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Report of the

FAO WORKSHOP FOR THE DEVELOPMENT OF A GLOBAL DATABASE FOR VULNERABLE MARINE ECOSYSTEMS

Rome, 7–9 December 2011

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
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PREPARATION OF THIS DOCUMENT

This is the report of Workshop for the Development of a Global Database for Vulnerable Marine Ecosystems (VMEs), which was held at the headquarters of the General Fisheries Commission for the Mediterranean (GFCM) in Rome, Italy from 7 to 9 December 2011. The Workshop, organized in response to the need for implementation and development of a Global Database for VMEs.

The FAO technical assistance to the workshop consisted of Fabio Carocci, Anton Ellenbroek, Aureliano Gentile, Françoise Labonté, Jessica Sanders, Marc Taconet, and Merete Tandstad. FAO support, including administrative and logistical assistance, was also provided by Ariane Acqua and Angela Towey.

This report of the meeting contains a record of the meeting proceedings, summaries of presentations and discussions, and the background documents.

This meeting was funded by three projects, including *Développement d'une banque de données sur les écosystèmes marins vulnérables en haute mer* (BDEMV) (GCP/GLO/309/FRA), *Support to the implementation of the International Guidelines on the Management of Deep-Sea Fisheries in the High Seas* (GCP/GLO/323/NOR) and *Fisheries management and marine conservation within a changing ecosystem context* (GCP/INT/253/JPN).

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Workshop for the Development of a Global Database for Vulnerable Marine Ecosystems (VMEs).
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ABSTRACT

The Workshop for the Development of a Global Database for Vulnerable Marine Ecosystems (VMEs), which was held at the headquarters of the General Fisheries Commission for the Mediterranean (GFCM) in Rome, Italy from 7 to 9 December 2011.

The Workshop was organized in response to the need for implementation and development of a Global Database for VMEs. The main objectives of the workshop were to i) determine what types of data and information need to be collated to be most useful in facilitating decision-making for regional fisheries management organizations and arrangements RFMO/As and states (and industry) in relation to management of impacts on VMEs; and ii) to determine a development strategy for options for developing the FAO VME database based on stakeholder input.

The workshop was attended by a range of stakeholders, participating in their personal capacity, including representatives of regional fisheries management organizations and arrangements (RFMO/As), intergovernmetnal and non-governmental orgranizations and scientific institutes.

Participants discussed five different topical areas 1) overview of RFMO/As VME-related activities, 2) overview of industry perspectives and inputs, 3) experience in VME-related databases and 4) tools and frameworks for the database, and 5) VME database options, priorities and a roadmap. Break-out group discussions pertaining to industry, management and science issues, and addressing database requirements are included under the relevant sections. Main conclusions where agreed upon which pave the way for the development of the VME database.

CONTENTS

ABBREVIATIONS AND ACRONYMS

ABNJ	areas beyond national jurisdiction
BPAs	benthic protected areas
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
COFI	FAO Committee on Fisheries
CoML	Census of Marine Life
CTD	conductivity, temperature, depth
EAF	ecosystem approach to fisheries
EBSA	ecologically and biologically significant areas
EC	European Commission
EEZ	exclusive economic zone
EU	European Union
FIGIS	Fisheries Global Information System
FIRMS	Fishery Resource Monitoring System
GEBCO	The General Bathymetric Chart of the Oceans
GEF	Global Environment Facility
GEOSS	Global Earth Observation System of Systems
GFCM	General Fisheries Commission for the Mediterranean
GIS	geographic information systems
ICES	International Council for the Exploration of the Sea
ICIS	Integrated Catch Information Systems
IEO	Instituto Español de Oceanografía
IUCN	International Union for Conservation of Nature
IUU	Illegal, unreported and unregulated fishing
KML	Keyhole Markup Language
NAFO	Northwest Atlantic Fisheries Organization
NEAFC	North East Atlantic Fisheries Commission
NERC	Natural Environment Research Council (U.K.)
NOAA	National Oceanic and Atmospheric Administration
NPFC	North Pacific Fisheries Commission
OBIS	Ocean Biogeographic Information System
OSPAR	Commission for the Convention for the Protection of the marine Environment of the North-East Atlantic
PICES	North Pacific Marine Science Organization
RFMO/As	regional fisheries management organizations and arrangements
ROV	remotely operated underwater vehicle
SAIs	significant adverse impacts
SEAFO	South-East Atlantic Fisheries Organization
SIODFA	Southern Indian Ocean Deepsea Fishers Association
SPRFMO	South Pacific Regional Fisheries Management Organization
TAC	total allowable catch
UNGA	United Nations General Assembly
VME	vulnerable marine ecosystems
VMS	vessel monitoring systems
VRE	virtual research environment

VTI	vessel transmitted information
WGDEC	ICES/NAFO joint Working Group on Deep-water Ecology
WoRMS	World Register of Marine Species

KEY RECOMMENDATIONS

Data

- Data scattered among many scientists and data sources need to be identified and collated.
- Regional fisheries management organizations and arrangements (RFMO/A) decisions and management measures should be included in the database.
- Fishers may be able to provide data at aggregated level (footprint for example), and may also be able to provide some fine scale around known vulnerable marine ecosystems (VMEs).
- The scale of consideration for VMEs may often be too detailed for use of Ocean Biogeographic Information System (OBIS) data; however, OBIS type data will be more valuable in areas where there is little data.
- The Ecologically and Biologically Significant Areas (EBSA) regional processes might contribute relevant data sets to the VME process.
- There should be an agreement on common ways of describing things, but not complete homogeneity.
- Information must be validated and properly attributed (ownership) and documented (Metadata).

Development

- The database needs to be relevant for fisheries management and has to include both fisheries dependent and fisheries-independent data; issues of presence and absence data need being clarified.
- There is a need for different mechanisms within and outside of RFMO/As. Specific support is needed to develop processes that could contribute to VME data where there are no RFMO/As
- Data sharing policies and confidentiality aspects must be defined. Data may be either public domain or have restricted access (commercially sensitive).
- The database should be developed in a step-by-step approach to ensure adaptability and progressive enrichment. An appropriate balance between detailed and summary data must be ensured, as necessary according to the regions.
- This type of global initiative could help pull together information on different processes across RFMO/As.
- This will create transparency in relation to VMEs and with what has been done and the database will reflect processes and definitions within the regions.
- Inputs should reflect the United Nations General Assembly (UNGA) Resolutions and the FAO Guidelines for the Management of Deep-sea Fisheries in the High Seas (DSF Guidelines).
- The database will be designed for different user groups.

Products and services

- It should be primarily fisheries related, different but complementary to OBIS.
- Industry information should be put into a format that could be used more freely and looked at against the scientific information.
- It should ensure that there is a scientific basis to the validation process.
- Fishing gears should be classified. For example it is necessary to determine if semi-pelagic trawl is bottom fishing. There could a lot of missing information if these fisheries are not included.

OPENING OF THE SESSION AND WELCOME

Background

1. The FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas (Deep-sea Fisheries Guidelines) were developed to provide guidance for States RFMO/As to ensure long-term conservation and sustainable use of marine living resources in the deep seas and prevent significant adverse impacts (SAIs) on VMEs, in line with UNGA Resolution 61/105. The FAO has developed a full programme for implementation of the Deep-sea Fisheries Guidelines including the development of a VME database which will provide an avenue to distribute information and raise awareness on recognized VMEs to fishery policy makers, managers, scientists and the public at large. The current FAO Workshop, organized in response to the need for implementation and development of a Global Database for VMEs, was held at the headquarters of the General Fisheries Commission for the Mediterranean (GFCM) in Rome, Italy from 7 to 9 December 2011.

2. A range of stakeholders participated in this meeting, including representatives of RFMOs, intergovernmental and non-governmental organizations and scientific institutes. However, this meeting was organized as an informal workshop and thus participants participated in the meeting in their own capacity. The list of participants can be found in Appendix 2.

3. The meeting was opened by Ms Jessica Sanders, FAO Fisheries and Aquaculture Department, who presented the background leading to the request for the development of a global database for VMEs. This included a review of the FAO Deep-sea Fisheries Guidelines, including text relevant to the database and vulnerable marine ecosystems. She highlighted key aspects of implementation, indicating that although some of the principles are broadly applicable these guidelines specifically address fisheries that occur beyond national jurisdictions and where the gear is likely to come into contact with the seabed. She also summarized the various range of activities (expert and technical consultations, workshops, etc.) that took place during the development of the Deep-sea Fisheries Guidelines, as well as recent FAO activities such as the 2010 Busan workshop on the Implementation of the FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas-Challenges and Ways forward. Ms Sanders also presented the FAO deep-sea high seas programme and related projects into which the VME database project fits.

4. Mr Marc Taconet, FAO Fisheries and Aquaculture Department, then presented the strategy, objectives and challenges for the design and operation of a "Global mapping information system on VMEs". He noted that stakeholders to be involved in this project include, managers (RFMO/As), industry, civil society organizations and scientists. He reiterated that facilitating the global registration and publication of information related to VMEs serves the implementation of Deep-sea Fisheries Guidelines and that the development of a global database could foster lesson learning and further development of appropriate management measures to protect VMEs.

5. Challenges to the development of a global VME database were noted, namely; availability of data to support VME identification using the VME criteria, data confidentiality and presenting the information and data in a way that it is useful for management decisions. Mr Taconet stressed that the development process needs to be dynamic and iterative, informative and scientific, and must involve all stakeholders. It should rely on a functional network for exchange of information based on partnerships between RFMO/As and other multilateral organizations such as the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) (herein referred to collectively as RFMO/As), industry associations, managers, scientists, and organizations holding repositories of environmental or other relevant information.

6. An overview of three envisaged components of the system was provided: the database (for collation and dissemination of relevant information), a sustainable network of acquisition and exchange of data and information in support of decisions for responsible exploitation with respect to VMEs, and a mapping component to support composite analysis (including descriptive, predictive and synoptic mapping) and visualization to facilitate application of the VME criteria.

7. Mr Taconet indicated that the current project supported by France (duration three years with a budget of $US 400 000) focuses on the implementation of an initial VME database component as a logical first step in the development of a more comprehensive VME information system. Gateways to the other later extensions are to be established at the onset to ensure the overall consistency of the proposed system. This will include activities for capacity building and exploratory activities in the field of descriptive mapping. Attention will also be paid to ensure the integration of information systems in a broader framework of interoperability among existing systems in other institutions, governmental or non-governmental, or developed by relevant institutions or projects. This last aspect would provide a platform for interconnectivity of scientific knowledge in support to decision-making.

Workshop objectives

8. The workshop objectives were introduced; i) to determine what types of data and information need to be collated to be most useful in facilitating decision-making for RFMO/As and states (and industry) in relation to management of impacts on VMEs; and ii) to determine a development strategy for options for developing the FAO VME database based on stakeholder input, including present/emerging issues and challenges, a proposed action plan including suggestions for the information sharing and data mechanism and Web site architecture development. The workshop consulted key stakeholders, and engaged them in establishing an initial list of relevant data sets, clarified issues related to presentation and sharing of databases, defined high level requirements regarding Web site architecture, and developed a roadmap for implementation. This project is to design a global, factual VME database and thus the job is to define type of information, database structure and responsibilities among partners in the project.

