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National Marine Fisheries Service Workgroup Report on Encounter Protocol on Vulnerable Marine Ecosystems in the North Pacific Fisheries Commission Area

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National Marine Fisheries Service Workgroup Report on Encounter Protocol on Vulnerable Marine Ecosystems in the North Pacific Fisheries Commission Area

14-15 September 2011
University of Hawaii Campus
Honolulu, Hawaii

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ABSTRACT

Scientists from the National Marine Fisheries Service (NMFS) met in Honolulu, Hawaii, to develop recommendations for establishing an encounter protocol on vulnerable marine ecosystems (VMEs) in the proposed North Pacific Fisheries Commission (hereafter referred as the Commission or NPFC) Area.

The NMFS Workgroup identified the following issues:

1. An encounter protocol for fishing in the NPFC Convention Area is recommended by the Workgroup for assisting the U.S. delegation to the Commission in preparing for the task of developing encounter protocols for the Convention Area. The key parameters of the encounter protocol are selection of VMEs for monitoring, geographical zoning, establishment of threshold encounter rates, move-on rules, and data.

2. The indicator species of VMEs of particular concern designated by the Commission are four orders of corals -- Alcyonacea, Antipatharia, Gorgonacea, and Scleractinia. The NMFS Workgroup recommended that the following two groups of VMEs also be included in the encounter protocol -- the hydrocorals (order Anthoathecatae) and sponges [glass sponges (class Hexactinellida) and demosponges (class Demospongiae)].

3. The encounter protocol could apply uniformly to the entire Convention Area with the option for the Commission to manage the Convention Area as four distinct geographical zones. These zones (see Fig. 3) are: Zone 1 – the Northwest Pacific-Emperor seamounts area; Zone 2 – Commission waters surrounding the Hawaiian Islands; Zone 3 – the Eastern Pacific area; and Zone 4 – the area off Alaska.

4. The recommended encounter protocol would be akin to building a traffic-light system to direct fishing activities that would impact VMEs in the Convention Area. The system would require differentiation of fishing rules at three different risk levels to VMEs and a database building component.

5. Threshold catch rates of indicator species of the VME groups would be established at three encounter risk areas: high-risk, medium-risk and low-risk areas. High-risk red areas would be closed to fishing. Closed areas would require new data to justify a change in status to medium or low risk. Fishing would be permitted in the other two lower risk areas. The distinction between the medium-risk amber and low-risk green areas would be additional data/specimen collection requirements for fishing in medium risk amber areas. These additional data and specimen collection requirements would need to be developed by the Commission.

6. The threshold catch rates of indicator species of VMEs that would trigger closed areas and move-on rules would be determined by the Commission from example encounter protocols on VMEs adopted by other RFMOs and through analyses of the available data. A working group of the Commission has already been assigned the task of analyzing the data bases on the four designated orders of corals.

7. The NMFS Workgroup reviewed move-on rules developed by other Regional Fishery Management Organizations (RFMOs) and recommended following the approach developed by the Commission for the Conservation of Antarctic Living Marine Resources (CCAMLR). CCAMLR requires vessels to move 1 nautical mile (nmi) from the track of triggered encounters. Other move-on distances of 2 to 5 nmi were also discussed but not favored as differences in encounter rates at different move-on distances cannot be distinguished without credible data. Besides, the area of most seamounts are small and moving off too far would reduce or eliminate research opportunities to collect and refine data bases to fine tune catch rate rules.

8. A database collection and reporting system would be an integral part of the encounter protocol. Specific data elements and specimens to be collected should be identified by the Science Working Group (SWG) of the Commission and should apply to all risk areas.

9. The NMFS Workgroup also suggested that data bases be maintained by individual members of the Commission as confidentiality concerns of centralizing the data base would be considerable. The members would then be responsible for analyses of their data to respond to specific questions of the Commission.

The participants of the workgroup were from the following NMFS units: Alaska Fisheries Science Center (Loh-Lee Low and Robert Stone), Pacific Islands Fisheries Science Center (Gerard DiNardo), Northwest Fisheries Science Center (Curt Whitmire), Southwest Fisheries Science Center (Christopher D. Jones), Northeast Fisheries Science Center (Thomas Noji), NMFS Pacific Island Regional Office (Rini Ghosh), and NMFS Science and Technology Division (Beth Lumsden).

The Organizing Committee members were Loh-Lee Low (Alaska Fisheries Science Center), Gerard DiNardo (Pacific Island Fisheries Science Center), Cheri McCarty (NMFS International Fisheries Division), and Shannon G. Dionne (NOAA Office of International Affairs).

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COMMISSION ASSIGNMENT

At the 9th Multilateral Meeting on Management of High Seas Fisheries in the North Pacific Ocean in September 2010, the participants agreed to have the Science Work Group (SWG) begin work to develop encounter protocols on VMEs for bottom fisheries in the Convention Area. The following participants were identified as points of contact for the discussions: Loh-Lee Low (coordinator, U.S.), Brett Norton (Canada, replaced by Janelle Curtis), Gang Li (China), Takashi Yanagimoto (Japan, replaced by Takeshi Hayashibara), Doo-Nam Kim (Republic of Korea), Alexei Baitayluk (Russia), and Chih-Shin Chen (Chinese Taipei).

The specific tasks of the SWG are as follows:

1. Determine the distribution of encounters in fishing and survey operations with the four orders of corals identified in the NPFC interim measures as primary indicators of VMEs. These orders are Alcyonacea, Antipatharia, Gorgonacea, and Scleractinia.

2. Estimate catch rates of corals brought up by the fishing gear.

3. Estimate catch rates of corals encountered but not brought up by the fishing gear.

4. Estimate catch rates encountered in directed fisheries on corals and catch rates of encounters not brought up by the fishing gear.

5. Compare the estimated catch rates with those rates encountered in the North Atlantic Fisheries Organization (NAFO) area and the scientific literature, taking into account differences in physical characteristics of the ecosystems and differences in fishing dynamics.

In order to progress this work, a group of NMFS scientists met in Honolulu, Hawaii, from 14-15 September 2011 to develop a proposal for establishing an encounter protocol on VMEs in the proposed Convention Area. This meeting was an internal NOAA Fisheries (also known as NMFS) gathering of experts to review the issues for assisting the U.S. delegation of the Commission to prepare the task of developing encounter protocols for the Convention Area.

