



Compliance Committee (CoC)

Report of the Working Group on Vessel Monitoring Systems (VMS) and related control systems

Marrakech, Morocco, 20–21 April 2015

(available in English only)

EXECUTIVE SUMMARY

The Working Group on Vessel Monitoring Systems (VMS) and related control systems in the GFCM area of application was held on 20–21 April 2015, in Marrakech, Morocco. The discussions in this meeting centered on the phased development of a centralized GFCM control system, building upon the standards and requirements provided for in recommendation GFCM/2009/33/7 on the establishment of VMS in the GFCM area of application.

Experts in attendance presented the most recent developments with regard to the application of VMS and the use of monitoring, control and surveillance technology. Since, according to the guidelines in resolution GFCM/2014/38/1, the GFCM has been advocating a modular approach to control which simultaneously encompasses both industrial and small-scale fishing vessels, alternatives to VMS were also discussed. Issues such as cost-effectiveness, the integration of data and the safety of the fishers at sea were examined. While progress in the development of control strategies by GFCM Members has been encouraging, work would be needed to foster a fully-encompassing approach at regional level.

In response to the Commission's request to assess the feasibility of developing a centralized GFCM control system, the ongoing pilot study overseen by the GFCM Secretariat was presented. This study had already provided important insight into how to set up such a system at the regional level. Furthermore, it was expected that this study would be continued in the future and, to this end, a roadmap was presented. Future steps in the pilot study would involve the cooperation of all relevant actors with a view to launch a fully-fledged prototype of the centralized GFCM control system. This undertaking would be mirrored by the provision of technical assistance to those GFCM Members working on improving their national control strategy. There was agreement on the need to advance with a phased development of a centralized GFCM control system; technical requirements would be defined accordingly to bring about harmonization at regional level.

OPENING, ARRANGEMENT OF THE MEETING AND ADOPTION OF THE AGENDA

1. The Working Group on VMS and related control systems in the GFCM area of application was held in Marrakech, Morocco, on 20–21 April 2015. The Working Group was attended by 22 experts from GFCM Members, non-Members, relevant organizations and entities. The list of participants is provided in Appendix B of this report.

2. Mr Taoufik El Ktiri, Director for Marine Fisheries and Aquaculture at the Ministry of Agriculture and Fisheries of Morocco, opened the meeting and welcomed participants on behalf of his country which was hosting the working group. Mr El Ktiri explained the importance that Morocco attached to the rational and sustainable management of fishery resources. Consequently, he stated that there was strong support at the national level for any initiatives aimed at strengthening controls and countering Illegal, Unreported and Unregulated (IUU) fishing activities in close cooperation with

neighbouring countries. Morocco had been an advocate for concerted action on these fronts and was eager to share knowledge and promote best practices through the GFCM. To conclude, Mr El Ktiri wished participants a successful meeting and expressed his interest in the outcomes of this working group, as well as those of the following Working Group on IUU fishing in the GFCM area of application, which was to be held back-to-back at the same venue.

3. Mr Abdellah Srour, GFCM Executive Secretary, recalled the objectives of the meeting, informed participants of relevant arrangements and introduced the agenda, which was adopted without changes and is provided in Appendix A of this report.

GENERAL OVERVIEW ON MONITORING, CONTROL AND SURVEILLANCE WITH PARTICULAR REFERENCE TO THE GFCM AREA, INCLUDING THE ROLE OF CONTROLS IN SMALL-SCALE FISHERIES

4. The GFCM Secretariat recalled all relevant actions that had been taken in relation to monitoring, control and surveillance (MCS). Firstly, an overview of international rules applicable to MCS was provided. It was emphasized that these rules were initially developed as a complement to fishery conservation and the management policies that emerged at the beginning of the 20th century. The GFCM Secretariat clarified that modern MCS developed from the concept of police of fisheries in traditional international law and that the modern traits of MSC only emerged with the adoption of the 1995 United Nations Fish Stocks Agreement. This treaty underlined the importance of regional fisheries management organizations (RFMOs) in developing MCS at the regional level. The GFCM, as well as other RFMOs, had started to adopt control schemes in the early 21st century, including the establishment of a VMS system by virtue of Recommendation GFCM/2009/33/7. This system, as decided by the Commission, was decentralized and developed in a phased manner with a view to, eventually, setting up a proper centralized GFCM control system. A set of guidelines for the phased development of this centralized system was laid out through Resolution GFCM/2014/38/1, which embodied a roadmap for the currently ongoing feasibility study.