9. The background documents for the workshop included one document on VME-related activities within RFMO areas[1] and a review of deep-sea related actions addressing VMEs prepared for the 2011 UN workshop on the impacts of bottom trawling.[2]

Appointment of the Chairperson

10. Mr Stefan Asmundsson, Secretary for the North East Atlantic Fisheries Commission (NEAFC), was appointed Chairperson.

Adoption of the Agenda

11. The Chairperson reviewed the agenda (Appendix 1). The agenda was adopted and the workshop was divided into five sessions, 1) overview of RFMO/As VME-related activities, 2) overview of industry perspectives and inputs, 3) experience in VME-related databases and 4) tools and frameworks for the database, and 5) VME database options, priorities and a roadmap. Break-out group discussions pertaining to industry, management and science issues, and addressing database requirements are included under the relevant sections. The agenda was adopted by the Workshop.

SESSION 1: OVERVIEW OF RFMO/A VME-RELATED ACTIVITIES

12. A questionnaire (Appendix 3) had been distributed to the RFMO/As with competence to

[1] Review of progress on implementation of the international guidelines for the management of deep-sea fisheries in the high seas – experience of RFMO/As with identifying and protecting VMEs, by Jake Rice. In *Report of the FAO Workshop on the Implementation of the International Guidelines for the Management of Deep-sea Fisheries in the High Seas – Challenges and Ways Forward*, Busan, Republic of Korea, 10–12 May 2010. FAO Fisheries and Aquaculture Report. No. 948. Rome, FAO. 2011. 74 pp.

[2] Workshop to discuss implementation of paragraphs 80 and 83 to 87 of resolution 61/105 and paragraphs 117 and 119 to 127 of resolution 64/72 on sustainable fisheries, addressing the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of deep-sea fish stocks.
www.un.org/Depts/los/reference_files/Workshop%20Summary%20of%20the%20Moderator%2014%20October%202011%20FINAL.pdf

manage discrete demersal fisheries in areas beyond national jurisdiction (ABNJ) before the meeting requesting information pertinent to the theme of the workshop. Mr Odd Aksel Bergstad, Institute of Marine Research (Norway), was requested by FAO to compile the results. He introduced Session 1, summarizing as reported below questionnaire responses from RFMO/As concerning their VME–related activities (full analysis in Appendix 4).

Presentation – *Contribution from RFMOs: summary of responses to questionnaire, by Odd Aksel Bergstad*

13. Organizations that responded included the North Pacific Fisheries Commission (NPFC), the South Pacific Regional Fisheries Management Organization (SPRFMO), CCAMLR, the South-East Atlantic Fisheries Organization (SEAFO), the Northwest Atlantic Fisheries Organization (NAFO) and the NEAFC. GFCM provided the information directly during the workshop. Key information included progress made by each organization related to identification and management as well as general experiences and gaps for VMEs since the publication of the two background documents, Expectations by RFMO/As and potential contributions to an FAO VME database were also elaborated.

14. Mr Bergstad noted that the responses were quite diverse indicating a wide range of fisheries and resources, and that the use of the concept vulnerable marine ecosystems is quite different among areas. He also noted the different levels of expertise and progress in identification and management of impacts on VMEs among RFMO/As, although most organizations have implemented some measures, including closed areas. Some RFMOs noted that many of the difficulties in addressing issues related to VMEs were managerial or scientific. The lack of identified VMEs or VME specific measures in areas not covered by RFMO/As was also noted as a significant gap.

15. Several issues relating to the design of a VME database were identified: 1) common benefits to users need to be clarified and must be transparent, 2) data in many repositories are derived from files of individual scientists on personal computers or organizations' databases which could be shared, 3) VME indicator records are generated by many means indicating the need for harmonization, 4) type of information to be contributed to a VME database needs to be determined, 5) data format should be decided, 6) access restrictions need to be considered to avoid misuse.

16. The benefits of a global database were perceived as: contributing to information on and understanding of the international context and principles; facilitating global compatibility and global distribution analyses; facilitating improved understanding of definitions, access to best practices and standardized and comprehensive information useful for future reviews; and for providing guidance to new organizations.

17. The full analysis of the responses to the questionnaire is provided in Appendix 4.

General discussion

18. The subsequent discussions included the topics listed below.

Diversity of VME identification processes and methodologies and challenges

19. It was noted that the methods for VMEs or other sensitive bottom habitat identification and the management measures taken to protect them vary tremendously by region. Some concern was expressed about the use of presence of an indicator species as the main criterion for determining a VME as this may result in closures of non-sensitive areas. Conversely the absence of an indicator species in the trawl does not necessarily imply the lack of sensitive habitats in the area.

20. The terminology used is quite different with diverse implications in each region. The database will have to respect and integrate the different types of area-based management measures and VME related measures taken by each region. The different regions also manage bycatch and discards of other vulnerable species, many of which already are under specific management regimes and are of relevance to VMEs. The database will also have to address the use of various terms and methodologies in each region, as specified by the RFMO/A or other competent bodies, while allowing for comparisons.

21. One challenge of the VME database will be to remain current and harmonized through a dynamic updating process consistent with the decisions of the RFMOs which each meet to make recommendations at different times during the year.

22. In addition, RFMO/As resources and capacities need to be considered in the design of a VME database, and clear working relationships and linkages with relevant RFMO/As activities would have to be established. This also applies for areas with no or emerging RFMO/A coverage (such as Indian Ocean, gap between North and South Pacific, Southwest Atlantic).

Data inputs and challenges

23. The types of data which can contribute/support the VME identification process and the associated challenges were discussed briefly. Both fisheries-independent and fisheries-dependent data are considered important inputs to VME management processes and therefore also for a VME database. Information on fisheries interactions with VMEs in addition to descriptive and georeferenced information on VMEs needs to be captured. For example, it was noted that CCAMLR uses both fisheries and scientific data, whereas NAFO has based their VME identification work mainly on fisheries-independent data.

24. Participants discussed the role of VTI (vessel transmitted information[3]) and whether it could be useful in the later upscaling of the VME database according to availability in the regions. This information could, for example, distinguish areas that are not fished or heavily fished, e.g. providing potential information on the footprint, areas that are untrawlable or strategically avoided because certain habitat features. Participants and the secretariat determined that this type of data would create a much larger and complex database than envisioned.

25. The potential usefulness of prediction models for habitat suitability and related data was also discussed, and would require further consideration.

26. Data sharing issues may arise and policies concerning protection or restriction on sharing of selected data sets should be addressed due to the commercially sensitive nature of some fisheries. In particular, if data could be used to increase capacity in a fishery or target precious corals or other valuable VME species.

27. A data submission format would have to be developed – which may require submissions with qualifiers to explain the data.

Scope and design of the database

28. Participants mentioned the potential inclusion of spatial management measures within national waters, including closures related to VME. The secretariat noted that due to the limited scope and funding of the project it is not possible to include such information at this stage.

29. Development of the database was suggested to follow a modular approach. Key points on the structure and content of the database included:

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[3] A term to mean logbook recordings, VMS data and other related data for use by science.

- The VME database should focus on the output and what the users need.
- The database should be more than just an inventory – it should also describe the processes and management procedures; VME coordinates should be shown with links to the process and data.
- The database should include all area-based management measures in ABNJ.
- Appropriate linkages to regional databases should be included. Inclusion of all detailed scientific data could cause the database to become unwieldy; and in some areas these types of detailed data are already held only by regional organizations for reasons of confidentiality.

SESSION 2: OVERVIEW OF INDUSTRY PERSPECTIVES AND INPUT

Presentation – *VME Risk Areas: How to capture the experience of the fishing industry and combine that with science information in ABNJ Deep-sea Fisheries, by Graham Patchell*

30. Mr Graham Patchell, Sealord Group, presented an overview of industry perspectives on VMEs. In terms of assessing the likelihood of an area to contain sensitive species, he stressed the considerable knowledge of fishers and a need to capture the experience of the fishing industry and combine that with other sources of information, such as traditional scientific information.

31. Key perspectives from the presentation were as follows:

- Some industry members feel that VME modelling techniques are often biased and driven by science advocates supported by antifishing lobbyists.
- Information from industry may be valuable and could be better used to support processes such as VME identification.
- Care should be taken when using a VME encounter as a proxy for VME risk areas. For example, the use of cameras as possible option to confirm presence or absence of a VME at the site of an encounter was suggested and reference was made to current trial practice in the Indian Ocean by Southern Indian Ocean Deepsea Fishers Association (SIODFA) vessels.

32. Mr Patchell identified problems with current processes for reducing significant adverse impacts on VMEs from an industry perspective.

- **Lack of access to data and involvement in scientific processes for industry and RFMO/As** – Data or information from scientific research or resulting from scientific processes is often not available. An example was given by the presenter: predictive modelling based on results of a 2011 Australian geology survey, predict that corals and sponges are present in large areas between New Zealand and Australia. This is not a realistic hypothesis according to industry. The industry questioned the extent of these VMEs and noted that caution should be used when working with predictive modeling and it would be useful to involve industry in the analysis process.
- **Accessing fine scale industry data on the high seas** – Fishing location data are commercially sensitive, thus not generally accessible. Competitors may gain access to sensitive fishing information if displayed in a global map or detailed in a database, potentially allowing others to enter the fishery. Particularly, in some regions where only a small proportion of features or a featureare fishable. Risk areas could be linked to fishable areas and this information is therefore "sensitive".
- **Acceptance/trust of industry information** – Industry declared benthic protected areas (BPAs) in the southern Indian Ocean to maintain biodiversity in the region. However, these measures were not fully accepted by other communities. Though recently, data from a Natural Environment Research Council (NERC) survey carried out in the context of a Global Environment Facility (GEF) supported project (executed by International Union for Conservation of Nature [IUCN]) confirmed the presence of intact coral in the BPAs.

Presentation – *Data from the industry in the North-East Atlantic, by Pascal Lorance*

33. Mr Pascal Lorance presented information on French fishing vessels' experience to the West of the British Isles. Fisheries developed from the early 1990s targeting roundnose grenadier, black scabbardfish, deep-water sharks and orange roughy. Blue ling has been exploited since the early 1970s. Since 2003, total allowable catches (TACs), licences and a number of technical measures have been introduced by the European Commission (EC) for European Union (EU) vessels fishing in the EU exclusive economic zone (EEZ) and international waters, i.e. NEAFC regulatory area. Fisheries for orange roughy and deep-water sharks have been closed to EU vessels in both the EEZ and international waters.

34. Fisheries monitoring include vessel monitoring systems (VMS) and fishery observer coverage. VMS facilitates defining the spatial extent and fishing footprint of fishing activity. As a result of management, the fishing effort has decreased over time and the spatial extent of fisheries has been reduced.

35. Onboard observations provide information on the full catch composition for 5 to 10 percent of all fishing operations (EU regulation). One issue is the proper identification of species and support identification material for sharks, rays and benthos is being prepared.

36. There is no known exploratory fishing at present time (i.e. fishing in new areas). Trawlers fish on trawl tracks that have been fished for several years. There is therefore likely to be no new impact on unfished habitats and the bycatch of VME indicator species is probably minor. In the context of the VME database, data collected on current fisheries in the Northeast Atlantic may therefore not provide much data, or mainly absence data.

37. Video data from 2002 to 2008 regarding hake, megrim and monkfish target fisheries in the Bay of Biscay show that fishing among years follows the same footprint, thus new areas are not often impacted.

Discussion

38. The discussion among participants centered on the incentives for fishers to enter into areas where there may be VMEs. While some noted that fishers avoid areas with corals to, at the least, prevent damage to their gear it was also pointed out that in some areas there are perverse incentives for fishers to enter these areas. However, the above debate is specifically in relation to trawl fisheries and is not necessarily applicable to other types of gears and their respective impacts e.g. longline or trap fisheries.