The organizing committee for this workshop underscored that NPFC will address encounters with VMEs broader than the four orders of corals identified in Task 1, above. Interim Measures (provided in more detail below) for the NPFC state that "the term vulnerable marine ecosystem is to be interpreted and applied in a manner consistent with the International Guidelines on the Management of Deep Sea Fisheries on the High Seas adopted by the FAO on 29 August 2008". In alignment with this international intent, the NPFC would be expected to develop an encounter protocol on corals and other indicator species of VMEs for any fishing activity that may take place within its Convention Area. As such, the meeting expanded its discussions to include two other groups of VMEs; the

hydrocorals (order Anthoathecatae) and sponges [glass sponges (class Hexactinellida) and demosponges (class Demospongiae)].

CONTENT OF REPORT

This report includes the following sections (1) Background information on the North Pacific Fisheries Commission; (2) Interim measures, and (3) Review of assigned tasks, and (4) Discussion. Appendix I contains background information for the United Nations General Assembly Resolution on Deep Sea Fisheries Encounters and its implementation guidelines developed by the Food and Agriculture Organization of the United Nations (FAO). Specific excerpts from the FAO reports that are useful to this Working Group meeting are noted in Appendix II. The workgroup agenda and key issues that were addressed are shown in Appendix III.

1. BACKGROUND INFORMATION ON THE NORTH PACIFIC FISHERIES COMMISSION

The final English text of the Convention on the Conservation and Management of High Seas Fisheries Resources in the North Pacific Ocean (Convention) was agreed to on 4 March 2011. Although the Convention has not yet been opened for signature, a Preparatory Conference has been convened to make the necessary arrangements for the commencement of the functions of the Commission established by the Convention without undue delay and to take all possible measures to ensure its effective operation. The current participants of the Preparatory Conference include Canada, China, the United States, the Russian Federation, Chinese Taipei, the Republic of Korea, and Japan. The objective of the Convention is to ensure the long-term conservation and sustainable use of the fisheries resources in the Convention Area while protecting the marine ecosystems of the North Pacific Ocean in which these resources occur.

The Convention applies to the waters of the high seas area of the North Pacific Ocean, excluding the high seas areas of the Bering Sea and other high seas areas that are surrounded by the exclusive economic zone of a single State. The area of application is bounded to the south, generally at 10°-20° N latitude as shown in Figure 1.

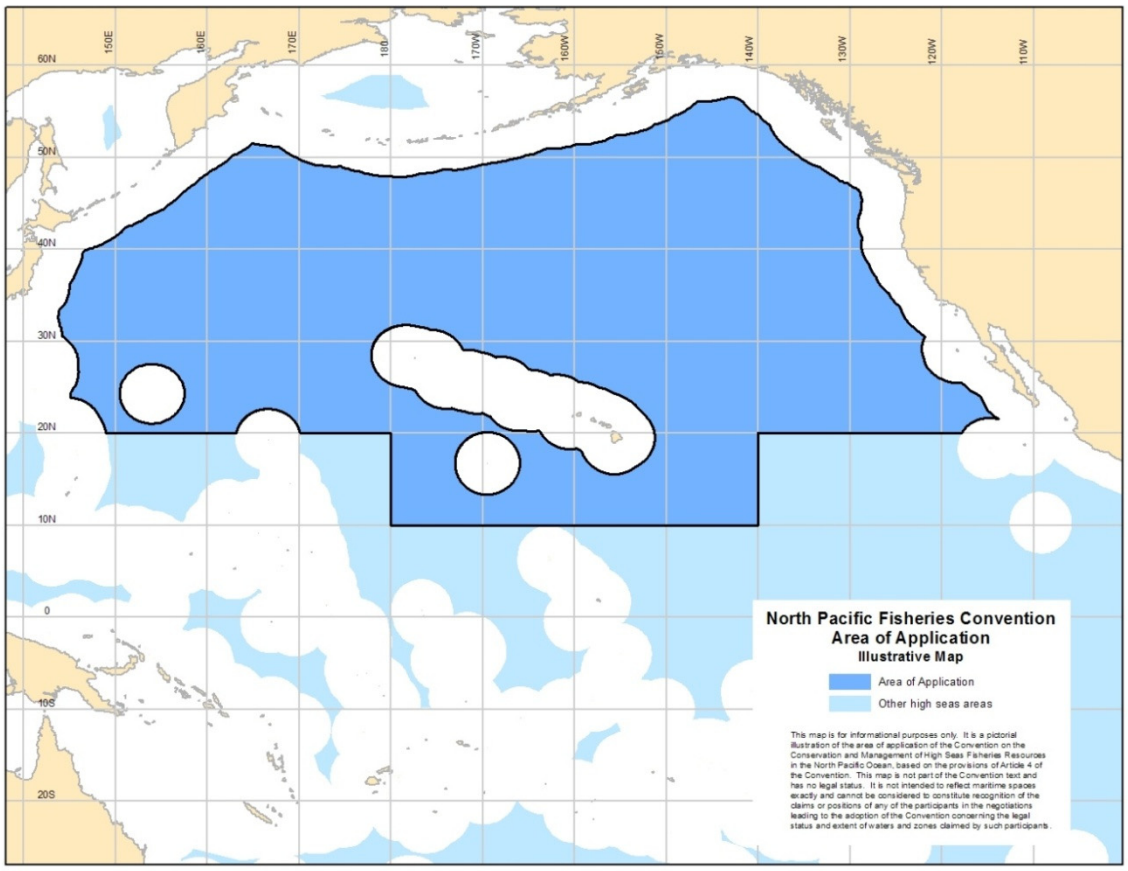

Fig. 1. -- The North Pacific Fisheries Convention Area.

2. INTERIM MEASURES

At the 10th Multilateral Meeting on Management of High Seas Fisheries in the North Pacific Ocean in Vancouver, British Columbia, Canada, the following *Interim Measures for the Protection of Vulnerable Marine Ecosystems of the Northeastern Pacific Ocean* were adopted on 4 March 2011:

(a) Conduct the assessments called for in paragraph 83(a) of UNGA Resolution 61/105, in a manner consistent with the FAO Guidelines and the Standards and Criteria included in its Annex 1;
(b) Submit to the SWG their assessments conducted pursuant to subparagraph (a) of this paragraph, including all relevant data and information in support of any such assessment, and receive advice and recommendations from the SWG, in accordance with the procedures in Annex 2;
(c) Taking into account all advice and recommendations received from the SWG, determine whether the fishing activity or operations of the vessel in question are likely to have a significant adverse impact on any vulnerable marine ecosystem;
(d) If it is determined that the fishing activity or operations of the vessel or vessels in question would have a significant adverse impact on vulnerable marine

ecosystems, adopt conservation and management measures to prevent such impacts on the basis of advice and recommendations of the SWG;

(e) Ensure that no vessels engage in bottom fishing until such assessments have been carried out *[from 119(a)]*, the determination called for in subparagraph (c) of this paragraph has been rendered and, where appropriate, managements measures have been implemented in accordance with the advice and recommendations of the SWG;

(f) Further ensure that they will only authorize fishing activities on the basis of such assessments and any comments and recommendations from the SWG;

(g) Prohibit its vessels from engaging in directed fishing on the following orders: *Alcyonacea*, Antipatharia, Gorgonacea, and Scleractinia as well as any other indicator species for vulnerable marine ecosystems as may be identified from time to time by the SWG and approved by the Multilateral Meeting on Management of High Seas Fisheries, or its successor, in the North Pacific Ocean.