5. Some preliminary comments were exchanged on the need for a control system at the regional level. By now, almost the entirety of the membership of the GFCM had established a fishing monitoring center and was relying on VMS as a MCS tool. The costs associated with the use of this technology had dramatically decreased over the years and this was mirrored by advancement in the technology employed. In addition to VMS, GFCM Members were also relying on other sources for the transmission of data from fishing vessels, including automatic identification system (AIS) and very high frequency radio (VHF). The problems typical of the use of VMS had, in turn, evolved and the main concern at present was the integration of data and the need to ensure a level playing field at the regional level, including through capacity building and technical assistance. Thus, there was widespread agreement on the need to endow the GFCM with a centralized system although a number of important parameters would have to be defined in due course, ranging from the need to encompass small-scale fishing vessels within the scope of the centralized system to the definition of regional data requirements.

VMS AND CONTROL SYSTEMS IN GFCM CONTRACTING PARTIES

6. Ms Sarah Cheniti, from the Ministry of Fisheries of Algeria, delivered a presentation on the current measures deployed by Algeria to undertake the monitoring of fishing vessels. A set of 12 land stations had been installed along the coast, receiving VHF signals from over 1000 fishing vessels equipped with transponders. These transponders were composed by an inbuilt global positioning system (GPS) device and a transmission component submitting the vessel unique identification number, its position, speed, catches as well as instant messages from onboard crew. The information was relayed through a TCP/IP network to the Center for Reception, Transmission, Treatment and Analysis, where automatic data checks were being performed to detect potential infringements in light of the national regulations, including those transposing GFCM recommendations. In addition, the center could remotely access the onboard devices to detect tampering attempts and, as a result, instantly acquire the last positions of the concerned vessels or apply changes to transmission settings.

However, some technical issues in the implementation of the national system were experienced, including the limited range covered by the VHF (30-50 nmi, depending on weather conditions). Accordingly, Algeria may need the assistance of the GFCM and would be in favor of a centralized GFCM control system which would complement and enhance the national one.

7. Similar technical issues were also reported by other participants who also recommended the need to identify sustainable transmission means, such as general packet radio service (GPRS), to be used at the regional level in situations where satellite connectivity was not a financially viable solution. In fact, common concerns included communication, especially with regard to cost, as well as the harmonization of data formats. The GFCM could potentially play a key role in sorting out such problems by developing regional standards for the facilitation of wide harmonization and improved communication.

8. Mr Dejan Aćimov, from the Directorate of Fisheries of the Ministry of Agriculture of the Republic of Croatia, presented the national fisheries monitoring centre (FMC) established by the Directorate of Fisheries. Information on fishing activities were being collected through 481 hybrid VMS onboard devices at variable frequency (satellite every 2 hours, GPRS every 15 minutes). Mr Aćimov pointed out that the FMC information system retained historical information regarding, in particular, vessel positions. Such data was also cross-checked against the background of the EU-compliant vessel register. Additional controls were also performed via secured web portal on the basis of e-logbook data (available for 505 vessels over 15 meters) and sales notes.

9. In the ensuing discussions, it was explained that Croatia was also planning to install VMS on all fishing vessels over 12 meters and on all trawlers and purse seiners regardless of their seize. The national authorities aimed to also implement an e-logbook, the cost of which was estimated to be approximately 400 euros per year, to be paid for by the government. They also planned to implement, if possible, user friendly cellphone applications for the fishermen. The fishermen were being trained regularly in order to ensure the correct transmission of the data which was ensured by means of GPRS near the coast and satellite in farther away areas.

10. Mr Magdi Ahmed Abd El Wahed, expert from Egypt, described the ongoing cooperation between the General Authority for the Development of Fisheries and several other national institutions, including the Ministry of Scientific Research and the National Institute of Communications, on matters relating to MCS. Egypt anticipated the installation of 750 devices on board of commercial fishing vessels operating in the Mediterranean Sea. At present, an assessment was being conducted at the national level to identify the most suitable equipment for the subset of the Egyptian fleet that would be required to install the devices.