39. The use of bottom trawl fisheries as an example to follow in the VME definition and identification has introduced great confusion regarding fixed gear fisheries. Although an homogenization of measures and protocols is desirable, specific fisheries need specific approaches.

40. Participants noted that industry can work with science agencies to provide information relevant to identification of VMEs in traditional fishing grounds, e.g. Spain is doing collaborative work between industry and scientists in the South Atlantic. Different types of fishing information that industry can provide should be incorporated into the VME analyses, e.g. locations that are avoided by trawlers (e.g. where there are coral fields) because fishers do not want to damage gear. However, a balance between transparency and confidentiality is needed to go forward with historical/current data use.

41. The degree of detail in the data that needs be provided for the VME database was discussed. This may vary by fishery. For example, tuna fishing grounds change because tuna are highly migratory but for demersal fisheries, the prime fishing grounds are fixed. When vessels fish on the

same specific locations because it produces profitable catches, information on those locations is sensitive. In addition, where no regional management measures are in place (e.g. TACs, etc.) industry data is even more sensitive due to the competitive environment. Where TACs and licenses are in place, fishing location may not be so sensitive. Participants also noted that data sensitivity persists over time, but depends on the fishery.

42. In the North-East Atlantic a collaborative experience in working with fishing industry was discussed. Positional information has been shared in some circumstances. The willingness to share data depends also on the kind of management measures in place. It was reiterated that with a system that provides secure rights or access to resources, access to this information is less of a concern. In an open access fishery, confidentiality is at real issue.

43. The industry and others noted that there is a requirement to know where fishing grounds are as well as where VMEs occur but there needs to be a balance between providing data and capture/dissemination or detailed fishing tracks (the later could be commercially sensitive). Proper consideration of data confidentiality was considered essential by participants, particularly if the VME database is to provide information necessary for fisheries management.

44. The need for detailed tow-by-tow data was questioned. The importance of using and integrating fishermen's knowledge more extensively in discussions was stressed, however this does not necessarily mean detailed (i.e. commercially sensitive) data.

45. Some RFMOs are currently managing haul-by-haul fine-scale data and results obtained from these are providing accurate advice, at the same time preserving the confidentiality of the fine scale data (e.g. CCAMLR).

46. The use of predictive models provides the probability of a VME species indicator occurring in a particular sea bottom type, most of the time on quite large scales. However, VMEs mainly occur in localized places. These models should thus be considered as an indicative initial step rather than a conclusion. Current models predict presence only and look for high densities of the sensitive species. Camera-based surveys cover a small proportion of the area, but the output can be useful for improving predictive models.

47. The fishing industry community and management agencies needs to provide proof of sustainability of these fisheries to civil society at large. As suggested above, the use of cameras on trawls could help serve this purpose. If an encounter with a VME indicator species occurs, cameras could be used to check if there is really are sufficiently dense or extensive amounts of sensitive species at that location. It was noted that placing cameras on all trawls would create a lot of data, which is difficult to manage and hence, camera should only be used when doing exploratory trawling (looking for new fishing grounds).

48. Practices in deep-sea fisheries vary globally and thus influences what information can be contributed. In the Indian Ocean for example, fishing occurs on slopes of seamounts and usually focuses on one target species. Hauls are short, with a 2–15 minute duration. This differs from the North Atlantic, a situation where fishing occurs on continental slopes and flat bottoms, on mixed species, with long tows.

49. Participants noted the problems created by subsidies to the fishing industry and the creation of perverse incentives in high seas deep-sea fisheries.

50. There should be a focus on what other information (e.g. coral location data, lost gear, etc.) is available and how can industry add to this. Incorporating fishers knowledge in the VME database is important. The database could also be useful for increasing the knowledge of the fishing community through educational or informative campaigns; an example was provided of FAO skippers meeting which was considered very useful. Participants also noted the need to differentiate areas within and

outside of RFMO/As and facilitate useful contributions from flag states contributions in non-RFMO areas.

51. Participants further discussed the types of data that should be included in the database. Some participants noted the usefulness of information from fishers, for example, information on where they do not fish to avoid damage such as large areas off Argentina or the Indian Ocean, thus potentially avoiding interaction with sensitive species. There was also a suggestion that fishers draw potential VME boundaries. Other participants noted that this is useful but there is a need for objective, high resolution information on both fishing activity and sensitive species in order to delineate VMEs and potential interactions.

52. There are different practices with regards to VME management and data availability among RFMO/As. NAFO encountered concerns about confidentiality of data, but no significant shift in fishing grounds was observed because of detailed location knowledge being made available. Fishing in this region is more about know-how, not so much about know-where. In the North Pacific there are fewer fisheries, but seamounts that potentially could have VMEs, e.g. in the northwest near the Emperor Seamounts chain there have already been protected areas designated. The NPFC does not yet require a high level of detail in terms of data to be collected, but is cogniscent of future requirement of detailed information. VMEs are assessed at fine-scale level in CCAMLR. The multilateral organization holds all levels of data, but only a portion of this is made publically available. Fishing vessels notify the CCAMLR Secretariat of their encounters and this data remains confidential. SEAFO is also provided with haul-by-haul data.

SESSION 3: EXPERIENCE IN VME-RELATED DATABASES

Presentation – *Data sources and types used by International Council for the Exploration of the Sea (ICES) and NAFO WGDEC and the development of an integrated database of VME records for the North Atlantic, by Francis Neat*

53. For the North Atlantic, Mr Neat indicated that the ICES/NAFO joint Working Group on Deep-water Ecology (WGDEC) provides advice on the conservation and management of vulnerable marine ecosystems in the deep sea. WGDEC draws upon a range of data types and sources to assess the evidence for the presence of VMEs, how likely such VMEs are to be at risk from bottom fisheries, and what protective measures are necessary. Their data include maps of sensitive species, maps delineating VMEs and information on management measures (and their effectiveness).

54. The North Atlantic advice on the analysis of VME-related data is provided to NEAFC, NAFO and the EC. Information sources comprise:

- Historical data from scientific literature, museums, survey reports and existing databases such as those of Commission for the Convention for the Protection of the marine Environment of the North-East Atlantic (OSPAR) (i.e. *Lophelia* reef and sponge grounds databases that could be linked although these records constitute historical information with positional and taxonomic uncertainty).
- Contemporary data from research surveys using conventional sampling devices and visual methods such as remotely operated underwater vehicles (ROVs) or camera systems (including dedicated VME survey data). Some of this data is taxonomically precise and includes verified absence data.
- Data from predictive habitat modelling and geophysical acoustic data, e.g. multibeam bathymetry, that indicate areas likely to contain VMEs (Multibeam providing geophysical data, indirect evidence of structure).
- Trawl data provided by the fishing industry on the presence of VMEs and also their fishing areas.

55. It was noted that predictive habitat models are strong at the global scale, but weak at the local scale.

56. Verified absence of VMEs is also available from some of these data sources and may be an important consideration in developing management options. Because these data sources have a variable time frames and varying levels of spatial and taxonomic uncertainty, a system is applied to weight the importance of data components. The various data layers are then considered together to give advice on management options for conservation of VMEs such as closed areas.

57. Until recently, data used by ICES in this process has been largely held by individuals, national institutes or OSPAR and there is no integrated archive of VME data. Thus, past advice lacks transparency because it is difficult to follow the process and trace the data used in shaping such advice. There is a need for transparency and public access as well as integration and links to other systems/organizations. A comprehensive data collection system could maintain confidentiality by classifying data in terms of sensitivity, as is done at ICES.

58. Key issues highlighted by the presentation include:

- Until now, data have been held by individuals who submitted data to ICES.
- There is no current integrated achieve of VME data and there is also need for compilation of data at the species level.
- There is a problem with traceability.
- The OSPAR database alone cannot be relied upon as it only includes habitats, eg some species such as gorgonians do not fall into OSPAR category.

59. The ICES data centre will host this data and the final product will be visible on Google Earth with trawl surveys available through YouTube.

Presentation – *Developing linkages between the EBSA data repository, the OBIS information system and the VME database, by Patrick Halpin*

60. Mr Patrick Halpin presented the structure and type of information contained in the Convention on Biological Diversity (CBD) Repository on EBSA Repository and OBIS. He recommended developing linkages between these two repositories (i.e. the CBD/EBSA repository and the OBIS Information System) and the VME database. There are many similarities between the VME and EBSA criteria, and thus there could be similar data needs. The repository for EBSA data hosted at the CDB Secretariat is being developed through Regional EBSA workshops (four held in 2011/2012).

61. The EBSA Repository illustrates spatial data, is organized/referenced by region, has workflow tools, interactive drawing tools and Keyhole Markup Language (KML) format (Google). Tool protocol is handled by the CBD Secretariat.

62. OBIS is an open access database on marine biodiversity, containing over 30 million records. One system shortcoming is that the supply of data is voluntary: there is ample data but much is not submitted. Also the predictive models which can be run with OBIS data might not be very relevant when considering the scale at which VMEs are considered.

63. Census of Marine Life (CoML) research and OBIS data can contribute to both the EBSA and VME process.

64. In the subsequent discussions participants noted that the parallel processes related to VMEs (through the FAO) and EBSAs (through the CBD) have led to confusion over the similarities and disparities for many stakeholders. Though the criteria for both processes are similar, the processes differ significantly. EBSAs are much broader conceptually and are used across the open oceans and also in EEZs. In addition, the EBSA process is a scientific and technical one with no management implications thus far. Though EBSAs endorsed by the CBD conference of the parties will be brought to the attention of the UNGA. VMEs, developed through fora in the fisheries community, are applied to deep-sea habitats/species traits and functions, used in relation to fisheries impacts, and embedded within the management tools of the RFMO/As.

Other information presented

65. Mr Luis Lopez Abellan showed photographs of the Walvis Ridge (Namibia) Research Experience 2008–2010 (for the SEAFO). Instituto Español de Oceanografía (IEO) is developing a geographic information systems (GIS) based geoportal that includes historical and current data. IEO works at a species and occurrence data level, and the data are provided to OBIS.

66. Mr Shingo Ota presented pictures of corals in the Emperor Seamount Area. Large amounts of coral bycatch were taken in the 1960s in this area. It was asked if these areas would qualify as VMEs but no conclusion was reached. It was pointed out that fauna are at low density in the pictures but a portion of this type of ecosystem should be preserved. A comparison of the pictures of existing fishing grounds and unfished areas indicates little difference. He suggested that there must be a common definition of VME and an understanding of what exactly should be contained in the VME database.

67. Mr David Ramm described the CCAMLR experience in relation to VME related work where the Secretariat holds data on VMEs as identified by scientific research (fishery-independent data), and potential encounters with VMEs identified during the course of fishing in high seas deep-sea fisheries (fishery data). The requirements for providing these data are described in CCAMLR's Conservation Measures (see www.ccamlr.org/pu/e/e_pubs/cm/drt.htm), and the data support the Commission's responsibilities in managing bottom fishing in its Convention Area (i.e. the Southern Ocean).

