).

Table 2 – Assessment of options

Option/Criteria	1. Cooperative decentralised	2. Shared decentralised	3. Partially centralised	4. Completely centralised
Consistency with national law	Difficult elsewhere →			Proven possible
	In other RFMOs many CPCs have claimed that requirements for them to provide nationally collected information to RFMOs is inconsistent with their national privacy laws. While these claims have been questioned, they have undoubtedly led to delays (in some case ongoing) in data provision and incomplete sharing.		CPCs that have experienced difficulty with sharing their nationally collected information have been able to participate in centralised data collection in other RFMOs.	
Transparency	Least →			Greatest
	Even though this option would still be a substantial improvement over the *status quo*, it still relies solely on flag State monitoring, with requirements for specific decision making on the part of the FMC on who to share data with and when. It also relies on other CPCs submitting requests.	Having all data automatically provided from the FMC to the Secretariat increases the likelihood that it will be accessed by relevant CPCs as and when appropriate, without potentially complex bilateral application and decision making. There would likely be a need for the Secretariat to have some form of audit capacity to assess the way that the FMC receives and transmits the data.	The major progression from option 2 is that data is sent immediately from the satellite service provider to the Secretariat rather than via a CPC FMC. This contributes to greater transparency in that the data is received and therefore available to other stakeholders in "near real-time", and without any CPC having the opportunity to review, filter, aggregate or delay it. It therefore places all CPCs on a more level playing field in terms of access to data (subject to specified rules).	Having a centralised VMS represents the greatest degree of transparency in that it is a program overseen by the Commission as a whole and administered by the Secretariat on behalf of all CPCs.

Option/Criteria	1. Cooperative decentralised	2. Shared decentralised	3. Partially centralised	4. Completely centralised
	Least			Greatest
Effectiveness in promoting vessel compliance (how easy is it for CPCs to use to monitor their own flag vessels, EEZs, vessels using their ports)	This is related to transparency and access to data. For *most* flag CPCs, this option is no different to the *status quo* – they already implement VMS and use it as they see fit. For coastal and port CPCs wanting to access information about vessels fishing in their waters or using their ports, this is a slight improvement over the *status quo*, but the improvements are relatively minor because of the issues of request permission, decision making and timeliness raised above, which make this option far weaker than others that would facilitate routine access.	The submission of all information from the FMC to the Secretariat promotes greater access to VMS data by non-flag CPCs (according to agreed rules) and therefore increases the likelihood of that data being used to promote vessel compliance. The issue of timeliness is an important consideration here though. For maximum effectiveness, VMS information must be available to the stakeholder in as near real-time as possible. This is particularly important during MCS operations (either direct actions such as at sea/aerial patrols, or routine action such as reviewing vessel activity as part of port inspections/CDS). This option poses greater risks than options 3 and 4 that data will not be available quickly enough or at the level of detail required to facilitate fully effective use.	This option substantially addresses the issue of timeliness of data. While there will always be delays in the transmission of information from vessels to the Secretariat via the satellite provider, options 3 and 4 both minimise this delay and result in data being available to relevant stakeholders as quickly as possible. The main weakness in terms of effective use of the data is that it would likely require a greater degree of manipulation by the Secretariat to produce a single, consistent database. The CPC survey showed large variation in the specifics of each CPCs current VMS, and it would take time and resources for the Secretariat to receive all of these outputs and collate them in a way that a single feed could be provided to relevant CPCs. This is also (even more so) a weakness of options 1 and 2.	A completely centralised system addresses the issues of both timeliness and consistency of data. Timeliness is maximised by the fact that the Secretariat is the "first receiver" of the information and, with the correct set-up, this can then be automatically made available to relevant CPCs. Consistency is also best addressed in this option because the Commission as a whole would determine standards for the data provided to the system, requiring little to no manipulation or collation before it can be made available. It is also worth noting that the current flag-based system has some obvious gaps in terms of flag CPCs that do not have the ability or capacity to run a standalone VMS. A centralised system would facilitate coverage of these fleets.
Usefulness for other MCS programs (CDS, PSM etc)	The analysis of usefulness largely correlates with those for effectiveness above. Using VMS information as part of other specific MCS programs or activities is enhanced through options that provide greater information that is automatically available to relevant CPCs and that is available in a consistent format in as near real-time as possible (ie – options 3 and 4).			

Option/Criteria	1. Cooperative decentralised	2. Shared decentralised	3. Partially centralised	4. Completely centralised
	Less ➡			More
Usefulness for science	There is potential that VMS data could be provided by each CPC to contribute to scientific work, but given past and current difficulties with sharing national fine scale data, this seems unlikely.		Centralised systems have a greater potential to contribute to the science because the data would more likely be considered as "owned" by the Commission and therefore able to be used for Commission purposes. This includes being able to use the data for routine data management and checking purposes such as the dis-aggregation of catch and effort information provided by flag CPCs under the current data rules.	
Costs - CPCs	Unlikely to change	Sharing of all data from FMCs to the Secretariat would need to happen according to a pre-agreed framework of data transmission standards (see Secretariat infrastructure costs below). Individual CPCs would need to acquire the capacity to comply with these standards. Depending on the software platform in use by the CPC, that could be significant.	Unlikely to change with the exception that those CPCs yet to establish a VMS may be able to do so at slightly lower cost (see 4.4.1 and 5.2.2)	Unlikely to change, although flag CPCs would have the option of removing their national VMS and only using the IOTC VMS, thereby lowering the costs borne directly by the CPC.
	Lowest ⬅			Highest
Costs – Secretariat staff	Unlikely to change as this would simply represent an additional defined data set that the Secretariat would use for limited and clearly specified purposes. The Secretariat would not be involved in sharing of data between CPCs.	There would need to be some form of audit process to assure all CPCs that data passed on from the FMC was not being filtered, delayed or altered contrary to agreed rules. Given the number of CPCs and the magnitude of the data, these costs would not be insignificant in terms of additional staff and travel costs.	Additional staffing would be required. Substantial information would be transferred to the Secretariat, who would then have specific responsibilities to collate the information, store and protect it, but facilitate CPC access according to Commission rules. Additional staffing is likely to be required in both VMS (operational management) and IT (system and database design).	As per option 3, additional staffing would be required. The additional staffing would be far more substantial under option 4 as the Secretariat would be responsible for a range of tasks currently undertaken by CPCs, such as type approvals, responding to unit failure, direct receipt of manual reports and routine report monitoring.