(h) In respect of areas where vulnerable marine ecosystems are known to occur or are likely to occur, based on the best available scientific information, close such areas to bottom fishing and ensure that such activities do not proceed unless conservation and management measures have been established to prevent significant adverse impacts on vulnerable marine ecosystems.

3. REVIEW OF ASSIGNED TASKS

3.1. TASK 1 of 5 -- Determine the distribution of encounters in fishing and survey operations with the four orders of corals identified in the NW Pacific Ocean interim measures as primary indicators of VMEs. [These orders are Alcyonacea, Antipatharia, Gorgonacea, and Scleractinia]

The proposed Convention Area has considerable numbers of seamounts (Fig. 2). Commercial trawling activities, however, are rather limited and confined mostly in the Emperor Seamount vicinity for Pacific armorhead (*Pseudopentaceros wheeleri*) and splendid alfonsin (*Beryx splendens*). The distribution of encounters of commercial trawling gear with VMEs (in general) and corals (in particular) is largely unknown to the NMFS Workgroup as the data of such encounters are not available.

Commercial fishing in the Emperor Seamount areas has been carried out by Japan, Korea, Russia, and Chinese Taipei. These records were not available to the NMFS Workgroup; but the NPFC interim Secretariat website (http://nwpbfo.nomaki.jp/) has some reports of commercial fishing trips.

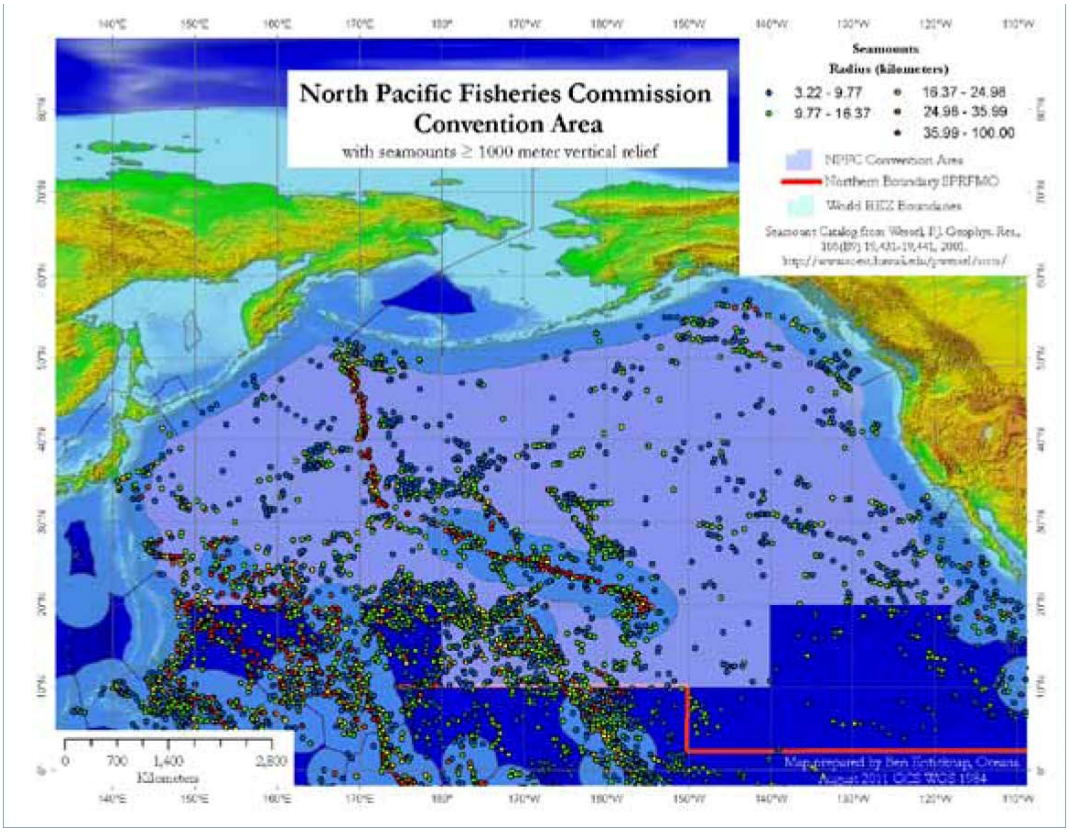

Fig. 2. -- Map of the North Pacific Fisheries Commission Convention Area showing seamounts.

There are a few good references on deep sea corals and sponges in the North Pacific Ocean (Pitcher et al. 2007, Baco 2007, and Lumsden et al. 2007). Another recent report on deep water sponges was authored by Stone et al. (2011). The NMFS Workgroup did not specifically determine if the bottom living organisms, like corals and sponges, that were encountered by fishing and research gear were in fact classified as VMEs. The scientific literature has generally assumed that these bottom living organisms over seamounts are to be classified as vulnerable by virtue of their rarity and unique bottom dwelling life histories per FAO guidelines.

The reports in the NPFC Interim Secretariat website confirm that the four orders of corals noted above are in fact present in the Convention Area. The distribution of these orders of corals and other VME indicators, however, over the seamounts in the Convention Area is not well known. The distribution and abundance of these VME species would vary by ocean environmental influences – by geography, bathymetry, seafloor, temperature, and other abiotic factors.

The summary below (Table 1) is from reports available in the NPFC Interim Secretariat website to indicate the general characteristics of the coral orders encountered in the Emperor Seamount areas:

Table 1. --Analysis on marine ecosystems in the Emperor Seamount-North Hawaiian Region.

Life History Traits of Component Species	Gorgonacea	Antipathria (black coral)	Scleractina (stony coral)	Alcyonacea (soft coral?)
Growth rate	Slow is a general character of deep sea corals	Slow is a general character of deep sea corals	Slow is a general character of deep sea corals	Relatively fast as compared to hard corals
Late Age of Maturity ?	No available information	No available information	No available information	No available information
Low or unpredictable recruitment?	No available information	No available information	No available information	No available information
Forms structural habitat?	Do not form reef. However form structured habitat when densely aggregated	Do not form reef. However form structured habitat when densely aggregated	Cold water species (less than 10 species). Form reefs	

Based on discussions of research surveys from California to Alaska, mainly within the U.S. EEZ, the NMFS Workgroup recommended that two more groups of organisms be designated as VMEs of particular concern. These are the hydrocorals (order Anthoathecatae) and sponges [glass sponges (class Hexactinellida) and demosponges (class Demospongiae)]. They are taxa that have similar life history characteristics as to those of the four designated NPFC coral orders and would be just as vulnerable to fishing impacts. There are at least 30 taxa of hydrocorals and 200 taxa of sponges known from Alaskan waters. It will be necessary to narrow down the indicator species of these groups.