68. Encounters with VMEs are notified to the Secretariat and reviewed by CCAMLR's working groups and Scientific Committee. These VMEs are recorded in CCAMLR's VME database, along with information on:

- how the VME was identified (including sampling equipment);
- details of all VME taxa observed, including their relative density, absolute density, or number of organisms if possible;
- ancillary data such as multibeam bathymetry, CTD profiles, current profiles, water chemistry, substrate types recorded at or near those locations, other fauna observed, video recordings and acoustic profiles;
- supporting evidence, rationale, analysis, and justification to classify the indicated area as a VME.

69. Vessels fishing in CCAMLR's high seas deep-sea fisheries are only permitted to operate longlines and pots, and each vessel is required to monitor all line segments for potential encounters with VMEs. Guidelines for recording such encounters are provided in fishery and scientific observer data forms (www.ccamlr.org/pu/e/sc/dat/intro.htm). If five or more VME-indicator units[4] are recovered from a single line segment during the course of fishing, then the vessel must immediately submit a VME-indicator notification to the Secretariat. Vessels are required to monitor all line segments for the number of VME-indicator units, and collect segment-specific data on the number of VME-indicator units. Scientific observers present on board all bottom fishing vessels record the occurrence and composition of VME-indicator taxa (see VME Taxa Classification Guide www.ccamlr.org/pu/e/sc/dat/intro.htm).

70. As of November 2011, CCAMLR has registered 34 VMEs in the Southern Ocean (in Subareas 48.1, 48.2 and 88.1 and Division 58.4.1). Thirty-two of these registered VMEs (in Subareas 48.1and 48.2 and Division 58.4.1) are located in areas which are currently closed to most bottom fishing activities. Two VMEs in the Ross Sea (Subarea 88.1) are located in an area where bottom fishing is permitted in depths deeper than 550 m. Bottom fishing within 1.25 nautical mile of those VMEs has been prohibited.

[4] "VME indicator unit" means either one litre of those VME indicator organisms that can be placed in a 10-litre container, or one kilogram of those VME indicator organisms that do not fit into a 10-litre container.

71. To date, CCAMLR has received 112 VME-indicator notifications of potential encounters with VMEs during the course of fishing in the HSDS fisheries: 29 notifications in 2008/09; 24 in 2009/10; and 59 in 2010/11. Most of these potential encounters occurred in the longline fisheries for toothfish (*Dissostichus* spp.). Forty-six VME Risk Areas were identified from these notifications (i.e. ≥10 VME-indicator units recorded from a single line segment) (42 in Subarea 88.1 and 4 in Subarea 88.2). In addition, six VME fine-scale rectangles were identified (5 in Subarea 88.1 and 1 in Subarea 88.2). Bottom fishing within each risk area (1.0 n mile radius) is prohibited until the risk area has been reviewed by CCAMLR's Scientific Committee and management actions has been determined by the Commission. Scientific research is permitted in Risk Areas by pre-agreement by the Scientific Committee.

72. CCAMLR will implement a web-based, public domain VME registry in early 2012, following the redevelopment of its Web site. In addition, CCAMLR publishes annually a report on bottom fisheries and VMEs (see www.ccamlr.org/pu/e/e_pubs/fr/drt.htm).

Discussion

73. The use of absence data in regard to the ICES database was discussed. Some participants noted that absence data are quantitative and that such quantitative indicators could be an integral part of the database. However, there is the issue of gear efficiency in determining whether non-catch of a sensitive species in the gear actually reflects absence or not. As well as other issues with the use of absence data. Participants came to the conclusion that this would not be a useful set of data for the VME database at this stage.

74. Potential size of the VME database was also discussed. It was noted that in the ICES database there are 4 000–5 000 records in the ICES area, more in the NAFO area, which does not include the absence data.

75. Participants noted that the ICES database provides an opportunity to maintain various levels of confidentiality thanks to an agreed policy. This could provide opportunities for contributions to the VME database.

76. The EBSA regional workshops and differences in regional approaches were discussed. In the North Atlantic, suggested EBSAs covered broad areas where as other regions suggested smaller spatial parameters.

77. With regards to the potential contribution of CoML and OBIS data it was noted the potential bias due to incomplete coverage and questioned the percentage of data relevant to the deep seas. The pertinence of this information would thus vary from region to region. The use of CoML, OBIS data and the EBSA process could be of more use in areas where there is no RFMO/A process in place to collect or hold data.

78. In regard to discussions on additional information, it was noted that there is no agreed global definition of a VME and it was pointed out that FAO is not aiming at uniformity. FAO is rather aiming at identifying approaches that have been taken within regions and compiling best practices.

SESSION 4: TOOLS AND FRAMEWORKS FOR THE DATABASE

Presentation – *Overview of frameworks and tools for the database, by Marc Taconet*

79. Introducing the session, Mr Taconet provided an overview of FAO database frameworks and tools relevant to the VME-database: The Fishery Resource Monitoring System (FIRMS), FIGIS, iMarine and D4Science.

80. FIRMS is a possible example of information exchange partnerships and the VME-database could build on similar workflow processes. FIRMS is powered by the Fisheries Global Information System (FIGIS), The FAO Fisheries and Aquaculture Department's IT platform.

81. iMarine is an initiative launched under an EU funded project which can assist in supporting multidisciplinary information needs of the ecosystem approach to fisheries (EAF) for the management and conservation of marine living resources. iMarine builds on the D4Science data e-infrastructure, a "cloud" technology which offers high storage and computing capacities, facilitates organization of workflows including confidentiality requirements, fosters interoperability among existing information systems and offers multidisciplinary collaborative workspaces. Sustainability of the iMarine infrastructure is part of the project's objectives. Besides FAO, other high seas deep-sea relevant organizations are partners in the iMarine project.

Presentation – *Some initial proposals of information products: structure, contents and functionalities for the VME database, by Fabio Carocci*

82. Mr Carocci introduced workshop participants to key elements of the VME database as they were conceived by the FAO secretariat before the workshop. The presentation outlined some of the principles that should inspire the development of the VME database and its main contents. A first suggestion for workflow and system architecture was presented as well as the basis for further analysis and discussions. Several examples of similar experiences in FAO and of potential input, storage, processing and output modules were illustrated. The database itself is envisioned to be a web-enabled, georeferenced database.

Discussion

83. The follow up discussion focused on the objectives of the database, level of details needed and ways of protecting the confidentiality of data, as well as the main functionalities such as submission of information and types of reporting by means of fact-sheets and mapping tools.

84. Main points included:

- **Database objectives:** The primary objective for the database should be to facilitate communication among RFMO/As and States and raise public awareness for civil society with regards to VME issues.
- **Database responsibilities:** In developing the VME database, RFMO/As and States responsibility is to provide data and information on VMEs (input) while FAO's responsibility is to provide a collaborative platform and means to access and disseminate the VME information (output). Input should be at finest detail possible, but the level of detail will depend on arrangements in place within each region. Full details will generally not go to the public and aggregation mechanisms are necessary before publishing and need to be further discussed. It is also understood that RFMO/As are generally legally constrained to providing aggregate data only, and the global VME database should link to contributing RFMO/As to seek further details. Conversely, where an RFMO/A is not hosting a database, it could link to the VME database instead of having to develop and maintain their own Web page/site on VMEs.
- **Historical changes:** The VME-database should maintain historical perspective to see what is happening now in relation to the past. Along time, the information on underlying management measures may change and the VME database should reflect these changes by linking VME related decisions to information at any given time.
- **Optimization issues:** Other points were raised regarding the need for a user friendly and fast response interface for accessing the VME database though the Internet, as well as the required difference in treatment between scientific information and fisheries data.

- **Dissemination tools:** The use of open access mapping tools, such as Google Earth, were discussed as valuable means to facilitate the dissemination of information stored in the VME database and to raise awareness. However, the misuse of facts and information should be prevented and any information disseminated should be generic with only limited search functionalities. Other mapping tools, such as those offered within the FIGIS infrastructure, might offer additional functionalities for access control to the VME database as requested by RFMO/As and States.

85. Overall, participants agreed on what was proposed for the VME database and were confident that FAO can deliver a first prototype on which basis details and improvements can be further discussed.

86. It was noted that RFMO/As and States may request FAO, if needed, to act as the custodian of data made available for the VME database. It was noted that the VME database could eventually include two separate workspaces: a public workspace, where data and information are made available without limitations, and a private workspace where only authorized users can access the content of the VME database.

Other information presented

87. A PowerPoint printout was circulated showing the development of an Offshore Spatial Management Network for South Africa (Source: Kerry Sink, South African National Biodiversity Institute). The system development started with a workshop where an approach and objectives were developed. Stakeholder engagement was multisectoral. A systematic biodiversity plan was developed, with the aim to represent habitat, protect VMEs and threatened species, support fisheries sustainability and reduce bycatch. A key aspect is the delineation of areas requiring protection and examples were presented.

DEMONSTRATION OF POSSIBLE TOOLS

Presentation – *Fisheries Global Information System, by Aureliano Gentile*

88. Mr Gentile introduced the FIGIS, as a possible multilingual IT framework for the development of the VME database.

89. FIGIS offers an information management tool to build institutional partnerships, a framework with reference to FAO information management policies, expert knowledge, software tools, collaborative mechanisms, and interoperability solutions. Furthermore, FIGIS has standards driven data exchange protocols within a streamlined information flows.

90. A typical scenario for the data production and dissemination was shown and particular emphasis was given to the fact sheet format. A fact sheet is a modular and portable form of knowledge for presenting information in a concise format which emphasizes words and key concepts. Information is transformed in a friendly format, easy to read and to utilize whereas the content and its layout are intuitive, minimalist and visually explicit.

91. FIGIS fact sheets are XML based and supported by metadata. They follow structured templates for the storage of the information and for the layout. Fact sheets can combine information from various sources dynamically, can embed maps and video and can be printed, transformed in other format and re-utilized in other Web sites.

92. FIGIS provides a Word/Excel-to-XML converter for the production of fact sheets or web pages in organized workflow. The tool facilitates data submission, ensures that the agreed standards are respected and referenced data are dynamically integrated as appropriate.

93. In terms of geospatial data opportunities in FIGIS, the database contain maps and geospatial explicit data, map viewers are available and support is provided for upload and editing of user's georeferenced data.

Presentation – *D4Science and iMarine infrastructures, by Anton Ellenbroek*

94. Mr Ellenbroek presented the opportunities offered by the D4Science infrastructure.

95. The D4Science technologies can offer extensive collaborative features, powerful data processing, database technology (using PostgreSQL and open source object-relational database system), and GIS features. All components developed in the infrastructure are based on Java and use Open Source software. This facilitates their re-use in other settings. These could be used to establish a more advanced technology infrastructure for future the design and operation of the VME database.

96. Future components of the VME database could use iMarine resources for collaborative environment on VMEs. Key features offered include geospatial data management and analysis, harmonization of data, authoring and authorization, reporting and repository.

97. The iMarine project can provide access to some resources for the duration of the project. Besides FAO, other relevant organizations are partner in the project; NEAFC will participate in VMS/VTI data analysis; OBIS is the world aggregator of marine species biodiversity; the FishBase Information Network (FIN) and Centro de Referência em Informação Ambiental (Reference Center on Environmental Information – CRIA) are providing species distribution predictive models (respectively Aquamaps and OpenModeller); Terradue provides wide access to oceans observation data (satellite and *in situ*).

98. A live demonstration of two Virtual Research Environments, the Integrated Catch Information Systems (ICIS) and VTI was delivered. This demonstration illustrated key features of geospatial data management and analysis, harmonization of data, authoring and authorization, reporting and repository. In order to make efficient use of the technologies, a well-defined set of requirements would have to be defined, especially to address the data access and sharing policies.