Option/Criteria	1. Cooperative decentralised	2. Shared decentralised	3. Partially centralised	4. Completely centralised
Costs – Secretariat running			Running costs come in two forms: • Reporting costs – MCSPs will charge to provide position reports to the Secretariat • System provision – while it would be possible for IOTC to develop a stand-alone VMS operating system, that is unlikely to be cost-effective. Commercially available solutions are well developed and have become far more affordable over time.	Costs would be similar to those in option 3, but reporting costs would be substantially higher. As explained below (section 5.6.4), MCSPs generally charge a primary recipient a higher charge than a secondary recipient. Reporting costs under option 4 could be as high as double those under option 3.
	Lowest ⟵			Highest
Costs – Secretariat infrastructure	Minimal additional IT infrastructure would be required as this would simply represent an additional database for internal usage by Secretariat staff. The amount of data and the lack of need to deal with it in real-time further reduce the need for dedicated hardware.	Infrastructure costs would be similar to option 1, although the magnitude of data would be greater. While not necessarily an "infrastructure" cost, it is worth noting that requirements for FMCs to pass data to the Secretariat and for the Secretariat to pass it back to CPCs relies on agreeing formal data standards. This is not a simple, quick or cheap process and would require at least one year of intersessional work followed by lengthy period for CPCs to adjust their national systems.	Additional infrastructure required is potentially significant because of the magnitude of data being received and transmitted. This infrastructure would be in the form of hardware (additional servers and back up facilities) and software to facilitate receipt of the data and to disseminate it according to a potentially complex set of agreed rules.	

4.3 Considerations in determining a way forward

As mentioned above, the options above do not answer all of the policy questions that IOTC needs to consider in determining how best to set up an enhanced VMS. The following also need to be considered.

4.3.1 Objectives of the VMS

Broadly speaking it is simple to determine that the objective of an RFMO VMS is to provide accurate and independent information on the location and activity of fishing vessels. However, it is also important to ask why that information is needed or useful. A more specific statement of Objectives would be useful to guide consideration of the options above. For example, a VMS set up to ensure flag States are meeting their obligations will be run far differently than one that is set up to assist coastal States to ensure that their EEZs are free from incursions. Both of these are important, as are other considerations.

An objective for the IOTC should be developed that recognises the role that accurate real-time VMS data plays in MCS (including through integration with other MCS programs), fisheries cooperation and supporting robust management frameworks, and links these benefits to achievement of IOTC and CPC fisheries objectives.

4.3.2 Scope of the VMS

The matrix in Attachment 2 shows that RFMO VMS' in existence have quite different scopes in terms of the vessels that they apply to and the areas that they cover. The current spatial scope of the IOTC VMS is comprehensive in that elements of the VMS apply right throughout the IOTC area, while the vessel scope is slightly more limited in that vessels less than 24m only need to be covered if they fish outside of their EEZ. This potentially excludes a large number of fishing vessels.

Consideration also needs to be given to the extent of coverage for non-fishing vessels (carriers, bunkers, tenders and support vessels).

Decisions on spatial and vessel scope should be based primarily on the objective of the VMS and the risks that certain vessels/areas pose to the achievement of that objective.

4.3.3 Data sharing

All four viable options above include avenues for greater sharing of VMS data between CPCs, although as noted options 1 and 2 are far more restrictive and less efficient than 3 and 4. However, the specific arrangements for who data is shared with, on what basis and for what purpose still need to be worked through.

Attachment 2 shows that RFMOs approach this differently. Again, the sharing of data should be driven by the Objectives of the VMS as a whole.

4.3.4 Funding

There is no doubt that options 3 and 4 will come at greater cost to the Commission than the existing VMS or the *status quo*. Responses from other RFMOs on cost breakdown were not comprehensive enough to provide definitive estimates, but indicative costs for the recommended way forward are provided below.

The Commission will need to determine how those additional funds are sourced, and while it is beyond the TOR for this study to make recommendations on funding, there are three general options available for consideration:

- Simple increase in the Commission budget – meaning that CPCs contribute to the additional cost in the same proportion that they contribute to the current budget. There is an element of fairness in this option in that the contribution formula is long standing.

- A greater proportion of the additional funds to be sourced from flag CPCs, perhaps based on the number of their flagged vessels to be covered by the scheme. Under this scenario it would be necessary to recognise that all CPCs stand to benefit from the VMS and therefore need to contribute. The degree to which non-flag CPCs benefit will depend on the option chosen because they each have different implications for access to the information.

- The Commission could seek some form of cost recovery from vessels. VMS is now considered routine monitoring for a fishery and is subject to cost recovery in many national jurisdictions as well as some multi-lateral groups.

4.4 Broader issues related to implementing an enhanced VMS

4.4.1 CPCs without a VMS

The first is the fact that some CPCs have not yet implemented the national VMS framework that option 4 would be built upon. While the survey indicates this is a small number of CPCs, the number of vessels that could be excluded if they do not come on board could be significant. This issue can be partially addressed in the selection of a preferred option in that options 4 and 3 may come at less cost to individual CPCs than options 1 and 2. As explained below (section 5.2.2), for those CPCs that have not yet implemented a national VMS program, option 3 provides a lower cost avenue to implement their obligations than developing a fully-fledged stand-alone VMS.

However, the issue of supporting developing States, particularly developing coastal States, to implement IOTC Resolutions is a broader issue that cannot be addressed through VMS design alone. Acknowledging that Resolution 15/03 contains some provisions for delayed implementation where there is a capacity gap, priority should be given to identifying programs to actively assist developing States that have not yet been able to meet the obligations under the VMS. While beyond the scope of this consultancy, IOTC may wish to consider such direct support for implementation of obligations in the design of any ABNJ follow-on project, noting that this would be very well aligned with the purpose of the Global Environment Facility.

4.4.2 Boundary/jurisdiction disputes

Monitoring the activity of vessels, and sharing that data amongst stakeholders relies on some level of agreement as to where maritime boundaries lie. This is very often contentious as there are a relatively substantial number of boundaries that are not yet formally settled under international law. These range from boundaries that simply have not been through the necessary process, to minor boundary disagreements subject to further negotiation to larger scale jurisdictional disputes. All of these cases exist in the IOTC area.

Simple cases of unfinished work or minor boundary disputes can be fairly easily dealt with through seeking agreement of "provisional lines" or even by reflecting both sets of coordinates where they exist. This is done routinely and there are publicly available data sets that show finalised and provisional/approximate lines.

More fundamental territorial disputes are far harder to address as they involve broader questions of sovereignty and sovereign rights and therefore have great impact not only on data collection, but on sharing and provision and on wider law enforcement processes. These are issues that cannot be solved in the context of an IOTC VMS, but relevant CPCs should be strongly urged to cooperate so that these bilateral issues do not prevent the agreement of an enhanced VMS.

There are several ways that this could occur, such as through bilateral agreement as to how the VMS will be managed without prejudice to wider discussions on the areas in question, or through delayed implementation. It is worth noting that when the WCPFC centralised VMS was agreed to in 2007, it excluded the area north of 20N and west of 175E, that being an area of substantial dispute and conflict between several countries, some of whom were, and others who were not, WCPFC members. The VMS did not become active in that area until 2013, following agreement amongst the effected members.