Appendix IV presents some photos of the four groups of VMEs designated by the NPFC (Alcyonacea, Antipatharia, Gorgonacea, and Scleractinia). Appendix V shows some photos of the two new groups recommended for monitoring -- hydrocorals and sponges.

While distribution information of the six groups of VMEs are spotty, the Workgroup believes that the distribution, relative abundance, species composition and physical characteristics of these VME groups will vary due to local influences of ocean environmental features –geography, bathymetry, depth, seafloor structures and geology

temperature, and other abiotic factors. Thus, there would be a need to develop encounter protocols that may be different for the following four geographical zones in the Convention Area: These zones (see Fig. 3) are: Zone 1 – the Northwest Pacific-Emperor seamounts area; Zone 2 – Commission waters surrounding the Hawaiian Islands; Zone 3 – the Eastern Pacific area; and Zone 4 –the area off Alaska.

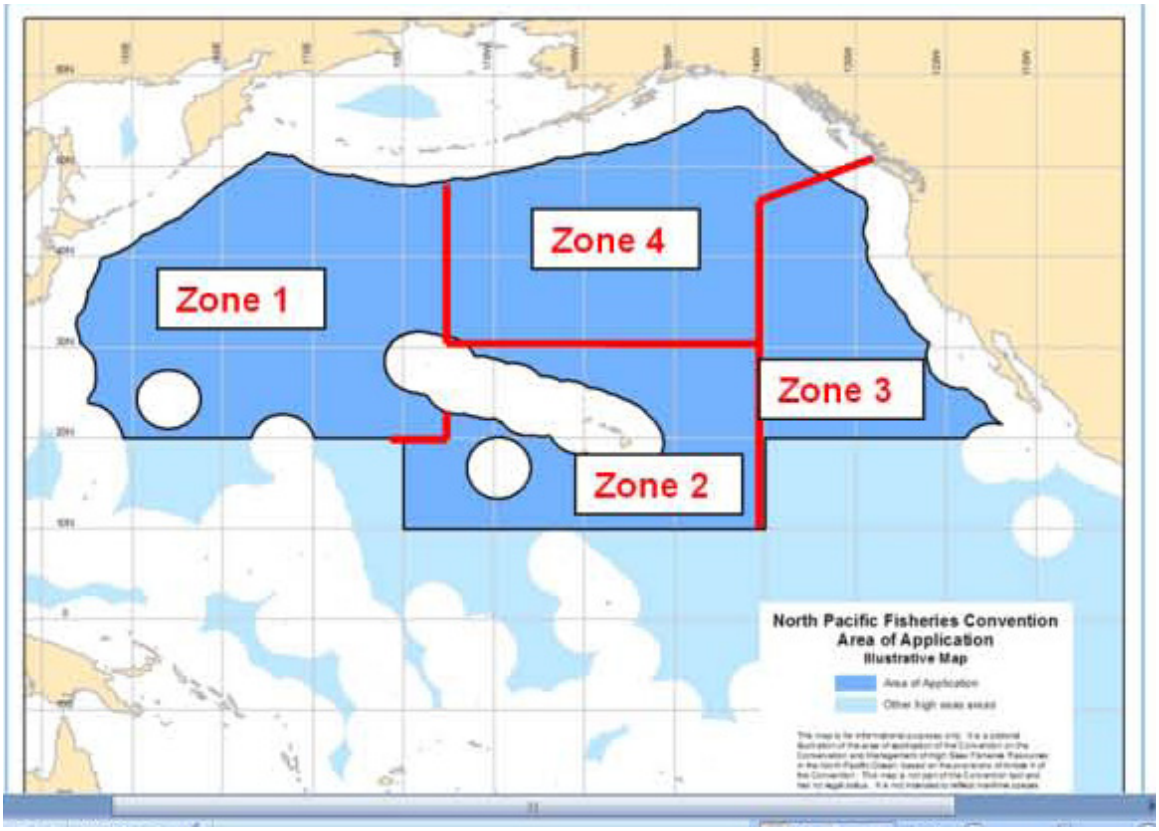

Fig. 3. -- Proposed zoning of the North Pacific Fisheries Convention Area for monitoring VMEs.

3.2 TASK 2 of 5 -- Estimate catch rates of corals brought up by the fishing gear

There is general lack of data on catch rates of corals and other VME taxa brought up by fishing (trawl) gear in the Convention Area. Catch rates would be influenced by catch efficiency, physical characteristics of the fishing gear, and the density of VME/coral species encountered. However, in practice, the catches that are brought up by the fishing gear onto the vessel could be very low or none because the fishing gear might retain only very small amounts of the VME/corals species while the encounters on the seafloor could have been substantial. Thus catch rates of VMEs/corals brought up by fishing (including trawl gear) could provide misleading information on actual encounter rates.

The appropriate method of measuring catch rates was also discussed. They could be in kilograms (kg) per unit effort, fragments per unit effort, frequency of encounters when VMEs are retrieved, and so forth. While weight per unit effort has been commonly used,

there is considerable debate whether measures such as kg per km fished is the best way to measure encounter rates to determine significant adverse impacts. However, move-on rules developed around kg per km of fishing operation to differentiate 3 levels of risk impacts can be a practical gauge for the Commission. The specific catch rates for each of the 3 risk levels were not developed by the NMFS Workgroup, due to lack of data. These rates may also be expressed in frequency of expected encounters.

Substantial new research and monitoring of gear performances with sophisticated mechanical and electronic devices would have to be developed to properly estimate true catch rates of VMEs by fishing gear.

3.3 TASK 3 of 5 -- Estimate catch rates of corals encountered but not brought up by the fishing gear

This estimate is even more difficult to establish. There is no currently planned research opportunity to estimate catch rates of encounters when the gear do retain and bring up VMEs/corals. Substantial new research and monitoring of gear performances with sophisticated mechanical and electronic devices would have to be developed to properly estimate true catch rates of organisms in VMEs by fishing gear.

3.4 TASK 4 of 5 -- Estimate catch rates encountered in directed fisheries on corals and catch rates of encounters not brought up by the fishing gear

This task is specifically included to draw out information of historical directed takes of corals. Chinese Taipei is known to have had directed fisheries for precious corals in the Northwest Pacific Ocean, especially over the Emperor Seamounts and in Hawaiian EEZ waters in the past. Other participants may also have had some historical direct takes of precious corals in the region.