11. It was recalled that the work underway in Egypt was also building upon a pilot study carried out in 2012 and 2013 with the support of the GFCM Secretariat. This pilot study resulted after the country sought the technical assistance of the GFCM in order to develop its own control system, including the possible establishment of a FMC. As one of the building blocks of this system Egypt was considering an existing traffic control software that had been developed to monitor the circulation of automobiles in major Egyptian cities. The pilot study carried out with the GFCM discovered that this software could not be easily adapted to MCS proper and some basic functions typical of a FMC would have to be integrated from scratch. It was hoped that Egypt, as one of the GFCM Members still devoid of an FMC, could benefit from the centralized GFCM control system and, through the provision of technical assistance by the GFCM, could therefore proceed with its national strategy.

12. Ms. Maria Oikonomou, from the Directorate General for Sustainable Fisheries of the Ministry of Reconstruction of Production, Environment and Energy of Greece, outlined the European and national legal framework regulating the implementation of VMS in Greece. Information were also provided regarding the EU funding schemes supporting the installation of VMS devices on fishing vessels longer than 15 meters, on the one side, and the installation of tracking devices on vessels having $LOA \leq 15$ m and ≥ 12 m currently in progress, on the other. Regardless of the fish stocks targeted, Ms Oikonomou emphasized that all the fishing vessels over 15 meters were fully equipped with VMS devices. Furthermore, fishing vessels authorized to fish large pelagic species and/or authorized to fish in international waters were obliged to be equipped with VMS devices, irrespective

of their length. The installation of this equipment was a prerequisite to obtain the authorization. The government was making significant efforts to ensure that the installation of devices for the control of fishing vessels implied no costs for the fishermen.

13. Subsequent to the presentation of the Greek national case, views were exchanged on the use of data collected through satellite, including VMS, for scientific purposes. It was recalled that Greece had been experimenting on the application of a spatial and temporal analysis based on these data as a means to integrate existing information on fisheries, including biological parameters used. Such an approach was fully consistent with the centralized GFCM control system which also endeavoured to embed scientific features so that VMS could be regarded as something other than a control tool.

14. Mr Benjamin Borg, from the Department of Fisheries and Aquaculture of Malta, presented some recent upgrades on the tracking procedures of its vessels and the use of VMS devices, introduced by Malta in 2014 and early 2015. This included the departure from Inmarsat C, as the country was now using Iridium, and the ability to switch to GPRS connectivity within 12–18 nmi from the coast in order to deliver more frequent reports and contain communication costs. The national FMC was able to receive and poll information from both EU and non-EU fishing vessels entering waters under Malta's jurisdiction. Mr Borg clarified that these new assets also allowed transmitting catch reports and additional data gathered through complementary sensors connected to the main device. Small scale fishing vessels from 6 to 9 meters in length that target dolphin fish and swordfish had also been equipped with GPRS trackers able to transmit position updates every 3–5 minutes. According to Mr Borg, this proved to be a robust solution requiring minimal maintenance.

15. In the ensuing discussions, it was noted that class-A AIS had been installed on all Maltese fishing vessels over 15 meters and that different data were being integrated. A pilot study had been conducted in cooperation with the European Maritime Safety Agency (EMSA – SafeSeaNet project) and further commonalities in the use of different data sources were being examined through the ongoing IMDatE project. Whereas the efficacy of integrated AIS/VMS data to retrieve detailed information of vessels routes within different fisheries zones had been proven already, the high costs associated with this undertaking still represented a difficult challenge to overcome. Still, the need to keep working on viable solutions, such as satellite-based AIS, was evident not only to complement VMS data but also as a means to prevent the malfunctioning of VMS. The implementation of hybrid transmission could in the future help to perform more detailed vessel tracking in coastal areas, while better supporting the submission of ERS/e-logbook and additional data captured through complementary means.