4.4.3 Supplementing VMS

Global experience using data such as Automatic Identification System (AIS) information to contribute to vessel tracking is growing. A fairly high number of larger fishing and carrier vessels in the IOTC are required to carry AIS, and that data could be obtained from the market if IOTC so chose. Securing AIS data can be valuable, particularly to supplement VMS data and to act as a redundancy, such as in the even of MTU failure. It does have drawbacks, primarily:

- Depending on the arrangement that can be negotiated, fine scale AIS data over a very large area has the potential to be expensive;

- AIS transponders are far more easily manipulated or simply powered off than MTUs;

- Not all fishing vessels are required to carry AIS transponders; and

- Some flag States, including some IOTC CPCs have been strongly opposed to using AIS information as part of fisheries MCS on the basis that it might encourage vessel masters to turn off the transponder, thereby creating safety concerns.

IOTC should consider whether AIS represents a viable data supplementation tool, but due to the issues raised above, no specific recommendations are made in this report.

5. Recommended Approach

Section 2 concludes that the current IOTC VMS as driven by Resolution 15/03 is quite weak compared to many other RFMOs in that it is completely decentralised, without any inducement or even encouragement for the sharing of data from the flag CPC to the Secretariat or to other CPCs.

Section 3 demonstrates potential weaknesses, or at least missed opportunities that arise from the vastly different means of implementation by different CPCs (different standards, states of implementation and service providers).

Section 4 lays out a suite of potential end-state options for an enhanced IOTC VMS and a series of additional considerations surrounding each.

This section focusses on the specific steps that are required to move towards one of those enhanced options. Table 2 shows that the major trade-off that IOTC needs to consider is between effectiveness and transparency on one side and cost on the other. As a well-established RFMO, and given that many CPCs are already in arrears, it is considered unlikely that CPCs will be in a position to make an instant transition to one of the high cost models, and this difficulty is probably exacerbated by the fact that the "start-up costs" are high. This section therefore proposes a multi-year approach to enhancing the VMS. This gradual approach will help to mitigate a rapid and large increase in cost, as well as ensuring that CPCs and the Secretariat have the necessary rules, capacity and infrastructure in place before additional data is collected.

5.1 Objective

At this time there is no particular stated objective for the IOTC VMS, and as discussed above, this is critical to informing the eventual design of a more robust system. The following objectives are recommended for an enhanced IOTC VMS, and these objectives drive further recommendations below:

The IOTC Vessel Monitoring System shall be developed as a secure; web-based; near real-time; user-friendly; system that will be operated to:

1. Assist flag CPCs to discharge their duties and obligations to ensure compliance by their vessels with flag and coastal State laws and with IOTC Resolutions;

2. Support CPCs' efforts to closely monitor, control and manage IOTC fisheries with a particular focus on assisting flag, coastal and port CPCs to prevent, detecting and deterring IUU fishing;

3. Facilitate greater cooperation between all CPCs by providing accurate, near real-time data in support of integrated IOTC Monitoring, Control and Surveillance programs and activities; and

4. To provide critical data to support decision making by CPCs and IOTC.

These objectives cannot be achieved by the current IOTC VMS as they necessitate a high degree of data sharing that does not exist at this time and could not be easily achieved without fundamental change in practice and policy.

5.2 Eventual end-state to achieve Objective

The recommended eventual end-state to achieve these objectives is option 3 – "partially centralised", which maintains the responsibility on flag CPCs to ensure that their vessels carry MTUs, but ensures that the data is passed directly from MCSPs to the IOTC Secretariat. This option remains focussed on flag States as the primary recipients of the data, in keeping with their obligations under international law to monitor and ensure compliance by their vessels. However, it also provides the most robust avenue for ensuring that that complete and timely data is available to relevant stakeholders[2], while regulating RFMO costs and building from the advanced state of implementation amongst most CPCs already.

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[2] As explained below (5.5), this should include avenues for flag States to monitor their own vessels, coastal States to monitor their EEZs and port States to monitor vessels seeking to use their port, as well as availability of information for science and management generally.

5.2.1   Why not option 4?

On balance, a completely centralised system meets the proposed objectives better than option 3 as it places all CPCs in control of all aspects of the program (although some specific functions would likely be ceded to the Secretariat). If there were no IOTC VMS framework in place at all, then option 4 would be the recommended end-state, however option 3 is more likely to be preferable in terms of consistency with the current CPC-centric approach and the need to regulate cost increases, given that the cost of airtime alone under option 4 would be almost twice as expensive as the estimate below for option 3.

5.2.2   Why not option 2?

Option 2 potentially meets the objectives proposed above, but does so at greater risk for a few reasons:

- At this time, there is little to no established practice of flag CPCs sharing detailed fine scale catch and effort information with the IOTC Secretariat or with other CPCs, including coastal States in whose EEZs their vessels fish;

- It relies on a high degree of trust between CPCs that the data passed from one to another will be unaltered and treated in the way that it should. With no degree of centralisation, there is little opportunity to determine if this is the case, or to institute solutions if it is not. This is not to imply that CPCs should not have reasonable faith in each other that data will be managed appropriately under any option, but the time, effort and money that many RFMOs (and many non-fisheries multilateral bodies) invest in compliance schemes and the IUU listing process is evidence that trust alone is insufficient to base such an important MCS scheme upon; and

- One of the only ways to determine if expectations are being met for full data disclosure from flag CPCs and full data protection amongst recipient CPCs would be a comprehensive audit capacity within the Secretariat. The costs of such capacity would likely be equal to, or perhaps even higher than the airtime costs under option 3.

As raised in section 4.4.1 above, there are also some CPCs that have yet to introduce the national VMS that would be required to make option 2 effective. While action is still required from those CPCs under option 3, it can be achieved with less capacity and expense. This is because the CPC would only have to implement the legislative requirement for vessels to carry MTUs, and enter into contracts with MCSPs to provide the data direct to the IOTC Secretariat. This option therefore does not rely on the CPC acquiring a software solution, developing the necessary ICT infrastructure and capacity and running a complete FMC.

Lastly, option 2 relies on CPCs sharing raw VMS data, which intron necessitates IOTC agreement on a range of data standards. While data standards would be useful to facilitate more broad data sharing within IOTC, this is a significant body of work that is not required under option 3 as commercial software providers already have long experience and proven capacity receiving multiple data formats from MCSPs.

5.3 Improving consistency in CPC VMS'

The survey results in section 1 show that there is a very high diversity amongst CPCs as to how they implement the current Resolution. In particular, figure 12 demonstrates large differences in some aspects that are critical to ensuring a consistent and robust MCS that can contribute to MCS and management.

Improvements to these issues can be made relatively quickly and at little cost to IOTC and minimal cost to CPCs, and these should be progressed regardless of any decisions made by IOTC about further enhancement or centralisation. Consistency is particularly important for the following:

- Tamper-proof and tamper-evident MTUs – Paragraph 8 of the Resolution creates the requirement for MTUs to be tamper proof and tamper evident. These provisions are broadly consistent with other RFMOs and generally adequate. It is worth noting though that the CPC survey showed that many CPCs also place additional requirements on their vessels, and these would strengthen the IOTC VMS. Figure 12 shows that the vast majority of respondents require that MTUs be capable of reporting power on/off and about half require the ability to detect and report if the antenna is blocked.