Discussion

99. It was noted that the type of facilities offered by D4Science (file repository, fine grained data sharing potential, or "R" analytical framework) are those needed by scientific community in their discussions and on processing analytical methods.

100. Most participants supported the concept but anticipate difficulties in having States, RFMO/As or fishers actually feed information into such an infrastructure. Main issues highlighted are compliance with the relevant organizations' policies, informal status of some organizations (e.g. NPFC and SPRFMO) and security and confidentiality aspects e.g. for VMS data or encounter records.

DISCUSSION GROUP SUMMARIES

101. The meeting participants broke into discussion groups (see Appendix 5 for list of discussion group participants) dealing with, i) science issues, chaired by Ms Ellen Kenchington, ii) management and policy, chaired by David Ramm, and iii) industry, chaired by Pascal Laurence. The groups were asked to consider three questions based on what was presented in the first three sessions;

- What do you hope to gain from the FAO VME database?
- What can you contribute to the FAO VME database?
- Are there any other existing initiatives that may be important to connect to the VME database?

Science discussion group

What do you hope to gain from the FAO VME database?

102. The science group discussed the primary benefits they hoped to gain from the VME database. The information disseminated publicly through the VME database should serve the RFMO/A advisory process, e.g. sharing of information to see how other science groups have used data or to learn about the VME organisms in general. It would also increase overall awareness of the general public on science-based processes within the RFMO/As and subsequent actions taken to protect VMEs.

103. This group also indicated that a major benefit could be the support of scientific processes through the development of a collaborative scientific platform under controlled and secured access enabling an integrated archive of VME data. Such a platform would faciliate scientific processes within RFMOs through access to data as agreed with competent authorities (e.g. fisheries derived data on VMEs), make accessible data that currently reside on individual computers, and integrate fishing, research data and other sources of data on a global scale. This could provide access to encounter data (at least in some RFMO/As), and potential assistance in research planning (e.g. prioritizing areas).

What can you contribute to the FAO VME database?

104. The scientific community could assist in providing appropriate linkages at national/regional level to related or useful projects and databases as indicated in the list below. This could include sourcing and making available data sets from projects, universities, and museums. This community could also contribute by providing advice on analytical tools that could be used in conjunction with the database (e.g. maps, statistics) and contribute to peer review of the data for quality control.

105. In addition to what scientists can contribute, the Science Group suggested that the management community within RFMO/As could provide data on:

- Closures related to the VME guidelines
- New fishing areas
- Existing fishing areas
- Encounter records in both new and existing fishing areas
- Risk areas (temporary closures)
- VMS records, historical time series
- Fisheries data (e.g., georeferenced logbook data; plotter data of coral)
- Voluntary closures

106. In areas without RFMO/As this could include:

- Encounter records kept by flag states

Are there any other existing initiatives that may be important to connect to the VME database?

107. Environmental data:

- The General Bathymetric Chart of the Oceans (GEBCO) or higher resolution bathymetry (multibeam echosounders where available as for example those from National Oceanic and Atmospheric Administration [NOAA])
- Seamount databases
- Hydrothermal vent database
- Oceanographic data

108. Biodiversity data:

- World Register of Marine Species (WoRMS)
- Coral databases, sponge databases
- EBSA Repository (CBD)

109. Fisheries and management data:

- FIRMS
- UNEP WCMC (world conservation monitoring center, UNEP)
- ICES/ North Pacific Marine Science Organization (PICES)/RFMO/As
- UNGA, FAO Guidelines

110. The Science Group also specifically discussed desired data properties of importance to the scientific community. These included:

- Reliability of data (peer review process and quality control)
- Data confidentiality (with hierarchical access) where clearly defined data policies will allow for more data to be contributed, but will limit public access
- Accurate metadata, and information on provenance
- Data with time stamp attached
- Taxonomic information linked to standard classifications like WoRMS
- Occurrence of VME (in numbers/weight/presence)
- Gear type (including doors, rollers, bars, configuration, escape panels), distance from the bottom, etc.
- Depth from vessel if available
- Links to catches of major species (using unique identifier for catch record)
- Fine enough spatial resolution to be able to address specific issues on closure boundaries etc. (fine-scale spatial planning and management)
- Identify a common spatial scale for all data sources if possible
- Georeferencing using decimal degrees coordinates
- Compatibility with international or regional standards (e.g., INSPIRE) to allow for integration and aggregation (e.g. within and outside EEZ) so to easily address global distribution questions.

Management and policy discussion group

What do you hope to gain from the VME database?

111. For RFMOs that have already instituted VME measures, the main benefits of the VME database will be to enable comparisons between RFMO/A approaches and application of criteria between regions, to assist in identifying best practices, and to promote transparency and outreach. Summary/aggregated VME data are adequate for the policy and management requirements, and focus should be on measures (i.e. action) which have been taken to avoid encounters with VMEs or other measures of relevance and not on actions that have not been taken.

112. Overall the development of the VME database needs to set be seen within the context of the UNGA request and the FAO international guidelines on the management of deep-sea fisheries in the high seas.

113. The management community specifically mentioned the importance of retrieving the following information publicly available VME database: a) information on VME areas (coordinates), b) criteria underlying the management measures, including species list and assessment processes, and c) information on VME classifications and measures currently in place. This information should be time referenced to facilitate review from a historical perspective. There are expectations that standards will evolve with regards to the move on rule and thresholds for different species, areas and gears – thus it is important to have temporal perspective. In future there might be different thresholds for different fisheries (e.g. trawl fisheries vs. longline fisheries, etc.). Inclusion of GIS type tools (including layers such as bathymetry) could also serve to identify information or data gaps.

114. The publicly available part of the VME database should include management related information such as different types of closures (even when not a VME), e.g. risk areas or temporarily

closed areas for which information is expected to be reviewed by a scientific process in the future. This should be inclusive of related regulations, maps of closed areas and the scientific processes behind the decision process. The database should also capture the general management measures in place aimed at reducing probability of an encounter with a VME (e.g. for the entire fishery, parts of an area, etc.) and allow for comparisons of species and threshold levels, with the view to the identification of best practices. It should acknowledge the different thresholds used by different authorities, or in different regions.

What can you contribute to the VME database?

115. In general the RFMO/As present at the workshop agreed that they could provide most of the information required for the database and possibly basic data in aggregated format (by grids). Nevertheless, it was noted that there are differences between RFMO/As and what they can contribute.

116. In the case of NEAFC, information would come from ICES through its research activities. With respect to fisheries data, more and more of the vessels operating in the region make use of electronic logbooks; their content goes to monitoring centers of the flag states, but there is no common practice for what can be extracted for scientific purposes. NEAFC has no observer requirements except for new fisheries.

117. NAFO has a slightly different situation compared to NEAFC. All research data can be provided and is not limited by RFMO policy constraints. VMS data cannot be provided directly, only to the science council at aggregated levels (hence only indirectly). The scientific council can request this data in a specific format. However, there are currently discussions within NAFO to propose relaxing these restrictions. NAFO also has onboard observers, but observer reports are confidential. Vessels operating in NAFO provide daily reports which include catch information (catch and bycatch).

118. Both SPRFMO and CCLMAR have access to tow-by-tow data, but these data are confidential.

119. The biggest constraint as regards RFMO/A contributions are the confidentiality requirements related to fisheries data. There is a specific need for data sharing agreements to address these issues.

120. In general, data which could be provided, include: area-based measures; other management measures; justification; history/timestamp; related regulations and compliance; links to background documents (working group papers, species identification guides etc.); possible provision of aggregated catch and effort data (e.g. by 1x1 degree).[5]

Are there any other initiatives that may be important to consider?

121. Important regional initiatives in the management community include: a) flag state requirements and reporting especially in areas without RFMO/As; b) information from research in risk areas (e.g. NEAFC through ICES); and c) seamount data, from regional analysis and the seamounts online database, noting that caution is required in how this information is used as not all seamounts equal a VME and many are well outside the fishing range.

122. Relevant global initiatives include: a) available bathymetry and topographic information, b) information from OBIS (although there would need to analyse the extent of information relevant to ABNJ, c) the CCAMLR representative system of MPAs, d) EBSA-related data and information collected through the identification process, especially in areas where little information is available; and e) potentially lists of threatened species (e.g. IUCN) where relevant, noting that the methodologies differ between the conservation and fishing communities and only lists that are generally accepted would be useful.

[5] It is unlikely that raw/fine-scale data would be able to be provided to the database.

123. The VME database could develop ownership and access points to RFMO/A factual database, similar to FIRMS. In FIRMS, every fact sheet is owned by an institution, and linked to information sources allowing to trace back original information underlying decisions.

Other points of discussion

124. All of the RFMO/As present at the Workshop appreciated the idea of having one central entry point to access information on VMEs and to find links to other relevant information. There is a need to be able to trace back original information underlying management decisions and it would be important that the database demonstrate this capacity. Scientific advice should be provided at a detailed enough level to facilitate understanding of whether processes and data are comparable.

125. The question on how to proceed in areas where there is no RFMO/As was raised and the need for the involvement and contribution of flag states was stressed. Examples of state actions were mentioned e.g. in Pacific where states decided on threshold levels and identified some protected areas although these might not be globally accepted by other nations.

126. There were also questions on what to do in the case where interim arrangements are in place under as SPRFMO. Reflection on how to distinguish this in the database will be required.

Industry discussion group

What do you hope to gain from the FAO VME database?

127. From the industry perspective, the main benefit from the database could be its use as tool for transparency and outreach which could help industry show the sustainability of its activity or demonstrate that the industry has taken serious steps to reduce impacts of fishing on VMEs. The database should promote information on State, RFMO or industry compliance with the FAO Deep-sea Guidelines or relevant UNGA Resolutions. The database should focus on information from competent authorities (states or RFMO/As).

128. The fishing industry group also discussed how they thought the database could be useful in general. Summary or aggregated VME data should be adequate for the policy and management requirements and data formats should allow for comparison between RFMO/A approaches and application of criteria. It could create a public dissemination space for sharing information, data or best practices including impact assessments when these are made available by RFMO/As.

129. The fishing industry group felt it would be important to include different types of "VMEs areas" in the database. For each area, the status and rationale for the classification of the area should be specified, e.g. complete fishing ban, permanent closure, temporary fishing ban/temporary closure, "unfished areas", areas declared under "exploratory fishing", VME risk areas or areas that are avoided by fishers because of known but undeclared VMEs.

130. The Group specified the types of information that would be useful for each of the following:

- **Areas:** VME type, status, classification, location, characteristics, including species occurrence and abundances management measures: closures, reviews of regulations, background material and references;
- **Indicators/management rules:** thresholds, move-on rules, gear specific (including catchability) – these should be available by region;
- **Fishing footprint:** flexibility would be required among regions, e.g. difference in fishing footprints declared by 60'squares by New Zealand in South Pacific, the Emperor Seamounts in the North Pacific);
- **Other:** Information from emerging RFMO/As; Management information regarding how Flag states authorize fishing activities in the high seas for their vessels.

131. The industry would find it useful if the database provided point data for VMEs which could be downloaded as part of electronic navigation instruments (e.g. MaxSea format import file).

What can you contribute to the FAO VME database?