The NMFS Workgroup recommended that the U.S. request that all NPFC participants provide data on their historical directed fisheries on precious corals and other VME taxa.

3.5 TASK 5 of 5 -- Compare the estimated catch rates with those rates encountered in the NAFO area and the scientific literature, taking into account differences in physical characteristics of the ecosystems and differences in fishing gear dynamics.

3.5.1 General move-on rules

The following discussion of a paper by Auster et al. (2011) published by ICES is specifically mentioned below to indicate the current state of debate on move-on rules.

“A move-on rule is based on the premise that a fishing vessel will move a minimum distance from a location where species indicating the presence of a VME are captured by the gear. RFMOs have set threshold weights or volumes that are considered (by the respective RFMO science processes and participants) to constitute “evidence of a VME” for such cases, as well as distances vessels must move upon an encounter. For example,

(1) In the NAFO (North Atlantic Fisheries Organization) area, if a vessel brings on board more than 60 kg of live corals or 800 kg of sponges, it must move a minimum of 2 nmi from the fished area.

(2) In the CCAMLR (Commission for the Conservation of Antarctic Living Marine Resources) region, more precautionary rules have been established for longlines. A bycatch of 5 kg or 5 VME units (i.e., 1 VME unit equals 1 L in a 10-L container or 1 kg in weight) in a segment of longline or pot line (1,200 m line length or 1,000 hooks) requires notification, while a catch of 10 kg or 10 VME units on a gear segment requires notification and moving on with a subsequent closure of 1 nmi around the encounter point.

(3) The South Pacific Regional Fisheries Management Organization (SPRFMO) was only recently organized and has not yet formally adopted VME encounter protocols. Participants have agreed, however, to a benthic assessment framework which does contain a VME encounter protocol. Weight thresholds for taxonomic groups under this protocol vary based on the analysis of historical bycatch weights, ranging from 1 kg for identified Antipatharia, Alcyonacea, or Gorgonacea, to 30 kg for Scleractinia, to 50 kg for Porifera, with an additional biodiversity score for all other benthic species. The move-on rule is either triggered by a threshold catch of one group or any catch of a number of groups."

3.5.2 Threshold assumptions

There are a number of implicit assumptions in protocols that are required to justify the premise that such actions have a conservation value. Here we discuss a number of these assumptions and suggest that the threshold values for encounters and associated move-on distances currently in use are inadequate to ensure conservation of VMEs in the face of current ecological or technological realities.

Threshold values for coral and sponge bycatch that trigger the move-on rule are not supported by any explicit demonstration of biomass–density relationships that produce some critical threshold for a VME nor any related evaluation about catch efficiency in fishing gear. Justification that move-on rules provide protection therefore requires many unsubstantiated assumptions regarding the level of bycatch that indicates presence of a VME, and the area that a VME might occupy around any given encounter site. It is true that evaluation of these factors would be a difficult task given that there are few studies linking the density or biomass of species or communities with bycatch. Limited studies that do address this issue, however, indicate that bycatch may be a very poor indicator of seabed species composition and density, largely because bottom-fishing gear (trawl nets and longlines) designed to catch fish is a very poor sampling tool for most sessile benthic organisms.

In a research study off Southeast Alaska, Freese et al. (1999) quantified catch efficiency of trawl-caught invertebrates by comparing density estimates based on area swept of the trawl with density estimates from video footage of the seafloor at deep-water sites (206–274 m depth). Differences in density estimates based on catch compared with photographic estimates was <1% for asteroids, echinoids, and molluscs, and 4.6% for

holothurians. There were no quantifiable estimates of octocorals or sponges, probably because the size and fragility of species encountered meant that they were not retained by the nets. Soft, flexible, and fragile specimens tend to be fragmented in the catch process and are extruded through the mesh. Hard specimens that fragment can drop through the meshes in the belly of the net. Specimens that are retained in the codend are those that are larger than the mesh of the gear throughout or at least have a density that allows transport to the codend in the flow regime within the net. Furthermore, specimens must be resistant to abrasion by the gear.

A comparison of taxa observed via video, trawl, and longline catch at stations along the northern Mid-Atlantic Ridge produced similar results, with underwater video capturing the greatest species richness (Mortensen et al. 2008). Although the aforementioned studies contain a limited set of observations focused on taxa that explicitly comprise VMEs, it was acknowledged that a gradient of catchability and catch efficiency accounts for variable patterns in catch composition of corals and sponges observed elsewhere (Wassenberg et al. 2002).

There are few published accounts of coral bycatch in cold-water deep-sea fisheries, especially in international waters. Coral bycatch from research survey trawl tows off eastern Newfoundland and Labrador in the Northwest Atlantic reveal a large disparity in catch based on taxonomic and morphological differences of corals (Edinger et al. 2007). Empirical data of coral bycatch were based on 15-minute survey tows. When extrapolated to 4-hour tows that are common in commercial fisheries on the high seas, only the highest catch rates of species classified as soft corals and large gorgonian corals might meet or exceed the 60-kg threshold value that would trigger the move-on rule. Shorter tows would almost never trigger the rule. Virtually no catches composed entirely of small gorgonians or other soft corals, and no catches of sea pens and cup corals would ever exceed the threshold value, although there are areas where such taxa dominate.

Threshold values based on the 50th percentile weight by taxonomic group from historic observer trawl catch data were used to establish evidence of a VME encounter in the SPRFMO region (Parker et al. 2009). The authors acknowledged that the level of bycatch that was biologically significant was not known, and simply chose the median historical (50th percentile) weight as the proposed basis to trigger the move-on rule. It is therefore important to consider the possible relationship between catch, catch efficiency, and the biomass of the species of concern impacted in such scenarios.

The protocols used in the North Atlantic may be generalized as follows. Vessels are required to move on in the NAFO and NEAFC regions of the North Atlantic using the threshold values of 60 kg of live coral or 800 kg of sponges. The Atlantic scientists then predicted the biomass of impacted taxa across a gradient of catch efficiencies. For example, at a 10% catch efficiency level for both corals and sponges, 600 kg of coral and 8,000 kg of sponges would actually be impacted. At 1% efficiency, a level more in accordance with the study by Freese et al. (1999), 6,000 kg of coral or 80,000 kg of sponge would be impacted based on a bycatch large enough to trigger the move-on rules concerned. Catches smaller than these levels would not require a vessel to move on."