- Frequency of reporting – The Resolution (para 7) specifies that reporting must occur at least every 4 hours, although there were some survey respondents that indicated periods longer than that. 4 hours is consistent with many other RFMOs, although some have hourly (and even half hourly in some periods) reporting by purse seine vessels. IOTC should consider polling rates according to the activity of the vessel type and the ability to detect anomalous behaviour. For example, 4 hourly reporting has been considered adequate to monitor the fishing activities of longliners, which can take up to 12 hours to complete a set/haul. Purse seiners have a much shorter operation time and it is generally considered that a shorter interval is required to adequately detect setting behaviour. Similarly, reporting rates for carriers and bunkers and the vessels that tranship to, or provision from them should be based on the length of the interactions so that activities such as transhipment cannot occur undetected.

- Ability to poll – If the IOTC VMS is going to form a part of wider MCS programs, it is important that the MTUs being used do not only report location data on a regular basis, but can also be remotely polled under certain circumstances, such as where a vessel is fishing close to a closed area, or is detected in the proximity of another vessel. However, it should be noted that remotely polling vessels is costly, and implementing this requirement may require some CPCs to use different MTUs. Both of the examples above could be adequately managed through more regular standard reporting rates, so if that is implemented, this this particular requirement could be considered a lower priority.

- Ability to report to multiple destinations – The ability of the MTU, and the MCSP, to provide copies of raw position data to multiple locations is a critical aspect for the proposed end-state. Some survey respondents indicated that this is already in place and most of the MCSPs indicated in the survey respondents are capable of this, but it needs to be put in place as a rule as soon as possible so that any MTUs/MCSPs not capable of this functionality can be phased out before the "go live" date.

- Geofencing – A certain degree of automation is desirable for VMS to adequately contribute to MCS programs and to achieve the objectives above. Once data sharing rules are in place, it will be important for the VMS to have inbuilt notifications, such as entry and exit notifications in each EEZ, and perhaps proximity alerts to designated ports.

- Responding to MTU failure – Resolution 15/03 already has some detail about the obligations on vessel owners/masters if the MTU fails to report, both in terms of the timeframes to rectify the reporting issue and the manual reporting requirements in the meantime. However, despite this guidance, the survey revealed quite different practices amongst CPCs. Once data is shared more freely and VMS becomes more of a mainstream tool for fisheries management, monitoring and enforcement, it becomes far more important that non-reporting is dealt with in a consistent manner. In addition to clarifying and implementing consistent practice amongst CPCs, there are two areas of concern with manual reporting that IOTC should keep under continual review:

- o VMS is fishery independent data whereas manual reports are fishery dependent; and

- o Manual reports are generally far less usable than VMS data.

These weaknesses are partially addressed by the existing provision in Resolution 15/03 for a flag State investigation for any vessel that has more than two failures per year. IOTC should also consider strengthening manual reporting arrangements by:

- o Reducing the allowable timeframe for manual reporting (currently 1 month); and

- o Developing IT solutions so that manual reports are provided in a consistent format that can be automatically uploaded and displayed alongside normal VMS reports on the common operating picture.

Suggested amendments to Resolution 2015/03 are provided for consideration in Attachment 2.

5.4 Enhancing the scope of the VMS

The current IOTC VMS applies to all vessels that fish outside their own EEZ and to vessels greater than 24m that only fish domestically, and this is consistent with the vessels that need to be included on the Record of Vessels Authorised to Fish in the IOTC Area of Competence (Resolution 2015/04). There is some justification for excluding purely domestic vessels as the relevant flag, coastal and port State is the same CPC. However, there are two important factors to consider:

- this does assume that domestic vessels do not pose any risk of incursion into neighbouring EEZs; and

- IOTC has a very large number of registered vessels that fall into this category.

The justification for excluding vessels less than 24m has traditionally been based on concerns about the physical and electrical ability for these smaller vessels to carry MTUs. There are many large fleets of artisanal and subsistence vessels fishing for IOTC species that certainly would not be able to carry the necessary equipment, but the blunt 24m rule is quite weak as it excludes vessels that do have capacity to travel long distances and potentially engage in IUU fishing, whether that is in the form of incursions to EEZs that it is not authorised to fish in or other activities such as transhipment outside of IOTC rules. New technology, such as more reliable solar generation have allowed many fisheries around the world, including domestic and distant water fleets of many IOTC CPCs, to have MTUs installed on vessels far smaller than 24m. Figure 5 shows that CPCs are already applying VMS to a very large number of vessels far smaller than 24m. In fact, 54.5% of vessels reported as being covered were less than 24m.

Taking Resolution 15/03 and Resolution 18/06 in combination, it is clear that the VMS applies to fishing vessels and to carrier vessels, but it is less clear whether VMS also applies to other types of vessels that operate in support of fishing. It is important that these vessels be included in the VMS as they contribute to the overall fishery IUU risk, engage in activities directly relevant to ongoing management of IOTC stocks and effectively increase effective fishing effort.

The scope of the IOTC VMS should be amended to cover:

- All vessels[3] greater than 24m;

- All vessels[1] operating outside of the flag CPC's EEZ; and

- All domestic only[4] longline, purse seine, pole and line, carrier and bunker vessels greater than 15m.

The change to 15m for the key types of commercial vessel is relatively arbitrary (although it is commonly used to differentiate between artisanal and industrial fisheries) and will no doubt be the subject of intense debate within the Commission. While a different threshold may be decided, it is vital that CPCs acknowledge that these vessels, particularly at sizes near to 24m do pose IUU risks to the IOTC and therefore do need to be included in the MCS programs of the Commission. Linking back to the objective, it is also worth noting that many of these vessels do contribute product to industrial canneries and processing facilities, meaning they would need to be accounted for any program such as an IOTC Catch Documentation Scheme.

Suggested amendments to Resolution 2015/03 are provided for consideration in Attachment 2, and as with the recommendations above about consistency, these should be progressed immediately regardless of wider decisions/options before IOTC.

5.5 Facilitating data sharing

One of the primary weaknesses with the current IOTC VMS is the complete absence of data sharing provisions in the Resolution. There are several good examples where smaller groups of CPCs have made arrangements outside of IOTC to share the VMS information that they have with each other, however these are mainly coastal State cooperative activities. Informal discussions with several IOTC coastal CPC representatives revealed no instances of flag States informing coastal States about potential incursions or illegal activities by their vessels since the VMS was first introduced in 2002.

The Objectives recommended above require a far greater degree of transparency and data access than is currently the case. While this is far more easily facilitated by the more centralised options described above, it still needs to be supported by a comprehensive set of rules about the provision, protection and dissemination of VMS data[5].