16. Mr Deniz Frljuckic, from the Ministry of Agriculture and Rural Development of Montenegro, described the institutional and legislative framework regulating MCS practices in his country. He emphasized the importance of the EU's support to Montenegro through ad hoc projects to aid in the development of the national FMC. Mr Frljuckic explained that the system, including the servers, was hosted within the governmental network and was operating in synergy with the Fisheries Information System in order to enable data representation and browsing services. In concluding, he called for more cooperation at the subregional level in the Adriatic Sea on MCS-related matters.

17. Reference was made to the subregional approach now embodied in the GFCM Agreement, as amended in 2014. Although this approach related mainly to the management of fisheries, participants were of the view that it should also refer to the control of fishing activities. Since the GFCM was shifting towards a regional control system, there was room for more cooperation to level and strengthen the capacities of neighboring countries. Where these capacities were more similar to one another, it would be easier to set up one common database for all data collected through the FMCs in the subregion. In the case where countries in a relevant subregion were gradually moving towards the adoption of tools such as the electronic recording and reporting system (ERS) and e-logbooks, it could be possible for the GFCM to define common standards for these countries to follow and, consequently, provide technical assistance to fill the gaps.

18. Mr Abdelhadi Fouima, from the Ministry of Fisheries and Agriculture of Morocco, introduced the legislative framework of his country which stipulated the conditions for the operations of the Moroccan FMC. Supported by 15 staff, this center received VMS reports every 2–4 hours according to

the type of fishery activities undertaken by the 2 200 fishing vessels being monitored. The national control system was contributing to lowering the amount of infringements in zones where fishing activities were forbidden and was providing significant support for the collection of data and information used by the National Institute for Fisheries Research. Mr Fouima also highlighted some constraints regarding, in particular, the communication costs for Inmarsat connectivity, currently being supported by a single provider. New FMC software was being elaborated, however, and it was foreseen that the software would be open to other connectivity providers and would integrate additional features, including ERS of catches.

19. Given the sound experience of Morocco in MCS-related matters, participants enquired about whether a plan was in place to, at some point, also monitor small-scale fishing vessels. It would be important to closely follow any developments in Morocco and then regard them as potential best practices for other GFCM Members. Presently, there were some 15 000 small-scale fishing vessels operating in Morocco and it was impossible to install VMS on all of them. Morocco was eager to broaden controls to at least the largest of the small-scale fishing vessels but, without adequate onboard power supply, the task would prove very challenging. Also, the fishermen should clearly see the benefit of installing any device, otherwise, their lack of cooperation would nullify all efforts. It was noted, however, that recent advances in technology were very encouraging and pointed to the direction of viable solutions, including from the perspective of the fishermen. The issue of safety was seen as crucial for convincing the small-scale fishers that daily monitoring of their activities was a service worth paying. The GFCM should continue to keep the country members apprised of any relevant developments that could be used with their small-scale fishing fleets. In this regard, it was recalled that a Regional Symposium on Small-Scale Fisheries would be convened by the GFCM in early 2016. This conference, to be hosted by Algeria, would also provide opportunities for further discussing this matter.

20. Mr Carlos Ossorio, from the Ministry of Agriculture, Food and Environment of Spain, outlined the current implementation of VMS in Spain which concerned approximately 4 300 fishing vessels above 12 m. The national platform had been developed to obtain vessel positions every two hours through certified VMS devices relying either on Inmarsat or Iridium satellite connectivity. Efforts had been made at the administrative level to establish flat rate communication fees. The use of VMS in Spain proved to be beneficial in several respects: it assisted in the detection of discrepancies in catch reports, it supported the collection of scientific data used in the assessment of fish stocks and it collected information on illegal fishing activities as a means to plan inspections. In concluding, Mr Ossorio stated that Spain would stand ready to welcome colleagues from other GFCM Members willing to see the day-to-day operations of the Spanish FMC and to share with them Spain's experience.

21. Participants noted that there had been a decrease in administrative proceedings and penalties in Spain in recent years and wondered whether this could be indicative of the fact that VMS was working as a deterrent to IUU activities. In this regard, it was recalled that the possibility of using VMS data as evidence in the course of legal proceedings against fishing vessels presumed to have fished illegally had been discussed within the GFCM in several occasions. There seemed to be a growing trend whereby GFCM Members were prone to make use of VMS data in the context of broader investigations and the example of Spain drew inspiration. With regards to the harmonization of data, the Spanish FMC had been enabled for direct transmission to the European Commission on the basis of the EU FLUX protocol which aimed at standardizing datasets for AIS, vessel day scheme (VDS), ERS and GPS, in accordance with a unique format and codification standard.