132. The fishing industry could provide information to the database, but through the flag State and/or through the relevant RFMO/As. The information flow should be better specified and industry would benefit from clearer instructions as there are multiple competent authorities in some areas (e. g. in the North Atlantic, there are different RFMOs, ICES, flag States, and the EU)

133. Information or data on the fishing footprint or tow-by-tow data, and detailed boundaries of fishing areas should only be included when possible. It should be noted that for many states it is not possible to provide this level of detailed information for legal reasons, such information must be treated under appropriate confidentiality requirements. The legal impediments or confidentiality issues might require memorandum of understandings (MOUs) to elaborate the responsibilities of RFMO/As, FAO, and flag States and where the originator of the data could define how the data can be used or what disclaimers need to be used (to protect the industry).

134. Information that should not be included in the VME database, due to their confidential nature includes:

- precise locations of precious corals or other VME species with high market values to prevent illegal, unreported and unregulated (IUU) fishing;
- fine level or detailed fishing data (aggregation of data is required to not disclose the exact position of fishing grounds or precious corals);
- detailed bathymetry originating from fishing operations.

135. According to the industry the following scientific information should be included:

- data from scientific surveys including summaries by squares of findings;
- absence data from scientific surveys are of major importance; and
- georeferenced metadata inventory of existing surveys (e.g. in North Atlantic) for use by stakeholders in impact assessment.

Are there any other existing initiatives that may be important to connect to the VME database?

136. VMEs and VME-related information should be the focus, and eventually other sources could be added, as relevant (in relation with modular approach described for the development of the database).

137. Other sources that may be of interest include:

- seamount data though the purpose would have to be well defined, data from Pangea (though there were questions about what is available on the deepwater environment);
- ICES database;
- seabed information sources (e.g. Global Earth Observation System of Systems [GEOSS]).

FAO VME DATABASE OPTIONS, PRIORITIES AND ROAD MAP

138. The proposal for the last day was to build on the previous inputs to develop, through discussion groups, the key elements of the VME database, highlighting priorities and the agreement on a roadmap. The first group addressed technical elements (technical requirements and data sources), while the second group covered the governance elements (data sharing policy, networking and social dimensions, governance and information system sustainability).

139. The technical requirements subgroup was asked to elaborate on the FAO technical proposal on the possible architecture of the database and to identify data sources that could contribute to and

enrich the content of the VME database. A summary of the discussion is presented at below. Potential candidates of additional data sources are available in Appendix 6.

140. The governance subgroup was invited to discuss an initial list of governance and data sharing issues (see Appendix 8). This list compiles needs and expectation expressed by participants during previous sessions, focusing on data flow and information contribution aspects. This group examined a) the level of ownership and control by stakeholders over system developments, and b) the necessary reporting structure and processes for achieving the database objectives [this includes who has authority, how this authority is controlled, and which mechanisms are used to ensure participation], and c) data sharing policies addressing the principles and conditions under which contributed information is shared and used.

Summary of the group discussions

Technical group report

141. Mr Carocci presented the summary of discussions of the technical requirements subgroup. The subgroup addressed several elements of the VME database, including principles, core elements, system architecture and functionalities. Here follows details of the outcomes.

142. These are the main principles the VME database should be built upon:

- The development of the VME database strongly relies on the contributions of the informal partnership among RFMO/As, the scientific community and the industry representatives aiming to build a network of collaborative efforts. This informal partnership is thereafter referred to as the "VME network".
- VME records to be disseminated through the VME-DB Web site are the result of a process, and therefore are those recognized or in the process of being recognized by legal entities such as RFMO/As and States.
- Each VME record is provided by recognized members of the VME network. The provider (or data owner) is responsible for the data submitted and for its maintenance; the data owner is also requested to indicate access rules (i.e. data with public or partially/full restricted access) and level of details accessible through the VME database web-based dissemination platform (i.e. exact or generalized locations through the use of geographic aggregation methods).
- Members of the VME network which are entitled to publish VME records through the VME database Web site are: i) RFMO/As having competence on the area where the VME is located (acting as data owner), or ii) flag States or industry representative that such flag States would designate to act on their behalf.
- To overcome confidentiality issues, aggregation methods at spatial/temporal scale must be developed and made available to data owners.
- VME locations are recorded as points, lines, set of grid cells, or areas in a Web-enabled georeferenced database.
- The description of a VME area should include biological/ecological information, type and level of threads or pressure on VMEs, status and trends in VME areas, management options, etc.
- The development of the VME database will follow the principles of modularity and scalability (i.e., a step by step approach alond the duration of the project in terms of functions and contents made available to the community and to the public).
- The VME database gathers all VME information which are stored in harmonized way and disseminated in an agreed standard through the VME database Web site.
- Each new submission needs to be compliant with a minimum set of mandatory information and controlled terminology agreed among data contributors. Any additional information is however properly stored and disseminated.

143. It was agreed that the VME database should initially contains the following core elements, possibly expandable when additional information or requirements become available.

- A set of elements identifying the VME area, including a unique identifier, a name, the data owner, the main source of information;
- The typology or status of the VME area described as established, under establishment, risk area, on a voluntary basis;
- The geographic dimension, including the location and coordinates, the proximity with other relevant ocean related features, metrics (e.g., surface, location of centroid, etc.);
- The criteria used to identify the VME as established;
- A description of main habitat and biological characteristcs within the VME area;
- The type of pressure currently exerted within or around the VEM area and the fishing footprints;
- The type of management options and its historical evolution established by the competent authority.

144. A minimum set of functionalities and facilities that the VME database should offer were discussed and agreed as follows.

- The input of information from data owners is enabled through either a series of web-based input forms or by means of submission of structured documents. The data owner could also provide link and access to existing databases or information systems if available.
- The data provided should be controlled against a set of validation models against controlled vocabularies or code-lists (e.g., international standards for species names, gear codes, etc.).
- If necessary, aggregation operators and summary reports for each VME area are provided to facilitate the analysis and dissemination of information within the VME database.
- A series of search facilities is offered to data owners and to the public to easy the retrieval of information.
- The output or publishing of such information will consist of fact-sheets, mapping viewers, export facilities, and structured summary reports in PDF format.
- Overall, the VME database could respond to criteria of an integrated authoring environment, including multi-user authoring, metadata creation, powerful linking, scalability, etc.
- The content management should ensure version control, security, authority and access rights by different groups of users.

145. The system architecture was briefly presented and discussed as follows, together with the potentiality offered by a more advanced infrastructure like iMarine.

- The basic system architecture is deviced considering the current technology available in FAO.
- The VME database is based on relational databases (e.g., Oracle, PosgresSQL, MySQL) connected with a server for mapping (e.g., GeoServer) capable of providing spatial geographic functions.
- The VME database portal relies on the FIGIS platform for data repository (VMEs, Map viewer and other information references).
- The content of the VME database is disseminated through the portal in the form of fact sheets (XML format) integrated with GIS based maps and a search interface.
- The more advanced iMarine e-infrastructure could provide to data owners, under a controlled access, a collaborative space through Virtual Research Environment (VRE) for enhancing the capacity of input, information sharing, and analysis.

146. More details can be found in FIGIS wiki page[6].

147. Mr Ellenbroek also presented an example outline of the possible organization of the VME database where the components would include the Web site, the collaboration tools, the data work flow, and the application functionalities. These elements are contained in Appendix 7.

Governance group report

148. Mr Taconet introduced the summary report from this subgroup. The Group noted that Involvement of stakeholders will be both handled from a formal and informal view point. Generally two fundamental cases should be addressed, those areas under RFMO/A coverage and those not covered by RFMO/A.

149. Formally, RFMO/As and States could be called on to participate in this initiative during FAO Committee on Fisheries (COFI) and invited to contribute through a circular letter. For areas under RFMO/A competence, States should also be invited to collaborate as part of the RFMO/A involvement. MOUs or a simple exchange of letter that describes the type of data to be contributed or involvement required can be established between FAO and a State or RFMO/A to strengthen commitments and help with transparency.

150. Informal involvement could take place through networking activities, which will combine regional workshops, moderated web-based discussion groups, mailing lists, wikis and training activities. Active networking will be key in order to foster guidance on new subjects.

151. The high level principle retained for policies is for FAO to drive, involve, make decisions and cope with conflicts resolutions; stakeholders have a guidance role and possibly editorial contributions.

152. A general principle is to develop this database following international standards for formats and best practices.

153. Policy should distinguish between areas under RFMO/A coverage and those not. This was, for example, discussed in relation to encounters, and historical fishing. While RFMO/As should provide to the VME-database aggregated results of their analyses including criteria that have been used, FAO could potentially make available a "toolbox" for States contributing outside of a RFMO/A and facilitate their collaboration.

154. Such "toolbox" could include a data repository for gathering information from stakeholders and analytical support consisting of tools, best practices and the lending of expertise which can be mobilized by FAO to assist a specific group of flag States. A firewall should exist between the data repository and its exploitation through working groups.

155. Regarding the "fishing footprint", the data contributed should distinguish among "historical footprint" and "current fishing areas". The capacity to review more detailed information is important and as such historical fisheries information is also important.

Discussion

156. The discussion which followed the presentation of the governance subgroup mainly focussed on issues of use of the VME database, sustainability and engagement of RFMO/A members, and networking.

[6] http://km.fao.org/FIGISwiki/index.php/VME_database_Workshop_December_2011

Use of the VME database

157. It was suggested that the VME database (in later stages) could serve as a global repository for information on impacts on marine resources and habitats, e.g., including survey data, fisheries data, references to literature, collections of case studies, etc., with well-documented data and studies documenting impacts including historical footprint, possibly at low resolution. Such a global collection of information does not exist anywhere and could very useful.

158. It was noted that the footprint is not equal to impacts from fishing activities. It would be useful to also include past distribution of fishing at the available resolution.

159. Industry noted that though catch, effort and fisheries related information normally is responsibility of flag states, auxiliary information collected by companies from fishing operations could be contributed directly by the industry.

Sustainability and engagement of RFMO/As

160. Sustainability aspects will have to be established on the way, and this should be covered as part of the final project report. A central question is which agency will support the platform once developed through the project. The various ideas for sustaining the VME database include co-financing by concerned institutions, fund raising through other projects (GEF project, individual regional projects), or hosting under the FIRMS agreement.

161. Data contributions from RFMO/As will require agreement from their contracting parties, and the consultation/feedback process might encounter delays. In order to facilitate this process an annex should highlight the optional and minimum requirements.

Networking

162. An active network will be important for driving the VME-database developments in an appropriate way. A group of RFMOs and industry have agreed to be cases studies for VME scientific information with management information.

163. ICES and NAFO are consolidating academic info in the North Atlantic, but this does not exist in other parts of the world. Networking would therefore aim at accessing similar information at global scale.

164. Active networking could be supported through various FAO activities such as regional workshops or historical data processing.

165. A final question was posed for areas not covered by RFMO/As, regarding how to list those flag States which should contribute.

ROADMAP/MILESTONES

166. The VME database development milestones were reviewed against relevant events, and agreed as follows.

VME-database milestones

- Circulate draft VME database workshop report for comments;
- Circulate draft VME database workshop report for comments;
- Further define goals and objectives for the VME database;

- Develop a mock-up facilitating an agreement on “products”;
- Establish means to communicate on-line with the direct stakeholders and data providers (Linked-In groups, FAO wikis, etc.). Use this to inform mock-up and discuss through small discussion groups, e.g. on case study areas;
- Analyse further the data needs, and help clarify through mock-up;
- Agreement on products;
- Agree on a follow-up agenda, and define some tasks for the participants: describe their data, existing tools to share, and needs;
- Propose milestones: e.g. after three months, everybody will have been contacted with a questionnaire. Results in a project objectives document;
- Define the components of the toolbox: guided online discussion on FAO offers in statistics (time series, catch/effort analysis), geospatial (maps, encounters, satellite products), and document (Web sites, factsheets, pdf, handbooks);
- Decide on tools to achieve the objectives;
- First public release of the VME database;
- Discussion on sustainability of database;
- Second main release of the VME database.