RFMOs that have been created more recently than IOTC, and particularly those that have been established since UNFSA (such as WCPFC and SPRFMO) have had the opportunity to develop such frameworks from their outset in a way that is unencumbered by any existing practice there. WCPFC has a comprehensive arrangement[6] that is forward looking in terms of its openness. The basic premises of the rules for VMS access are:

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[3] "All vessels" should be interpreted comprehensively as fishing vessels and any vessel operating in support of fishing vessels including, but not limited to carriers, bunkers and purse seine tender/supply vessels.

[4] "domestic only" refers to vessels that are only authorised to operate in the flag CPC's EEZ.

[5] Access and sharing of other data sets, such as fine scale catch and effort information will also need to be improved for IOTC to implement wider MCS programs, and while this is beyond the TOR for this report, IOTC should consider developing a single set of rules and procedures.

[6] The arrangement is spread across a few specific documents, but the main ones relevant here are:
https://www.wcpfc.int/doc/commission-09/rules-and-procedures-protection-access-and-dissemination-high-seas-non-public; and
https://www.wcpfc.int/doc/data-02/rules-and-procedures-protection-access-and-dissemination-data-compiled-commission

1. Each CCM[7] must nominate its "MCS entities" that are authorised to receive the non-public domain data (this generally includes entities such as the FMC, maritime police, coast guard etc).

2. Within each MCS entity, the CCM must also list the Authorised MCS Personnel that may request and access non-public domain data.

3. The data that an MCS Entity can obtain is based on:

    a. flag States shall have access to information relating to vessels flying their flag;

    b. coastal States shall have access to information relating to vessels fishing in their EEZ, or applying to fish in their EEZ;

    c. coastal shall also have access to information relating to vessels located with 100 nautical miles of their EEZ boundary;

    d. port States shall have access to information relating to vessels using their port, or applying to use their port; and

    e. CCMs that have an "MCS presence or capability" on the high seas shall receive information relating to specified areas of high seas where they are conducting MCS activities.

4. CCMs must store the data in accordance with the security it would have at WCPFC (there is a specific Information Security Policy[8] that includes a risk assessment framework).

5. CCMs must destroy the information within specified timeframes unless notified as being subject to an ongoing investigation.

6. There are specific penalties (loss of access to any and all non-public domain data) for breaches of the rules, as well as for non-provision of data.

7. There are reporting requirements for CCMs to describe how they have protected non-public domain data, including affirmation that the destruction provisions were complied with. The Secretariat also provides an annual report on access to non-public domain data.

The specific documents are obviously far more comprehensive than this brief summary, and a similar level of detail will be required within IOTC to find the right balance between a framework that makes the necessary data readily available to those CPCs that need it to undertake their respective functions (point 3), while also creating an environment of sufficient rigor that data providers can trust that all CPCs will use the data in good faith (points 1,2,4,5,6 and 7).

A comprehensive VMS will also add significant value to IOTC science, and specific rules and arrangements will be required for scientists to be able to access and use the data.

The WCPFC framework is already agreed and used by at least 7 IOTC CPCs and the Invited Experts, who between them represent a large proportion of the vessels that would be covered by the IOTC VMS. Therefore, while discussions on sharing sensitive data will be comprehensive, it is suggested that the WCPFC documents be used as a starting point.

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[7] Equivalent to CPCs within IOTC
[8] https://www.wcpfc.int/doc/data-03/information-security-policy

5.6 Building Secretariat capacity and budget

Under option 3, receiving, collating, storing and disseminating VMS data will be a wholly new function for the IOTC Secretariat. While experience exists in the handling of scientific data, there are key differences here in the specificity of the information, magnitude of the data and the regularity of receipt and transmission.

There are private sector actors, non-government organisations and regional agencies that IOTC could potentially outsource VMS management to. This option has not been explored at this stage on the basis that collecting and sharing data under a regional VMS will be a new undertaking for IOTC, and one that will rely on significant trust amongst CPCs and between CPCs and the Secretariat. Introducing a third party that will also need to establish the necessary trust and credentials is unlikely to be possible in the early stages.

The proposed end-state of option 3, quite significantly reduces the need for additional Secretariat staffing than would be needed under option 4 because much of the responsibility for routine checking, such as responding to vessels that do not report, will remain with the flag State. Notwithstanding, additional investment will be required in at least four areas.

5.6.1   Staffing

Handling this amount of specialised data will require a dedicated VMS officer (as opposed to several under option 4). Based on existing positions within the Secretariat, this would likely be a P3 level position, with a cost of between USD 100,000 and 130,000[9].

Additional IT capacity is also likely to be required – particularly during the start-up period where the Secretariat will need new databases, hardware and procedures. This could probably be achieved through a periodic standing consultancy at lower cost than a dedicated position, but even so, a cost of USD 100,000 per year in the initial phase is not unreasonable to expect.

5.6.2   System acquisition

As mentioned in table 2 above, it is possible for IOTC to build its own in-house system that would receive position data from the various MCSPs, display it graphically and provide the necessary tools for CPCs to access the information they are entitled to and analyse the data as required. However, given the state of advancement of commercial solutions and the level of competition amongst service providers that has driven down costs and increased customer-tailoring over the last decade, building a stand-alone system is unlikely to be cost effective. A variety of commercial products[10] are already being used by IOTC CPCs, and in fact only 1 CPC reported using in-house developed software for its VMS.

The cost of using such a service provider will depend very heavily on the complexity of the system and the permissions that are granted via the data sharing rules. High complexity will demand high "service desk" costs for the provider to create new users with unique data permissions.

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[9] This is based on the approved 2020 indicative budget for existing P3 positions
[10] Those specifically mentioned included Thuraya, Trackwell, Thorium VMS, Argos-CLS, Gost and Visma.

As an indication of potential cost, the WCPFC VMS software platform, which closely resembles option 4, costs about USD 230,000 per annum. The ICCAT VMS, which is very similar to the IOTC VMS except that it requires direct provision of data from the FMC to the Secretariat incurs an annual non-staff cost of approximately EUR 120,000 (≈USD 136,000). These are likely to be useful upper and lower cost bounds.

5.6.3   Infrastructure

Many commercial service providers include off site data storage in provision costs, but the Secretariat will still need new hardware to handle the data it receives and transmits. In both ICCAT and WCPFC this is about USD 10,000 per annum.

5.6.4   Airtime costs

The proposed end-state will require data to be transmitted directly from the MCSP to the Secretariat. While this incurs airtime costs, they are far lower than they would be in a centralised system (option 4). When an MCSP is instructed to provide data feeds to multiple recipients, they designate one recipient as the primary account holder and others as recipient agencies. The primary account holder (in this case, the CPC) pays the full fee. The recipient agency (the Secretariat) pays a lower fee and only receives a copy of the position data. As an example, in the Pacific FFA is the primary account holder in many cases, and WCPFC is the recipient. Generic information provided by FFA suggests that most MCSPs charge in the range of USD 0.01 to 0.03 per position, with recipient charges at the cheaper end of this scale[11].