22. Mr Wissem Bouzid, from the Ministry of Fisheries of Tunisia, illustrated the national VMS system, which was initially piloted in 2006–2008 for vessels targeting tuna and is now scheduled for progressive implementation across the entire fleet over 15 m. In parallel, the Center for the Administration and Management of Fisheries Information (CAGIP) had been endowed with a secure network, allowing improved coordination with the national centers for interventions at sea. Custom onboard devices, named U3C and leveraging Inmarsat-C and 3G/GPRS connectivity, had been conceived and tested to allow for the storage and transmission of VMS and catch data along. These devices also allow for the storage and transmission of information collected through several sensors

that support the crew in case of distress at sea, protect the unit from tampering attempts and promptly report any tampering attempts directly to the CAGIP. The unit also includes a backup battery with a capacity of up to one week in the case of a loss of power. Mr Bouzid made particular emphasis on the role of the CAGIP, where systems have been established to handle data relating to the fleet register, historical information on effort (e.g. catches, fuel consumption, infringements), onboard crew, zones forbidden to fishing activities, ports and the transmission of data to ICCAT and, eventually, to the centralized GFCM control system.

23. In the ensuing discussions, it was specified that 62 Tunisian fishing vessels had already been equipped with VMS but some 900 would follow suit. Tunisia was committed to broaden the control of its fleet but, at the same time, it was also eager to promote a multidisciplinary approach whereby control would not be solely pursued at the national level. In this regard, the importance of integrating scientific features was stressed, as well as the need for a centralized GFCM control system. This system would indeed pave the way for the integration of important features supporting better scientific analysis and, in turn, enable GFCM Members to take advantage of data collected in many different ways.

24. Mr Murat Toplu, from the Directorate General of Fisheries and Aquaculture of Turkey, described the national provisions addressing ongoing remote tracking for 1 150 fishing vessels over 15 m through AIS and envisaged measures at the national level for 1 350 vessels over 12m to be monitored through satellite-based communication. In both cases, the Turkish Ministry of Transport, Maritime Affairs and Communications was the competent authority. An integrated software platform was being prepared to support the national FMC in the management of both VMS and electronic logbook data, which was expected to become available through AIS, GSM and satellite-based transmissions. In concluding, Mr Toplu informed participants that technical specifications had been prepared for the onboard devices and tenders were being prepared to identify suitable providers.

25. Being the only GFCM Member with national waters in both the Mediterranean and the Black Sea, Turkey specified that both seas were addressed by relevant provisions on MCS. Initially, Turkey had relied mainly on AIS, but was now moving towards also using VMS. To this end, Turkey was also interested in providing software integration between AIS and VMS.

26. Mr Pierre Girard, from CLS, introduced the VMS devices and services provided by his company operating, *inter alia*, satellite systems for location and environmental data collection based on Argos and Iridium connectivity, oceans observation via specialized satellites, radar-based monitoring of land and maritime activities. An extensive overview was provided on the company's IT services, which offer hosted FMC services for various type of fleets and concerned infrastructures and can currently store up to 50 TetaBytes of customer data. During his presentation, the North Atlantic Format was mentioned as the reference standard for the exchange of VMS data; Mr. Girard indicated that it was being used by NAFO, NEAFC and CCAMLR. Newly adopted hybrid terminals which are able to be remotely configured were described and it was specified that they supported remote polling by FMCs and updatable geo-fencing. In concluding, Mr Girard presented a variety of integrated software solutions, mainly THEMIS and Halios Catch manager, which supported: a) secured web/mobile app access to VMS information available to operators and fishermen, b) the customizable management of e-logbook data flow, c) export of catch data statistics and d) consultation of oceanographic data to support scientific use of VMS-derived information.