The NMFS Workgroup did not have direct information of actual catch rates encountered by fishing and research vessels by the participants of the NPFC. The group however wishes to highlight the following issues:

a. Catch rates reported by fishing and (even) research vessels can provide misleading information regarding whether a significant encounter event has taken place. Most of the catches of VME indicator taxa are not expected to be retained by the trawl gear during fishing or in the haul back process.
b. As discussed in the ICES report, the catch rates used by NAFO and other RFMOs have a lot of assumptions built in to trigger the move-on rule. These assumptions are difficult to verify and may not be appropriate in other regions.
c. While the catch rates are debatable, the use of catch rates as proxies for triggering move-on rules is a logical step for cautious management of encounters with VMEs/corals. The question is what rates should be used for the NPFC?

3.5.3 Move-on and other rules for NPFC

While the NMFS Workgroup cannot determine that all trawl encounters would have SAIs on any benthic components of seamount ecosystems, it is prudent to have encounter rules while not imposing undue burden on current and future fishing activities. It is also acknowledged that the presence or absence and densities of VMEs/corals of all species are likely to be highly variable over all the variations of NPFC-area seamounts. Thus, all seamount situations are not the same. How then should a set of move-on rules be developed?

- The Workgroup received a presentation from Bob Stone about his analyses of VME encounter data collected from research operations in Southeast Alaska. He suggested that 50 kg per haul might be an appropriate encounter threshold for corals in the Gulf of Alaska and Bering Sea. That is, an average trawl haul made in coral habitat in those regions retains about 50 kg of coral. Values greater than 50 kg per trawl haul would indicate above average abundance of coral in the haul. Since trawl hauls in Alaska are typically 16-20 km (or more) in length, the reference catch rate can be expressed as 2.5 kg per km trawled.
- Another important consideration in determining an appropriate encounter threshold for corals is to put into context what a unit weight truly means in terms of coral biomass (or habitat). About 50 colonies of *Corallium,* similar in size to some Alaskan hydrocorals (e.g., *Stylaster campylecus* with approximate dimensions of 35 cm high and 32 cm wide weighing about 600 g), would represent a 25 kg encounter threshold.
- There will be a need to conduct in situ observations over representative seamounts to determine (or validate) appropriate encounter threshold for potential indicator species of vulnerable marine ecosystems (species composition, abundance, distribution). Thus, more research will be needed to set threshold move-on rates through science and other factual data to protect VMEs from SAIs.
- After reviewing the move-on rules formulated by CCAMLR, NAFO, and SPRFMO, the NMFS Workgroup determined that the approach developed by

CCAMLR may be appropriate for consideration to be applied to the NPFC Area for most seamounts. This approach would require vessels to move off 1 nmi from the track of triggered encounters. Other move-on distances of 2 to 5 nmi were also discussed but not favored as differences in encounter rates at different move-on distances cannot be distinguished without credible data. Besides, the area of most seamounts are small and moving off too far would reduce or eliminate data gathering opportunities to collect and refine data bases to fine tune catch rate rules.

- Larger seamounts, like those in the Emperor Seamounts area, may require longer distance move-on rules; like 5 nmi.
- It may also be reasonable to consider not developing move-on rules for VME zones where limited bottom fishing actually occurs (e.g., Zone 3 (eastern Pacific area extending from California to Canada) and Zone 4 (Alaska)).

3.5.4 Database

The NMFS Workgroup also recommended that the building of a database system should be an integral part of the Commission's Encounter Protocol. Such a database will be needed to document developments of fisheries in the Convention Area and their potential impacts on VMEs.

Appendix VI gives a draft exploratory fishery protocol in the Northwest Pacific Ocean that could be modified to gather data. In general the following types of details would be needed:

a. General information -- Include contact information, nationality, vessel name(s) and dates of data collection.
b. VME location - Start and end positions of all gear deployments and/or observations. Maps of sampling locations, underlying bathymetry or habitat and spatial scale of sampling. Depths sampled.
c. Sampling gear - Indicate sampling gears used at each location.
d. Additional data collected - Indicate additional data collected at or near the locations sampled. Data such as multi-beam bathymetry, oceanographic data such as CTD (conductivity, temperature, depth) profiles, current profiles, water chemistry, substrate types recorded at or near those locations, other fauna observed, video recordings, acoustic profiles etc.
e. Supporting evidence - Provide supporting evidence, rationale, analysis, and justification to classify the indicated areas as VMEs.
f. VME taxa - For each station sampled, provide details of all the VME taxa observed, including their relative density, absolute density, or number of organisms if possible.

SUMMARY

The reports in the NPFC Interim Secretariat website confirm that the four orders of corals designated by NPFC (Alcyonacea, Antipatharia, Gorgonacea, and Scleractinia) for monitoring are in fact present in the Convention Area. The distributions of these orders of

corals and other VMEs, however, are not well known. The occurrences and densities of these VMEs would most likely vary by ocean environmental influences – by geography, topography, depth, bottom structures, temperature, sunlight exposure, and other abiotic factors.

The NMFS Workgroup recommends that two more groups of VMEs be designated as VMEs of particular concern. These are the hydrocorals (order Anthoathecatae) and sponges [glass sponges (class Hexactinellida) and demosponges (class Demospongiae)].

The NMFS Workgroup recommended that encounter protocols may need to be developed for four major zones. These zones (see Fig. 3) are: Zone 1 – the Northwest Pacific-Emperor seamounts area (this is the original area of the Northwest Pacific Bottom Fisheries Organization); Zone 2 – Convention waters surrounding the Hawaiian Islands; Zone 3 – the Eastern Pacific area from California to Canada; and Zone 4 –the area off Alaska.

Threshold catch rates of indicator species of the VME groups would be established at three encounter risk areas: high-risk, medium-risk and low-risk areas. High-risk red areas would be closed to fishing. Closed areas would require new data to justify a change in status to medium or low risk. Fishing would be permitted in the other two lower risk areas. The distinction between the medium-risk amber and low-risk green areas would be additional data/specimen collection requirements for fishing in medium risk amber areas. These additional data and specimen collection requirements would need to be developed by the Commission.

There is general lack of data on catch rates of corals and other VME components brought up by the fishing gear. Catches that are brought up by the fishing gear onto the vessel could be very low or none because the fishing gear might retain only very low amounts of the VME/corals species while the encounters in the bottom substrates could have been extensive. Thus, catch rates of VME species brought up by fishing (including trawl) gear could be misleading information of actual encounter impacts.

The NMFS Workgroup debated the measurement of catch rates. They could be in kilograms (kg) per unit effort, pieces per unit effort, and frequency of encounters. The specific catch rates for each of the 3 risk levels of encounters were not developed by the NMFS Workgroup due to lack of data. The SWG of the Commission will need to deal with this.