It is difficult to predict total airtime costs that IOTC would incur as this relies on policy decisions on the scope of the VMS and the polling frequency. The CPC survey indicates that over 5,000 vessels are currently covered by CPC VMS, although the very large proportion (54.5%) of these are less than the current threshold of 24m. A high number (36%) are even less than the proposed revised threshold of 15m, suggesting that not all would be subject to data acquisition by IOTC. The table below provides indicative airtime costs[12] for different vessel numbers at four-hourly and two-hourly polling.

Vessels	2 hourly (USD / per annum)	4 hourly (USD / per annum)
3,000	262,800	131,400
4,000	350,800	175,400
5,000	438,000	219,000

5.6.5   Summary of indicative costs

It is impossible to provide accurate estimates of the potential cost increase because there are many fundamental policy decisions that are required that would drive the marginal cost compared to the *status quo*. However, the indicative costs above suggest that an enhanced VMS would require additional resourcing in an approximate range of USD 380,000 to USD 810,000 per annum. In absolute terms, these amounts are relatively minor compared to the size and value of the fisheries being managed and considering the number of CPCs participating in IOTC.

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[11] Greater detail cannot be released as these are commercial arrangements, but as an example, one MCSP charges FFA about $0.04 per position, whereas WCPFC, as the recipient, pays $0.015.

[12] Not that this uses $0.02 per position as an example. While these are broadly indicative of costs charged by many of the MCSPs currently used by IOTC CPCs, they do vary.

However, as a proportion of the overall IOTC budget this is quite high (≈ 8 to 18% of the indicative 2020 budget). There are three reasons why the proportional budget increase is relatively high:

- There is zero investment in VMS at present;

- The overall budget of IOTC is actually relatively low compared to some other RFMOs; and

- There are a huge number of vessels that could be included in the VMS compared to some other RFMOs (which increases air time costs).

5.7 Considering funding

An enhanced VMS that meets the objectives outlined above will undoubtedly come at additional cost to IOTC. IOTC should consider that the benefits in terms of fighting IUU fishing and the positive contribution that additional data would make to science and management outweigh this additional investment.

Of the RFMOs/RFBs directly consulted, most (and certainly all of the RFMOs) have chosen to fund their VMS through their normal budget. That is, CPCs contribute to the costs of the VMS through the general contributions formula, rather than through any special arrangement for flag CPCs etc. This is likely to be the most appropriate funding avenue for IOTC, at least in the short term.

However, this implies an increase in each CPC's contribution of anywhere between 8 and 18%, and that may well prove difficult to accept in a single increase and to sustain in the longer term. This could be partially mitigated in two ways:

- Commence contribution increases early – the section below sets out a proposed timeframe for key decisions and developments and this timeframe would suggest that the total cost increase would not be borne for several years. IOTC could proactively increase contributions early in the timeframe to cover the start-up costs (such as recruitment) and perhaps even to hold the additional funds in trust to defray ongoing costs and stage further increases

- Investigate a direct cost recovery arrangement – Vessels fishing in the EEZs of pacific island countries pay registration fees to both the FFA and the Parties to the Nauru Agreement and these registration fees are used *inter alia* to fund the centralised VMS' operated by those agencies on behalf of the countries. The huge diversity in profitability and operation of IOTC vessels would be a complicating factor, but some form of cost recovery – even if only limited to vessels fishing in high seas or other EEZs – would be an effective mitigation against contribution increases.

5.8 Key decisions, developments and timeframes

The steps outlined above are more or less presented in chronological order, although some tasks can and should be undertaken concurrently. The following provides a summary of how and when decisions and work might be progressed:

5.8.1   S23 – May 2019

1. Consider and amend the recommendations of this review.

2. Adopt a workplan based on recommendations of this review as amended.

3. Consider and endorse amendments to Resolution 15/03 to enhance consistency in CPCs' VMS, based on Attachment 2.

4. Agree to increase each CPC's financial contribution for 2020 by 5%, with that funding set aside for VMS development.

5. Consider and agree on an enhanced scope (inclusivity of additional vessel types and sizes), based on Attachment 2, but including phased-in additions if necessary.

6. Agree that each CPC will intersessionally:

   a. confirm the type and number of its vessels that will be covered under the revised scope; and

   b. obtain advice from their MCSPs as to the airtime costs that they would charge to transfer position data directly to the Secretariat.

7. Task the Secretariat to investigate the cost of various potential system providers through an EOI process; and

8. Establish an expertise-based intersessional working group to develop rules and procedures for the sharing, use and protection of VMS data.

5.8.2   S24 – May 2020

9. Consider the outcomes of tasks 6 (number of vessels and transfer costs from MCSPs) and 7 (EOI to service providers) to determine a more accurate indicative budget for long-term implementation.

10. Consider and endorse the output from task 8 (data sharing rules).

11. Agree to use the funds collected under the additional 5% 2020 budget to facilitate preparations within the Secretariat with a priority on recruiting a VMS officer (to assist in project management and all tasks), and if affordable, acquiring necessary infrastructure and IT support.

12. Agree to increased financial contributions for 2021 and beyond based on the budget developed under tasks 9 and 10.

13. Establish an expertise-based intersessional working group to develop options for cost recovery of at least some elements of the VMS.

14. Task the Secretariat to undertake a more comprehensive tender process to recommend a system provider.

5.8.3   S25 – May 2021

15. Select a system provider based on the outcomes of task 14 and recommendation of the Secretariat.

16. Agree on a subsequent work plan for "go live" of a system based on the set-up requirements of the system provider and Secretariat and necessary notification periods etc of the MCSPs.

Attachment 1 - Brief assessment of VMS in other RFMOs/RFBs

	NEAFC	IATTC	ICCAT[13]	CCSBT	IOTC	WCPFC	FFA	SPRFMO	NAFO
Implemen-ting entity	Contracting Party	Members and Cooperating non-Members.	Contracting Party, Cooperating non-Contracting Party, Entity or Fishing Entity	Members and Cooperating Non-Members	Contracting Party and Cooperating non-Contracting Party	Commission VMS, administered by the WCPFC Secretariat (operated by FFA under contract). CCMs required to ensure vessels comply.	FFA Secretariat.	Commission VMS, administered by the SPRFMO Secretariat. CCMs required to ensure vessels comply.	Contracting Party
Vessel to which it applies	All vessels >24m total length (or >20m between perpendiculars) fishing in the Regulatory Area (which does not include EEZs)	All vessels >24m length operating in the EPO and harvesting tuna or tuna-like species	All vessels >24m total length (or >20m between perpendiculars). Parties are encouraged to apply to smaller vessels.	According to requirements of the Convention area where they are fishing (IOTC, WCPFC, CCAMLR, ICCAT), IOTC in any other high seas, or req's of coastal State of any EEZ not covered.	All vessels >24m in length (encouraged for smaller) plus all vessels <24m fishing outside their EEZs for IOTC species. (Some allowance for CPCs without a VMS to have an implementation plan to cover all vessels before April 2019 at the latest)	All vessels fishing for HMS in the high seas of the Convention Area, and EEZs where the coastal State has requested inclusion in the scheme (14 Members waters are currently included in the Commission VMS).	All foreign fishing vessels applying to fish within FFA members EEZs	All vessels fishing in the high seas of the Convention area, plus a buffer of 100nm (excluding vessels flagged to adjacent coastal States fishing in their own waters). Members can request that their EEZ be included in the Commission VMS.	All vessels