27. Mr Tom Rossiter, from Succorfish presented the SC2, their latest solutions in terms of onboard devices for hybrid VMS connectivity (Iridium/GPRS/GFCM) and high position accuracy (within two meters). The main highlight for such devices was the ability to integrate e-logbook onboard systems, electronic scales (at sea weighting) and an array of complementary devices based on Bluetooth and radio-frequency identification (RFID) technologies able to collect and integrate data on gear status, fishing effort, and environmental indicators. It was stressed that the integrated use of such data for scientific purposes would imply a considerable added value for decision makers and relevant national authorities. Attention was also drawn to the operational reliability, data security and safety provisions for this device, including the anti-tamper IP67 enclosure, the internal non-volatile memory, the AES 256 data encryption, the additional autonomy delivered by the optimized internal battery and

the optional solar panel, specifically designed for small scale fishing vessels with limited onboard power supply. Mr Rossiter then presented a case study, conducted in partnership with the Maltese company Loqus, addressing the implementation of an all-encompassing, tailor-made system allowing multiple and mobile friendly user access with features specifically designed to facilitate management tasks. This led to the development of the catch mobile application, an instrument which is customizable at the country level to meet local needs.

28. Mr Kolbeinn Gunnarsson, from Trackwell, introduced the company's work in delivering fisheries monitoring services for several countries and RFMOs. Technical requirements and specifications by Trackwell included the integration of hybrid data sources from diverse connectivity means and the use of virtualized IT infrastructures based on Windows Azure. Mr Gunnarsson stressed Trackwell's commitment to ensuring flexibility in addressing emerging needs, such as the phased implementation of the EU FLUX data communication standard, system performances to handle real time submission of consistent amounts of data, cost-efficiency, high-availability and load-balancing. The VMS software platform, developed by the company, was able to integrate standard VMS and ERS fleet monitoring features, such as geo-fencing, vessel trip history trail analysis and remote user access. Particular importance was given by Mr Gunnarsson to the special features provided by Trackwell, such as the ability to synchronize with fleet register databases from the customer's information systems and the ability to incorporate additional databases and maps. In concluding, some case studies were cursorily described.

29. Ms Maggie Riley, from the Pew Charitable Trusts provided an overview on the activities by her organization to foster conservation of living marine resources, including through support to the implementation of relevant international treaties and the recommendations by RFMOs. She made reference in particular to the efforts by Pew in contributing to reduce illegal fishing and, to this end, explained how the activities realized relied on the inclusion of policy data, cutting-edge technologies, best practices on information sharing and the cooperation with enforcement authorities such as Interpol. Ms Riley went on to present the project Eyes on the Seas, conducted in cooperation with Satellite Applications Catapult, which allowed for concrete integration of vessel tracking data (AIS and VMS), high-definition satellite imagery (SAR and Optical), comprehensive fleet registers and automatic alerts and analysis. The process leading to the detection of cases of suspect illegal fishing activities was also illustrated as this could become an additional instrument for port authorities to enhance the efficacy of inspections.

30. In the ensuing discussions related to the work of the companies and organizations of the invited experts, participants expressed gratitude for the very useful presentations made and the information shared. They considered the importance of exploring existing possibilities for the integration of data, including vessel tracking data, existing options to reduce costs of communication and the testing of new devices and technologies to strengthen MCS. There was agreement that the steady and decisive progress in both science and technology would, in the coming years, result in concrete assistance in the form of new tools to assist countries in improving their control systems.

PRESENTATION OF THE PILOT STUDY ON A GFCM CENTRALIZED VMS

31. The GFCM Secretariat delivered a presentation on the pilot study for a centralized control system, being carried out in light of the decision by the Commission at its thirty-eighth session (FAO headquarters, May 2014) and in accordance with the roadmap in the guidelines of Resolution GFCM/2014/38/1. It was recalled that the pilot study was being conducted to test the very feasibility of the centralized control system which would have to pursue several objectives in addition to those relating to MCS, such as scientific added value, integration of data processing subsystems and development of complementary effort information, catch information, by-catch reports and environmental indicators. The GFCM Secretariat detailed, in particular, the technical aspects of the pilot study which had enabled the establishment of a virtual hardware infrastructure featuring: a) the ability to deploy servers with up to 16 cores and 116 GB of RAM; b) an ISO 27001 certified data storage service for servers backups and uncompressed historical datasets able to hold up to 200 TeraBytes; c) service levels up to 99.95% for virtual servers, 99.99% of connectivity uptime for