APPENDIX 1

Annotated Agenda

DAY 1 – Wednesday 7 December 2011	
09:00–9:45	**Introduction** - Welcome and introductions - Opening and administrative arrangements - Positioning the workshop and its objectives, and organization of work
09:45–11:00	**Session 1: Overview of RFMO/A VME-related activities** - *Presentation:* • Synthesis of RFMO/A activities - *Odd Aksel Bergstad* (15 min) • Complementary information from other participants - *Discussion* • Understanding data flows and information storage within different RFMO/As – What information is the basis for different analysis? (survey data, fisheries related data (catch and effort), VMS data, etc.) – confidentiality issues – availability of information for scientific analysis? • Are there systems in place that can be useful for global database? How does the different RFMO/As see the use and need of a database?
11:00–11:20	**Coffee break**
11:20–12:45	**Session 2: Overview of industry perspectives and inputs** - *Presentation:* • Synthesis of data and needs – *Graham Patchell* (15 min) • Complementary information from other participants - *Discussion* • How are industry data used in the management process today? Strengths and weaknesses of data? (possibly touched upon in presentation), Industry perception and willingness to contribute?
12:45–14:00	**Lunch**
14:00–15:30	**Session 3: Experience in VME-related databases** - *Presentation:* • Data sources and types used by the ICES/NAFO Working Group on Deepwater Ecology and the development of an integrated database of VME records for the North Atlantic – *Francis Neat* (15 min) • Developing linkages between the EBSA data repository, the OBIS information system and the VME database – *Patrick Halpin* (15 min) • Complementary information from other participants - *Discussion*

	• What are potential linkages and synergies?
15:30–15:50	**Coffee break**
15:50–17:00	**Summary of the three sessions and discussion of products/services** • What do you hope to gain from the FAO VME database? • What can you contribute to the FAO VME database? • Are there any other existing initiatives that may be important to connect to the VME database?
DAY 2 – Thursday 8 December 2011	
09:00–10:30	**Session 4: Tools and frameworks for the database** - Presentation: • Overview of frameworks and tools for the database – *Marc Taconet* (15 min) • An initial proposal of information products – *Fabio Carocci* (15 min) • Presentation/demonstration of possible tools – *Anton Ellenbroek* and *Aureliano Gentile* (45 min) - *Discussion*
10:30–11:00	**Coffee break**
11:00–13:00	**Discussion groups** • What do you hope to gain from the FAO VME database? • What can you contribute to the FAO VME database? • Are there any other existing initiatives that may be important to connect to the VME database?
13:00–14:15	**Lunch**
14:15–15:45	**Discussion groups (continued)** - Discussion/recommendations
15:45–16:15	**Coffee break**
16:15–17:30	**Summary of the group discussions/recommendations** - Users recommendations for the VME database
DAY 3 – Friday December 9th 2011	
09:00–10:30	**Discussion groups – FAO VME database options, priorities and road map** • Technical requirements • Data sources • Data sharing policy • Networking and social dimensions • Governance and information system sustainability
10:30–11:00	**Coffee break**
11:00–13:00	**Ways forward – summary of the group discussions** - Reaching consensus on requirements and priorities, and forging a common vision - Road map
13:00–14:15	**Lunch**
14:15–15:30	**Ways forward (continued)**
15:30–16:00	**Coffee break**
16:00–	**Conclusions and main recommendations**

APPENDIX 2

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APPENDIX 3

RFMO/As experiences in VMEs: Questionaire for RFMO/As

1. Could you please review the following background papers? and:

Background Paper 1: Review of progress on implementation of the FAO international guidelines for the management of deep-sea fisheries in the high seas – experience of RFMO/A/As with identifying and protecting VMEs. By Jake Rice, DFO

Background Paper 2: Summary of the Moderator: Workshop to discuss implementation of Paragraphs 80 and 83 to 87 of Resolution 61/105 and Paragraphs 117 and 119 to 127 of Resolution 64/72 on sustainable fisheries, addressing the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of deep sea fish stocks

a) Please provide any missing information and/or progress related to VMEs in your organization

- NEAFC established five closed areas for the protection of VMEs from April 2009 to December 2015.
- The scientific evaluation of VMEs in NEAFC Regulatory Area is done by ICES.

b) Please provide a short description on how your organization is/will address the current gaps/challenges in acquiring or sharing VME data

- NEAFC is prepared to share the available data on VMEs provided that the request specification do not collide with existing NEAFC confidentiality rules.

2. Please provide a short description of your expectations for the FAO VME database

a) What does your organization hope to gain from the FAO VME database?

- The Secretariat's main expectation is the possibility of gathering information on developments in other areas of the world.

b) What can your organization contribute to the FAO VME database

- We hope to contribute with the existing information/data on VMEs and information on any future developments including scientific evaluations and recommendation, and control and enforcement issues.

APPENDIX 4

RFMO/As experiences in VMEs: Analysis of the responses to the questionnaire

Compiled by
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INTRODUCTION

Following the invitation to the FAO workshop on the VME database, a questionnaire was issued to relevant organizations asking for additional comments and information pertinent to the theme of the workshop. Two background documents were provided, i.e. a summary paper by Jake Rice read at the FAO Workshop on VME issues held in Busan, Republic of Korea in 2010, and the moderator's report from the UNGA Workshop in September 2011.

Responses to the request were received from several RFMO/As and CCAMLR. The following is a short summary of the responses.

SUMMARY OF RESPONSES

1. Experiences and challenges/gaps

Missing information and/or progress related to VMEs

There are obvious differences in the responses due to the various status of the RFMOs/As. In cases where conventions have not been fully ratified (SPRFMO, NPFC), the responsibility for implementing measures to comply with the UNGA resolutions rests on flag states. Nonetheless, several of the reports show that interim measures introduced by the organizations have led to significant action.

SPRFMO has adopted interim measures in 2007 and reports that e.g. VME encounter protocols or decisions taken by some participants to close some areas to vessels fishing due to the potential presence of VMEs, have been designed and implemented independently by flag states. To replace interim guidelines, a 'SPRFMO Bottom Fishery Impact Assessment Standard' is being developed and several flag states have submitted impact assessments and these are publicly available. SPRFMO has commenced work on their own geodatabase which currently holds geographic layers of interest to SPRFMO participants, including layers about potential VMEs such as seamounts and fishing footprint. A draft comprehensive research plan to guide all relevant future research activities of SPRFMO participants is being developed. The major shortcoming is probably that all measures are currently voluntary since the convention has not been ratified by all parties.

NPFC is in a similar interim state as SPRFMO and comments that although the FAO Guidelines for Management of Deep Sea Fisheries provide certain qualitative criteria for deciding whether an ecosystem is a VME, it is not easy to apply them to actual ecosystems without quantitative criteria. As such, the participants have not yet had a discussion on what quantity of coral indicates existence of VMEs. An ad hoc Working Group on VME criteria and encounter protocols is examining these issues. Interim measures have been agreed, including also closures of subareas of the proposed convention area. Video surveys on seamounts were conducted by Japan.

CCAMLR has recorded some encounters with VME indicators, mainly through research activity, and have declared some risk areas in accordance with agreed measures. In 2011 the Commission agreed that all bottom fishing activities shall be prohibited within the defined area of the registered VMEs, with the exception of scientific research activities agreed by the Commission for monitoring or other purposes. The impact assessment framework used by CCAMLR to estimate current bottom fishing impacts on VMEs was recently updated.

SEAFO describes how various data-sets, including up-to-date bathymetry, from a number of public sources were compiled to create a basis for choosing a set of closures likely to have seamounts and other habitats sustaining VMEs (perhpas also chemosynthetic ecosystems). Very few records of VMEs or VME indicators were available from the SEAFO areas and dedicated scientific surveys sampled very limited areas. The process led to advice from the Scientific Committee that resulted in a set of 11 closures implemented in 2010. Furthermore, an identification guide for corals and sponges has been compiled for the observers on board the fishing vessels (100 percent observer coverage on vessels). The data capturing sheets have been modified to facilitate the reporting of corals and sponges. The Commission has also adopted measures for 'existing' and 'new' bottom fishing areas. Associated encounter and move on rules were specified and new threshold levels for corals and sponges were adopted in 2011.

NAFO continues to review and refine its management measures as new information becomes available and new experience is gained. Recently, the Organization:

- adopted the official NAFO "footprint" in its Regulatory Area. The footprint distinguishes the "existing fishing area" and the "new fishing area";
- extended the closures to bottom fishing activities of eleven areas of significant coral and sponge concentrations, and the coral protective zone in Division 3O to 2014 to synchronize with the effective closure dates of the six seamounts;
- extended the deeper boundary up to 2 500 meter-contour of Area 5 – Northeast Prong of the Flemish Cap;
- reduced the 800-kg sponge threshold to 400 kg and 600 kg in the new and existing fishing areas, respectively;
- elaborated on the guidance in assessing bottom fishing activities and on what the assessments should address;
- published field guides on corals and sponges in the NAFO Regulatory Area.

In 2011, the Fisheries Commission requested the Scientific Council to produce a detailed list of VME indicator species and possibly other VME elements, to produce a comprehensive map of the location of VME indicator species and, and to make recommendations for encounter thresholds and move-on rules for groups of VME indicators including sea pens that meet the FAO Guidelines for VME and SAI. The results of the Scientific Council's work are expected to be available by June 2012. A working groups of managers and scientists consider the scientific advice and formulate further recommendations on mitigation strategies and measures for consideration by the Fisheries Commission for implementation beginning 2013.

How organizations address current gaps/challenges in acquiring or sharing VME data

SPRFMO reports that once the convention is ratified it is expected that the results of the organization's analyses determining agreed actual VMEs will be included in the SPRFMO geospatial database, and could potentially be made available to the FAO, providing the information was determined to be public domain data.

NPFC reports that ROV and bottom camera surveys will be continued by Japan and that participants in a Preparatory Conference will examine how other RFMO/As have decided that certain ecosystems are VMEs.

CCAMLR keeps a VME registry, in accordance with the Commission's rules for data access and use, and up-to-date information is communicated to flag states at short intervals. A web-based component of the VME registry will be implemented following the completion of the redevelopment of the CCAMLR Web site in early 2012. This web-based component will include a full listing of registered VME, VME risk areas and VME fine-scale rectangles, and will be located in the public domain. CCAMLR also publishes annual a comprehensive report on bottom fisheries and VMEs (see www.ccamlr.org/pu/e/e_pubs/fr/drt.htm).

SEAFO shall biannually examine the effectiveness of provisions introduced to protect VMEs and take necessary steps as recommended by its Scientific Committee.

NAFO considers that the gaps/challenges can be classified either as scientific or managerial, and notes the following:

- Elaboration of threshold quantities and VME indicator species,
- Lack of scientific data sharing policy among Contracting Parties of NAFO,
- Restrictive policy in the provision of VTI data (or VMS) to the scientists,
- No information on VME encounters by fishing vessels. It is not clear whether this is due to non-encounters or non-compliance of vessels in reporting VME encounters.
- Lack of clear policy and comprehensive measures on discards,
- Lack of international standard in temporal and spatial scale of VME data, e.g. in NAFO, a 5- nautical mile grid was used as a basis in producing the fishing footprint.