A move-on rule is based on the premise that a fishing vessel will move a minimum distance from a location where species indicating the presence of a VME are captured by the gear. RFMOs have set threshold weights or volumes that are considered (by the respective RFMO science processes and participants) to constitute “evidence of a VME” for such cases, as well as distances vessels must move upon an encounter.

There are a number of assumptions in protocols that are required to justify the premise that move-on actions have a conservation value. The NMFS Workgroup determined that

the threshold values for encounters and associated move-on distances currently in use may be questionable to ensure conservation of VMEs in the face of current ecological or technological knowledge.

Threshold values for coral and sponge bycatch that trigger move-on rules are generally not supported by any explicit demonstration of biomass–density relationships that produce some critical threshold for a VME nor any related evaluation about catch efficiency in fishing gear. Justification that move-on constitutes protection therefore requires many unsubstantiated assumptions regarding the level of bycatch that indicates presence of a VME, and what area such a VME might be expected to occupy around the encounter site.

While the NMFS Workgroup cannot determine that trawl encounters would have SAIs on any components of the seamount eco-structures, it is prudent to have encounter rules while not imposing undue burden to experimental fishing. It is also acknowledged that the presence or absence and densities of VMEs/corals of all species are likely to be highly variable over all the variations of NPFC-area seamounts.

The NMFS Workgroup received a presentation from Bob Stone about his analyses of VME encounter data collected from research operations in Southeast Alaska. He suggested that 50 kg per haul might be an appropriate encounter threshold for corals in the Gulf of Alaska and Bering Sea. That is, an average trawl haul made in coral habitat in those regions retains about 50 kg of coral. Values greater than 50 kg per trawl haul would indicate above average abundance of coral in the haul. Since trawl hauls in Alaska are typically 16-20 km (or more) in length, the reference catch rate can be expressed as 2.5 kg per km trawled.

Another important consideration in determining an appropriate encounter threshold for corals is to put into context what a unit weight truly means in terms of coral biomass (or habitat). About 50 colonies of *Corallium,* similar in size to some Alaskan hydrocoral (e.g., *Stylaster campylecus* with approximate dimensions of 35 cm high and 32 cm wide weighing about 600 g), would represent a 25 kg encounter threshold.

There will be a need to conduct in situ observations over representative seamounts to determine (or validate) appropriate encounter threshold for potential indicator species of vulnerable marine ecosystems (species composition, abundance, distribution). Thus more research will be needed to set threshold move-on rates through science and other data to protect VMEs from SAIs.

After reviewing the move-on rules formulated by CCAMLR, NAFO, and SPRFMO the Workgroup recommended that the approach developed by CCAMLR may be appropriate for consideration to be applied to the NPFC Area. This approach would require vessels to move off 1 nmi from the track of triggered encounters. Other move-on distances of 2 to 5 nmi were also discussed but were not favored.

The Workgroup also suggested that it may also be reasonable to consider not developing move-on rules for VME zones where limited bottom fishing actually occurs (e.g., Zone 3 (eastern Pacific area from California to Canada) and Zone 4 (Alaska)).

The NMFS Workgroup noted that it is important to build a database of VME encounters as an integral part of the Commission's Encounter Protocol. Such a database will be needed to document development of fisheries in the Convention Area and their potential impacts on VMEs. The data bases would be maintained by individual members of the Commission as confidentiality concerns of centralizing the data base would be considerable. The members would then be responsible for analyses of their data to respond to specific questions of the Commission.

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APPENDIX I: Background of International Directives on Deep Sea Fisheries Encounters

The United Nations General Assembly (UNGA) approved *Resolution 61/105* in December 2006. This Resolution calls on States to directly, or through Regional Fisheries Management Organizations and Arrangements (RFMO/A), apply the precautionary approach and ecosystem approach to sustainably manage fish stocks and protect vulnerable marine ecosystems (VMEs), which may include coldwater corals and sponges, from significant adverse impacts (SAIs).

The Food and Agriculture Organization of the United Nations (FAO) Committee on Fisheries (COFI) developed the "*International Guidelines for the Management of Deep-sea Fisheries in the High Seas"* (*FAO Guidelines*) to guide the implementation of *UNGA Resolution 61/105*. Under this Resolution, States and RFMO/A are instructed that they should have an appropriate protocol identified in advance for how fishing vessels should respond to encounters with a VME in the course of fishing operations.

The *FAO Guidelines* also state that, if after assessing all available scientific and technical information, the presence of a VME or the likelihood that fishing activities would cause SAIs on a VME cannot be determined adequately, States should only authorize fishing activities to proceed in accordance with

i. Precautionary conservation and management measures to prevent SAIs as described in paragraph 65 of the *FAO Guidelines*;
ii. Paragraph 74 that refers to a protocol for encounters with VMEs consistent with paragraphs 67-69 and measures, including ongoing scientific research, monitoring, and data collection, to reduce uncertainty.
iii. The *FAO Guidelines* state that marine ecosystems should be classified as vulnerable based on the characteristics that it possesses and provides the following list of criteria:
iv.

i. Uniqueness or rarity– an area or ecosystem that is unique or that contains rare species whose loss could not be compensated for by similar areas or ecosystems.

These include:
• habitats that contain endemic species;
• habitats of rare, threatened or endangered species that occur only in discrete areas; or
• nurseries or discrete feeding, breeding, or spawning areas.

ii. Functional significance of the habitat – discrete areas or habitats that are necessary for the survival, function, spawning/reproduction or recovery of fish stocks, particular history stages (e.g., nursery grounds or rearing areas), or of rare, threatened or endangered marine species.

iii. Fragility – an ecosystem that is highly susceptible to degradation by anthropogenic activities.

iv. Life-history traits of component species that make recovery difficult – ecosystems that are characterized by populations or assemblages of species with one or more of the following characteristics:
• slow growth rates,
• late age of maturity,
• low or unpredictable recruitment, or
• long-lived.

v. Structural complexity – an ecosystem that is characterized by complex physical structures created by significant concentrations of biotic and abiotic features. In these ecosystems, ecological processes are usually highly dependent on these structured systems. Further, such ecosystems often have high diversity, which is dependent on the structuring organisms. Examples of potentially vulnerable species groups, communities and habitats, as well as features that potentially support them are contained in the Annex of the FAO guidelines. In the Annex, corals are only one of the possible "VMEs" listed.