database engines and 99.95% for virtual networks; d) inbuilt disaster recovery mechanisms for databases, allowing transaction log backups to take place every 5 minutes and differential database backups to be triggered every hour. Considerations were also made regarding the cost estimations for the IT infrastructure and concerned services, benefiting from recurrent UN-wide negotiations with the provider. In total, it was estimated that the cost of a centralized GFCM control system would amount to roughly 35.000 UDS per year (virtual hardware infrastructure). In addition, the costs of a proper VMS software to be added, possibly through a cooperation agreement with an external provider, would have to be factored in. These costs could be approximately 10 000 USD, according to a very preliminary estimation.

32. As the centralized GFCM control system would have to be responsive to the needs of both GFCM Members with and without an FMC, the pilot study now required the specification of different data requirements. The next step would be to lay down data workflows envisaged through the study from national FMCs, on the one side, and specifics on direct transmission from onboard devices absent FMCs, on the other. In the first case, it was proposed to adopt the North Atlantic Format to allow data transfer from FMCs, in line with similar procedures in place in other RFMOs. This would also allow for the use of FAO recognized standards for vessel type (ISSCFV), fishing gears (ISSCFG) and species (ISSCAAP). In the second case, it was stressed that the submission from GFCM Members without FMCs, that had potentially adopted an assorted variety of other devices, would require formats to be harmonized in the data flow. For this purpose, the best approach would be the one-off formulation of a common transmission format to be used by onboard devices to transmit data. GFCM Members in the future would be expected to request, through future tenders on the purchase of devices, that the harmonized data flow used at the regional level be mandatorily used by the providers. Otherwise, any direct transmission from onboard devices would be impossible.

33. In order to follow through with the pilot study, the proposed timeframe for 2016 and 2017 was presented, including expected actions. It was proposed that a short technical document be prepared by the GFCM Secretariat and submitted to the GFCM Compliance Committee at its ninth session (Italy, May 2015) with the purpose of summarizing the different technical requirements presented. Subsequent to this session, the technical document should be used as a basis for a census in order to request the relevant information on data standards used by all GFCM Members. Similarly, relevant providers of VMS software should be fully involved.

OPEN DISCUSSIONS ON THE PHASED DEVELOPMENT OF A GFCM CENTRALIZED VMS AND NEEDS RELATED THERETO (E.G. INTEGRATION OF DATA, COSTS OF COMMUNICATION, ETC.)

34. In the ensuing discussions, participants agreed that the GFCM ought to formulate common standards for both GFCM Members with and GFCM Members without FMC. This would be fully consistent with the modular approach advocated in the guidelines provided for by Resolution GFCM/2014/38/1. Also, in the medium term, common standards would represent the best solution to bring about harmonization and prompt an even development of control systems by GFCM Members. Participants recognized that the pilot study had already provided positive indications as to service levels, technical sustainability, contained maintenance costs, lower costs for data transmission through the use of lightweight data transmission formats (JSON was proposed) and optimized data traffic consumption entailed in a centralized GFCM control system. It was suggested that exchange on technical information should be further prompted by the GFCM Secretariat through a dedicated, secure portal to be lodged in the GFCM Extranet.

35. The discussions also addressed standards identified by the pilot study to ensure adequacy of statistical analysis of VMS data, supported by tools and methodologies relied upon in the scientific community. Consistent with the technical choices already adopted within the SAC Working Group on Stock Assessment, the R language, supported by the Revolution Analytics Framework, was identified as a suitable option to integrate scientific features in the centralized VMS control system. Furthermore, the applicability of R packages specific for fisheries (such as FLR, VMSTools and VMSBase) was positively assessed as they would underpin the processing of VMS data, ERS/e-Logbook data, fleet

composition information, information on by-catches incidents, environmental indicators and further types of data that could be integrated. In this respect, the pilot study had also already provided some good indications and it was deemed adequate to continue working in the same direction.