2. Expectations for the FAO VME database

Expected gains from the FAO VME database

SPRFMO comments that the most valuable contribution of an FAO database would probably be to provide international context, principles, definitions and best practice for oceanic regions to ensure global compatibility between RFMO/As, thereby also facilitating the comparison of the VME data held by the SPRFMO Secretariat with VME data held by other RFMO/As. They already plan to implement a geodatabase including VME data.

NPFC considers the FAO database useful for analysis in the NPFC and its Preparatory Conferences, especially if it also contains each RFMO/As basis for identifying VMEs.

CCAML does not seem to expect direct internal gains, but sees the potential for international standardization, communication and evaluation of impacts.

SEAFO mentions sharing of experience gained by other RFMO/As in order to better protect VMEs.
NAFO expects a benefit from having more informed background in formulating and implementing VME measures in response to UNGA 61/105. The FAO VME database can hasten the evolution and identification of “best practices”.

Contributions to the FAO VME database

SPRFMO reports that the VME data in the organization’s geodatabase could potentially be made available to the FAO, providing the information was determined to be public domain data. The organization has not yet formally considered the VME database.

Similarly, NPFC reports that as the current Scientific Working Group (and future NPFC Scientific Committee) completes work on encounter rates and distribution of VME indicator species, it can share that information via the database.

CCAMLR may contribute locations of registered VMEs, VME risk areas and fine-scale rectangles in the Southern Ocean, and their physical and biological characteristics, and also estimates of the total impact across all bottom fishing methods for the Southern Ocean. Other input would be of more procedural or general character.

SEAFO expects to contribute by making data available and sharing experience.

The NAFO Secretariat may be able to provide technical inputs in the development of the database. It can submit (within policy constraints) the VME-related information to the FAO VME database. The information NAFO can submit may include: maps and coordinates of the footprint and closed areas, list of existing VME measures, relevant NAFO publications, etc.

CONCLUSIONS

Responses to the FAO questionnaire were received from five organizations and all addressed significant issues to be considered further. NEAFC did not submit a response but would seem to be in a very similar situation as NAFO with regards to the state of implementation of various measures and the revision schedule. A difference may be that NEAFC relies heavily on the scientific advice of ICES and also presumably expects ICES to maintain a record of VMEs discovered to date in the NEAFC Regulatory Area.

All responses suggest that, provided data provision satisfies the organizations' data policies and are otherwise approved by the organizations, VME records would be available for entry into a proposed FAO VME database. Presumably this means that data sharing policies valid for the FAO database would then also have to be agreed with data providers.

All organizations see benefits from a global FAO database as a repository for VME records, and mentions issue such as standardization, experience gathering, and the possibility to do wide-ranging analyses of VMEs and human impacts as potential benefits. Several responders ask for records to be included of definitions of VMEs and encounter information.

Some organizations keep own databases, others rely on cooperating scientific bodies to maintain records. NAFO and CCAMLR offered to assist FAO with technical development.

VME records come from several sources, i.e. commercial fisheries records, encounter reports, and scientific investigations. A further source may be habitat suitability models indicating where VMEs are likely to occur but not documenting the existence of VMEs. The reports do not comment on these different sources and on exactly what data should be entered into the FAO database. This is an important issue given that e.g. most present closures were implemented without exact information on the presence or characteristics of VMEs. In many cases the state of knowledge was such that information on the spatial scale of VMEs or even existence of VMEs was lacking. (Despite this, several organizations closed significant areas because scientific advice pointed to certain areas or habitats were likely to have VMEs or were considered representative selections of such areas). An FAO database, if perhaps somewhat restrictive in terms of data quality, may benefit the regional revision processes that are conducted continuously or intermittently in all the organizations.

Another issue not addressed is transparency of information and processes underlying designation of VMEs and other measures. Potentially the VME database could help the regional organizations convey to stakeholders and the general public information on VMEs and what actions were taken to protect them, as called for in the relevant UNGA resolutions.

APPENDIX 5

Breakout discussion groups

Science	Policy/Management	Industry
Chairperson:	**Chairperson:**	**Chairperson:**
Ellen KENCHINGTON	David RAMM	Pascal LAURENCE
Odd Aksel BERGSTAD	Stefan ASMUNDSSON	Luis Lopez ABELLAN
Loh-Lee LOW	Ricardo FEDERIZON	Marc GHIGLIA
Barbara MARSHALL	Susie BALL	Joao NEVES
Francis NEAT	Kyujin SOEK	Shingo OTA
	Federico DEROSSI	Graham PATCHELL
FAO	**FAO**	**FAO**
Fabio CAROCCI	Aureliano GENTILE	Peter DEUPMANN
Anton ELLENBROEK	Hideki MORONUKI	Jessica SANDERS
Françoise LABONTÉ	Merete TANDSTAD	Marc TACONET
	Brigitte D'OFFAY	

APPENDIX 6

Governance, data sharing policies, networking, sustainability as per the outcome of the Governance Subgroup (Session 5)

There were two primary issues discussed:

- **Governance** addresses the level of ownership and control by stakeholders over system developments, and about the necessary organizational structure for achieving the goals pursued. Governance also covers who has the authority, how this authority is controlled, and through which mechanisms is the participation ensured (e.g. need for Steering committee, sub-bodies, etc.).
- **Data sharing policies** address the principles and conditions under which contributed information is shared, and used**.**

ISSUE	DATA SHARING POLICIES	GOVERNANCE ISSUES
DATA FLOW		
From industry to flag State, through RFMOs and/or FAO	• Conditions under which FAO can be custodian of countries data	• Who are flag States representatives? • Could contributions operate under Partnership arrangements? Or bilateral MOUs with FAO?
	• Which standards to adopt – formats and protocols, platforms	• FAO decides, or Forum needed to discuss
Survey data	• What level of information can be agreed to be shared?	• Identification of the providers
		• Which group defines data processing/or produces the summary outputs?
INFORMATION CONTRIBUTED	• Intellectual property rights (IPR) • Data ownership and related responsibilities • Information security • Confidentiality requirements	
VMEs – typology	• Harmonized terminologies – definitions. etc • Rapid or progressive convergence • Potential conflicts in designation	
VMEs – support information	• Provenance of information	
Encounters	• Data confidentiality requirements •	• Scientific advisory board who could ensure the review process
Footprint information – aggregated	• Applicable grid resolution • Need to preserve traceability to detailed info	
Footprint information – tow by tow	• Confidentiality requirements	
Footprint information – historical fishing data		• Who/how decide on priority data sets?
Information in support of VMEs	• Quality assurance / control – minimum. requirements	
Public dissemination space for sharing	• Level of direct editorial control on the content of Web pages of the	• Who is entitled to publish portal information?

"Best practices"	portal	
Downloads for electronic navigation instruments	• The originator must define how the data can be used, or disseminated in combination with the other sources. • Disclaimers	• MOUs: Responsibilities of RFMOs and FAO, and States
ISSUE	**DATA SHARING POLICIES**	**GOVERNANCE ISSUES**
OTHER INFORMATION	• Scope: what to be included and what not?	• Scope stems from UNGA resolution, HSDS guidelines and Busan workshop • Scientific advisory board (scientists can advise on relevant sources/ databases, or analytical tools) • Which forum defines whether a type of information source can be included • How decision is made on priorities
EBSA	• Which level and type of EBSA information could be included?	

APPENDIX 7: Different levels of products for the VME database

	VME-Web site	VME-Collaboration suite	VME-Data repositories	Applications	Requirements collected at
Access level	Public	Group	Shared	Private	
Type	Fact-sheets	Policy documents	Sharepoint or similar		M1
		Management guidelines	idem		M1
		Mapping guidelines	idem		M1
		Other areas (EBSA, EEZ)	idem		
		RFMO/A	idem		
	VME Maps	Define boundaries	GIS,		M1
			Geonetwork		M1
	VME Species Descriptions	VME Species	WoRMS/GBIF/FIGIS/AM		M6
		Valuable species	FIGIS/RFMO	Industry, RFMO	M9
		Other species	WoRMS/IUCN/UNEP WCMC	Industry, RFMO	M9
		Taxon criteria with FAO guidelines	FAO Species Fact sheet, stock reports		
	VME Species Data	Distribution data	FIGIS/AM/...	AM	
		Occurrence data	iMarine/GBIF/ITIS/CoL	IPT	
	VME Elements	State	Seamounts, physical, biodata		M3
		Pressure	Capture, pollution, disturbation		M6
		Management	Quota, move-on, closure	Fact-sheet	M6
		Impact/response	Monitoring,	none	M12
Solution	CMS/FIGIS	CMS/FIGIS	i-Marine/RFMO/A/Geoserver	iMarine VRE's: ICIS/VTI	

APPENDIX 8
Summary of the information to be included in the VME database

Issue	Science	Management/ Policy	Industry	Notes
Agreed information to include				
Required				
All designated closed areas (spatial or temporary closures, etc.), non-tra areas with exploratory fishing regimes (for some regions), and VME-risk areas	X	X	X	
Include all related management and designation information	X	X	X	
(status, classification, locations, extent of areas, characteristic including species abundance and occurrence	X	X	X	
Include time which information was submitted or agreed upon		X		
Background information (UNGA, FAO Guidelines), references and review		X	X	
Background/justification for VME-related measures	X	X	X	
Including criteria, thresholds, move-on rule		X		
Changes in management decisions over time (related to VMEs), including dates		X		
Linkages with common data sources		X		
Optional				
Georeferenced metadata information on research, surveys, etc. (Who has done what/where/when?)	X		X	For impact assessments, and research planning
Absence data from fisheries independent surveys				
Encounter records in new (exploratory areas) and existing (footprint)	X			Availability of data dependent on area and institution (aggregated, as required)
Data not to be provided				
Detailed info on precious corals or other targeted VME species				
Bathymetry				- Possibly provided in some regions for VME areas - Not to be downloadable

Issue	Science	Management/ Policy	Industry	Notes
What inputs can be provided?				
Area coordinates		X		
Management measures (dates, history, links to background information, etc.)		X		
Justification of management measures		X		
Links to national and regional databases	X			
Provide advice on analytical tools that could be used in conjunction with the database (maps, statistics)				
Aggregated catch/effort data (possibly)		X		Unlikely that fine-scale data made available because of data confidentiality (RFMO)
Peer review of data	X			
Aggregated information on the footprint		X	X	Dependent on region (by seamounts, blocks, historical fishing data, etc.)
VMS data (aggregated)	X			Dependent on region
Multimedia (e.g. camera footage, etc.)	X		X	
Scientific studies (georeferenced)	X			
What benefits/services will be provided?				
Facilitate comparison between RFMO approaches and access to best practices in regions (fishing operations, impact mitigations, catchability of gears, threshold levels, etc.)		X	X	
Improve transparency and availability of information for public			X	
Show actions taken by RFMO/industry/states to address sustainability issues (show that the industry has taken serious steps to reduce impacts of fishing on VME)			X	
Single source, error free point data on spatial management areas (for downloading at sea)			X	
A public dissemination space for sharing – e.g. on best practices			X	
Provide a platform for integrating both fishing and research data and other sources of data on a global scale	X			
See how other science groups have used data or to learn about the organisms themselves (advisory process)	X			
Access to data that scientists do not currently have access to (fisheries derived data on VMEs)	X			