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[13] Since this assessment was prepared the ICCAT VMS measure has been updates, including enhanced provisions on several key criteria

	NEAFC	IATTC	ICCAT[13]	CCSBT	IOTC	WCPFC	FFA	SPRFMO	NAFO
Data sent to	Flag State	Flag State	Flag and Coastal State	To the "relevant national and regional authorities" according to where they are fishing.	Flag State	WCPFC Secretariat	FFA Secretariat (Regional Fisheries Surveillance Centre)	SPRFMO Secretariat and the flag State (Members and CNCPs)	Flag State FMC, who must forward to NAFO within 24 hours. Flag State can authorise vessels to send data direct to NAFO.
Frequency of reporting	At least every hour, and on entry and exit from the Regulatory Area.	At least every 4 hours for LL, and 2 hours for other vessels	At least every 4 hours.	At least every 4 hours	At least every 4 hours	Default rate is every 4 hours. During FAD closure periods, purse seine vessels between 20N 20S report every 30 mins. National waters in the Commission VMS may require higher reporting rate. Entry and exit (from high seas) report / alert.	Default rate is 4 hours. Purse seine vessels report hourly, except during FAD closures where report required every 30 mins. Most LL report two-hourly	Hourly if using benthic or bentho-pelagic trawling, bottom long-line gear or potting or if operating within 20nm of an EEZ boundary. Or every 4 hours in other circumstances.	No less than once an hour, plues entry and exit
Specified system requirements									None found.
Autonomous /independent system	Yes		Yes			Yes		Yes	

	NEAFC	IATTC	ICCAT[13]	CCSBT	IOTC	WCPFC	FFA	SPRFMO	NAFO
Tamper evident / resistant		Yes		Yes	Yes No tampering or obstruction by masters allowed. If detected by CPC, must be reported to IOTC and flag State.	Yes. And "Must be protected so as to preserve the security and integrity of data", "must not be … possible for anyone other than the monitoring authority to alter … data stored in the ALC" Further detail in SSPs.	The operator shall not interfere with, tamper with, alter, damage or disable or impede the operation of the ALC/MTU.	Yes. Prohibited to destroy, damage, switch off, render inoperative or otherwise interfere with ALC without authorisation. If suspected, notification and investigation required. Minimum Standards to prevent tampering.	
Approved ALC/MTU types?						Yes	Yes		
Other system requirements	Must be able to detect bottom fishing in areas outside declared bottom fishing areas, and in closed areas.					Commission minimum standards for ALCs, including that ALCs must be capable of reporting hourly.		Minimum standards for ALCs, including ALCs must be capable of reporting every 15 mins.	
Reports:									
Vessel ID	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	NEAFC	IATTC	ICCAT[13]	CCSBT	IOTC	WCPFC	FFA	SPRFMO	NAFO
Position *(variation in accuracy req's)*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date, time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Speed, course	Yes	Yes							Yes
Catch data	Where applicable								
Transhipment data	Where applicable								
Non-operation requirements									Flag State Contracting Party must inform master/owner of vessel when device not functioning.
Repair	Repair within 1 month, or as soon as vessel enters port.	Repair within 1 month, or as soon as vessel enters port.	Repair within 1 month, or as soon as vessel enters port.	In accordance with req's of area where vessel is fishing.	Repair within 1 month, or as soon as vessel enters port.	Within 30 days or must cease fishing, stow gear and immediately return to port (provision for extension of 15 days in exceptional circumstances).		Within 60 days or must cease fishing, stow gear and immediately return to port.	Repair or replace within 1 month or next entry into port.

	NEAFC	IATTC	ICCAT[13]	CCSBT	IOTC	WCPFC	FFA	SPRFMO	NAFO
Manual reporting	Report at least every 4 hours. Info same as above.	None. Guidelines and templates for manual reporting "to be developed". Normal logsheet reporting req's apply.	Daily reports, containing same info as above.	Yes, "at a frequency that allows the fishing activity of a vessel to be identified", with info as above.	Must immediately notify of failure. CPC must advise IOTC of position of vessel within 2 days. Report at least every 4 hours. Any vessels that don't yet have VMS (under transitional implementation plan) have to manually report daily, same info + position at beginning and end of fishing operation.	Every 6 hours. Above info plus "activity". No manual reporting allowed by purse seine vessels during FAD closure periods.	Every 4 hours. Failure to provide manual reports can result in vessel being required to stow gear and immediately return to port, and removal of "good standing".	Every 4 hours. Report info as above, plus additional vessel ID info (including Vessel Masters name) and activity. All vessels manually reporting are publicised on the SPRFMO website.	Report position data every 4 hours.

	NEAFC	IATTC	ICCAT[13]	CCSBT	IOTC	WCPFC	FFA	SPRFMO	NAFO
Data sharing	NEAFC shares the VMS data with ICES twice a year		If a vessel is within a coastal State's waters, then the vessel messages are to be automatically transferred by the flag State to the Coastal State. CPC provides VMS messages from its bluefin tuna fishing vessels to ICCAT every 6 hours at least.	Each Member and CNM provide an annual report on their VMS to Commission. Provision for sharing where vessel is suspected to have operated in contravention of CCSBT CMMs.		Data goes to WCPFC Sec, and flag, coastal and port States "utilise" the Commission VMS.	Data sharing arrangements between FFA Members for all vessels on the FFA Vessel Register.	Data goes to the Sec. Members and CNCPs can request data for their own flagged vessels. Data can be used by the Scientific Committee. Provision exists to request access to data.	NAFO posts all VMS position data to the NAFO MCS Website and makes it available to all CPs with an inspection presence. Also provided to Scientific Council and other NAFO constituent bodies in summary form. Shared for search and rescue and maritime safety Requesting CPs in aggregated anonymized form for most recent 5 year period (provision for objection to such sharing).