36. Having noted the current stage of the pilot study, participants acknowledged that eligible technology partners, like providers of VMS software, would also be capable of contributing to the next steps ahead. Since the centralized VMS control system would foster harmonization at the regional level, the solutions proposed by these providers on the market would need to be in line with GFCM requirements. The customization of the VMS software modules could also be done in cooperation with the providers, by incorporating relevant GFCM databases, defining appropriate access policy and having a transmission testing phase from sample vessels through short-term projects conducted in under the oversight of the GFCM in interested GFCM member countries. Participants recognized that it was of paramount importance for them to pay due attention to the full development and implementation of their fishing vessel register systems as they would constitute the building blocks of the centralized VMS control system. There was agreement that those GFCM Members with an adequate compliance level with Resolution GFCM/35/2011/1 would be given priority for the short-term projects, while remaining GFCM Members would be given technical assistance.

37. The Executive Secretary, in noting that several GFCM Members had requested technical assistance in connection with MCS related issues and that this trend would increase steadily while the centralized GFCM control system was being developed, pointed out that any request for technical assistance should be clearly formulated and addressed to his attention through a letter sent by the relevant national authorities.

38. In order to monitor progress with the proposed roadmap for the pilot study, spanning from 2015 to 2017, it was proposed that the Working Group should be convened again in 2017. In the meantime, work would be coordinated by the GFCM Secretariat with the involvement of relevant GFCM Members, non-Members and relevant organizations, including providers of VMS software.

ANY OTHER MATTER

39. There were no additional matters discussed.

CONCLUSION AND CLOSURE OF THE MEETING

40. The Working Group agreed on the following recommendations:

- Countries should continue to make all efforts necessary to ensure the full implementation of Recommendation GFCM/33/2009/1 on VMS;
- Consistent with the modular approach to controls foreseen by Resolution GFCM/38/2014/1, suitable solutions to control small-scale fisheries should be taken into account and, as appropriate, tested on a trial basis;
- The GFCM Secretariat should continue to develop, through the ongoing pilot study, a centralized control system which will:
 - harmonize a format for data transmission from FMCs to the centralized control system (for Contracting Parties having a FMC), possibly based on the NAF, including through an appropriate survey;
 - implement a common data transmission format for direct transmission to the centralized control system (for Contracting Parties not having a FMC);
 - integrate VMS, AIS and other data sources with other relevant fisheries data collected through means such as ERS and e-logbooks, as well as with scientific features in support of management;
 - complete the VMS software platform for the centralized control system, including customization of this platform, as supported by Contracting Parties and relevant technology partners;
 - launch the data transmission to the centralized control system testing phase.

- The centralized control system should be hosted at the GFCM Secretariat and will consist of an infrastructure including a virtual hardware and a customized VMS software;
- Confidentiality standards and requirements relating to the transmission, storage and use of data should be fully consistent with the GFCM legal framework;
- The centralized control system should be tested at subregional level in candidate pilot areas (e.g. Adriatic Sea, Strait of Sicily and Black Sea);
- Technical issues and best practices relating to the implementation and management of FMCs, such as IT infrastructure, integration of data, sharing of information, etc., should be discussed at expert level in the next meeting of this working group (to be convened in 2017);
- Countries having a specific need for technical assistance and capacity building should address a letter to the GFCM Secretariat and clearly indicate the areas where technical assistance is needed. This will allow the GFCM Secretariat to ensure coordination in the remit of the GFCM Framework Programme and with potential donors.

41. Participants expressed their gratitude to the GFCM Secretariat for the organization and for the expert support provided throughout the meeting as well as to the Morocco for the kind and warm hospitality.

Agenda

- 1. Opening and arrangements of the meeting**
- 2. Adoption of the agenda**
- 3. Introduction of participants and working group's objectives**
- 4. General overview on Monitoring, Control and Surveillance with particular reference to the GFCM area, including the role of controls in in small-scale fisheries (*by the GFCM Secretariat*)**
- 5. VMS and control systems in GFCM Contracting Parties (*national representatives will be requested to present pertinent information on all MCS tools which are either in place or desirable at national level and regional level*)**
- 6. Presentation of the pilot study on a GFCM centralized VMS (*by the GFCM Secretariat*)**
- 7. Open discussions on the phased development of a GFCM centralized VMS and needs related thereto (e.g. integration of data, costs of communication, etc.)**
- 8. Any other matter**
- 9. Conclusions and closure of the Working Group**

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