	NEAFC	IATTC	ICCAT[13]	CCSBT	IOTC	WCPFC	FFA	SPRFMO	NAFO
Other notes				Can be switched off in port if Port State has authorised it. Agreed data Confidentiality and security provisions. FMC required to have automatic data processing and transmission capability, and backup and recovery procedures.	FMC required to have automatic data processing and transmission capability, and backup and recovery procedures. Can be turned off if in port for >1 week with approval of flag State. Provision for investigation where tampering or non-reporting suspected.	Detailed SSPs, including inspection protocol.	Foreign fishing vessels required to have ALC/MTU on and reporting automatically for period of validity of FFA Vessel registration and/or fishing licence regardless of the location of the vessel.	Security and Confidentiality Requirements.	FMC must be capable of automatic data processing and electronic data transmission, applies back-up and recovery procedures and maintains data for no less than 3 years. All costs for own VMS are responsibility of CP. Prescribed data exchange format.
CMM ref	NEAFC Scheme of Control and Enforcement	C-14-02	Res 2014-09	Resolution on the CCSBT Vessel Monitoring System (VMS)	Resolution 15/03	CMM 2014-02 (Also Standards, specifications and procedures have been adopted)	HMTCs	CMM 06-2018	Article 29, NAFO COM Doc 19-01 (combined active Conservation and Enforcement Measures).
Year last updated	2017	2014	2014	2017	2015	2014 (SSPs updated in 2016)	2016 (last time HMTCs were updated but perhaps not VMS req's?)	2018	

Attachment 2 – Proposed amendments to Resolution 2015/03

The amendments below only respond to the specific issues highlighted in sections x and y on the scope of the VMS and ways to enhance consistency in the application of VMS amongst CPCs. They do not seek to address longer term amendments that will be needed to cover other elements of the recommendations as they will need to be developed over time as policy decisions are taken by the Secretariat.

This attachment only shows paragraphs where specific changes should be considered.

Preamble [No change proposed]

1. Each Contracting Party and Cooperating Non-Contracting Party (CPC) shall adopt a satellite-based vessel monitoring system (VMS) for ~~all~~ vessels flying its flag ~~24 metres in length overall or above or in case of vessels less than 24 meters, those operating in waters outside the Economic Exclusive Zone of the Flag State fishing for species covered by the IOTC Agreement within the IOTC area of competence.~~as follows:

    a) All vessels[14] greater than 24m;
    b) All vessels[12] operating outside of the flag CPC's EEZ; and
    ~~)~~ All domestic only[15] longline, purse seine, pole and line, carrier and bunker vessels greater than 15m.

~~3.~~2.   [No change proposed]

~~4.~~3.   [No change proposed]

~~5.~~4.   The Commission may establish guidelines for the registration, implementation and operation of VMS in the IOTC area of competence with a view to standardising VMS adopted by CPCs.

~~6.~~5.   Information collected in respect of each vessel covered under paragraph 1 shall include:

    a)   the vessel identification;

    b)   the current geographical position of the vessel (longitude, latitude) with a position error which shall be less than 500 metres, at a confidence level of 99%; and

    c)   the date and time (expressed in UTC) of the fixing of the said position of the vessel.

~~7.~~6.   [No change proposed]

~~8.~~7.   Each CPC shall ensure that the information in paragraph 5 is transmitted to the FMC at least once every 4 hours for [insert vessel types where low reporting rate is acceptable] and every [X] hours for [inset vessel types where more regular reporting is required]. Each CPC shall ensure the masters of fishing vessels flying its flag ensure that the satellite tracking device(s) are at all times fully operational.

~~9.~~8.   Each CPC as a Flag State shall ensure that the vessel monitoring device(s) on board its vessels are tamper resistant, that is, are of a type and configuration that prevent the input or output of false positions, and that they are not capable of being over-ridden, whether manually, electronically or otherwise. To this end, the on-board satellite monitoring device must:

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[14] "All vessels" means fishing vessels and any vessel operating in support of fishing vessels including, but not limited to carriers, bunkers and purse seine tender/supply vessels.
[15] "domestic only" means vessels that are only authorised to operate in the flag CPC's EEZ.

a) be located within a sealed unit; and

b) be protected by official seals (or mechanisms) of a type that will indicate whether the unit has been accessed or tampered with;

c) be capable of providing specific automated reports when powered off or on; and

b)d) be capable to providing automated reports when the antenna is blocked.

9bis. In addition, each CPC as a flag State shall ensure that the vessel monitoring device(s) on board its vessels have the following capabilities:

a) Able to be programmed to provide automatic reports when the vessel enters or exits designated areas;

b) Able to be remotely prompted to provide position reports outside of regular reporting intervals [note - may be low priority if short reporting intervals are agreed]; and

a)c) Able to provide location data described in paragraph 5 directly to multiple (at least two) recipients.

10.9. The responsibilities concerning the satellite-tracking devices and requirements in case of technical failure or non-functioning of the satellite-tracking devices are established in **Annex I**.

11.10. [No change proposed]

12.11. [No change proposed]

13.12. [No change proposed]

14.13. [No change proposed]

15.14. Resolution *0615/03 On establishing a Vessel Monitoring System Programme* is superseded by this Resolution.

ANNEX I

RESPONSIBILITIES CONCERNING THE SATELLITE-TRACKING DEVICES AND REQUIREMENTS IN CASE OF TECHNICAL FAILURE OR NON-FUNCTIONING OF THE SATELLITE-TRACKING DEVICES

A) [No change proposed]

B) [No change proposed]

C) [No change proposed – although port State consent should be considered in approval to turn VMS off]

D) In the event of a technical failure or non-operation of the satellite tracking device fitted on board a fishing vessel, the device shall be repaired or replaced within one month30 days. CPCs shall ensure that the vessel returns to port before the conclusion of this period and does not commence a fishing trip until the CPCs FMC has confirmed that the satellite tracking device is functioning correctly. After this period, the master of a fishing vessel is not authorised to commence a fishing trip with a defective satellite tracking device. Furthermore, when a device stops functioning or has a technical failure during a fishing trip

~~lasting more than one month, the repair or the replacement has to take place as soon as the vessel enters a port; the fishing vessel shall not be authorised to commence a fishing trip without the satellite tracking device having been repaired or replaced.~~

E) In the event of a technical failure or non-functioning of the vessel monitoring device on board the fishing vessel, the master or the owner of the vessel, or their representative, shall communicate immediately to the FMC of the Flag State, and if the Flag State so desires also to the IOTC Secretariat, stating the time that the failure or the non-functioning was detected or notified in accordance with paragraph F of this Annex. In the event of a technical failure or non-functioning of the vessel monitoring device on board the fishing vessel, the master or the owner of the vessel, or their representative, shall also communicate to the FMC of the Flag State the information required in paragraph 5 of the Resolution every four hours, by email, facsimile, telex, telephone message or radio.

F) When the Flag State has not received for 12 hours data transmissions referred to in paragraphs 7 of the Resolution and E of this Annex, or has reasons to doubt the correctness of the data transmissions under paragraphs 7 of the Resolution and E of this Annex, it shall as soon as possible notify the master or the owner or the representative thereof, and the manual reporting provisions in paragraph E shall commence immediately. If this situation occurs more than two times within a period of one year in respect of a particular vessel, the Flag State of the vessel shall investigate the matter, including having an authorised official check the device in question, in order to establish whether the equipment has been tampered with. The outcome of this investigation shall be forwarded to the IOTC Secretariat within 30 days of its completion.

G) [No change proposed – but more real-time arrangements will be required for the provision of manual reports to the Secretariat once option 3 is implemented]