APPENDIX II: Excerpts of FAO Guidelines on Vulnerable Marine Ecosystems That are Relevant to the Development of Encounter Protocols of Trawl Fisheries over Seamounts and Other Deep Waters of the North Pacific Ocean

A. General Designations of VMEs

The report of the Secretary General of the United Nations at the 61st General Assembly in July 2006 entitled "The Impacts of Fishing on Vulnerable Marine Ecosystems: Actions Taken by States and Regional Fisheries Management Organizations and Arrangements to Give Effect to Paragraphs 66 to 69 of General Assembly Resolution 59/25 on Sustainable Fisheries, Regarding the Impacts of Fishing on Vulnerable Marine Ecosystems" named the following four types of VMEs for attention in the deep sea areas. These are as follows:

1. Sponge Fields

Sponge fields are a characteristic benthic component of many deep-sea assemblages all over the world, the majority of samples having been taken between 800 and 6,000 m depth. Some 65 species have been described to date. Due to their large size, slow growth rates and weak cementation, most sponge species are very fragile and thus only sampled via photographic methods. Despite this fragility, specimens may be quite abundant on abyssal seabeds. The presence of the large sponges adds a low three-dimensional structure to the bottom, thus increasing habitat complexity and attracting a large number of species. These associated fauna have been investigated in the Faroe Islands, where it was found that the sponges house about 250 species of invertebrates. It is believed that sponge fields may provide an important feeding habitat for various fish species including young ocean perch (*Sebastes* sp.) and groundfish. The fauna associated with sponge fields is reported to be as least twice as rich in species as the surrounding gravel or soft bottoms.

2. Oceanic Slopes

The slopes of oceanic island groups form a unique habitat. The lower parts of these slopes may be equated with seamount communities, but their upper slope habitats do not occur elsewhere. There is a growing evidence that demersal or benthopelagic deep-water fish and squid species tend to show limited dispersal between island groups such that depleted populations may not be replenished from other areas.

3. Polymetallic Nodules

Polymetallic nodules form flat horizontal fields at depths between 4,000 and 6,000 m, such as in the Pacific central abyssal basin. These nodule fields are inhabited by diverse epifauna that provide habitat for other species.

4. Carbonate Mounds

Carbonate mounds are very steep-sided mounds of a variety of shapes, which may be up to 350 m high and 2 km wide at their base. They occur offshore in water depths of 500-1,100 m. Carbonate mounds are typically composed of carbonate sands, muds and silts. The cold-water reef-building corals (*Lophelia pertusa* and *Madrepora oculata*), as well as echiuran worms are characteristic fauna of carbonate mounds.

B. Specific Examples of Potentially Vulnerable Species Groups, Communities, and Habitats, as Well as Features That Potentially Support Them

These specific examples are stated in "The Annex of the FAO document International Guidelines for the Management of Deep-sea Fisheries in the High Seas", adopted on 29 August 2008 through a Technical Consultation held in Rome in two sessions (4–8 February and 25–29 August 2008)".

The following examples of species groups, communities, habitats and features often display characteristics consistent with possible VMEs. Merely detecting the presence of an element itself is not sufficient to identify a VME. That identification should be made on a case-by-case basis through application of relevant provisions of FAO Guidelines.

Examples of species groups, communities and habitat forming species that are documented or considered sensitive and potentially vulnerable to deep sea fisheries in the high-seas, and which may contribute to forming VMEs:

i. certain coldwater corals and hydroids (e.g., reef builders and coral forest including: stony corals (Scleractinia), alcyonaceans and gorgonians (Octocorallia), black corals (Antipatharia) and hydrocorals (Stylasteridae));
ii. some types of sponge dominated communities;
iii. communities composed of dense emergent fauna where large sessile protozoans (xenophyophores) and invertebrates (e.g., hydroids and bryozoans) form an important structural component of habitat; and
iv. seep and vent communities comprised of invertebrate and microbial species found nowhere else (i.e., endemic).

Examples of topographical, hydrophysical or geological features, including fragile geological structures, that potentially support the species groups or communities, referred to above:

i. submerged edges and slopes (e.g., corals and sponges);
ii. summits and flanks of seamounts, guyots, banks, knolls, and hills (e.g., corals, sponges, xenophyphores);
iii. canyons and trenches (e.g., burrowed clay outcrops, corals);
iv. hydrothermal vents (e.g., microbial communities and endemic invertebrates); and
v. cold seeps (e.g., mud volcanoes for microbes, hard substrates for sessile invertebrates).

C. Vulnerability and Significant Adverse Impacts

The FAO document "International Guidelines for the Management of Deep-sea Fisheries in the High Seas", adopted on 29 August 2008 through a Technical Consultation held in Rome in two sessions (4–8 February and 25–29 August 2008) defined these terms:

Vulnerability is related to the likelihood that a population, community, or habitat will experience substantial alteration from short-term or chronic disturbance, and the likelihood that it would recover and in what time frame. These are, in turn, related to the characteristics of the ecosystems themselves, especially biological and structural aspects. VME features may be physically or functionally fragile. The most vulnerable ecosystems are those that are both easily disturbed and very slow to recover, or may never recover.

The vulnerability of populations, communities and habitats must be assessed relative to specific threats. Some features, particularly those that are physically fragile or inherently rare, may be vulnerable to most forms of disturbance, but the vulnerability of some populations, communities and habitats may vary greatly depending on the type of fishing gear used or the kind of disturbance experienced.

The risks to a marine ecosystem are determined by its vulnerability, the probability of a threat occurring and the mitigation means applied to the threat.

Significant adverse impacts are those that compromise ecosystem integrity (i.e., ecosystem structure or function) in a manner that: (i) impairs the ability of affected populations to replace themselves; (ii) degrades the long-term natural productivity of habitats; or (iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types. Impacts should be evaluated individually, in combination and cumulatively.

When determining the scale and significance of an impact, the following six factors should be considered:

i. the intensity or severity of the impact at the specific site being affected;
ii. the spatial extent of the impact relative to the availability of the habitat type affected;
iii. the sensitivity/vulnerability of the ecosystem to the impact;
iv. the ability of an ecosystem to recover from harm, and the rate of such recovery;
v. the extent to which ecosystem functions may be altered by the impact; and
vi. the timing and duration of the impact relative to the period in which a species needs the habitat during one or more of its life history stages.

Temporary impacts are those that are limited in duration and that allow the particular ecosystem to recover over an acceptable time frame. Such time frames should be decided on a case-by-case basis and should be in the order of 5-20 years, taking into account the specific features of the populations and ecosystems.

In determining whether an impact is temporary, both the duration and the frequency at which an impact is repeated should be considered. If the interval between the expected disturbance of a habitat is shorter than the recovery time, the impact should be considered more than temporary. In circumstances of limited information, States and RFMO/As should apply the precautionary approach in their determinations regarding the nature and duration of impacts.

APPENDIX III: Workshop Agenda and Key Issues

WORKSHOP AGENDA

Day 1:

1. Background presentations on seamounts in the Convention area (outside the EEZs of national jurisdictions, generally north of 20-degrees north latitude in the North Pacific Ocean, excluding the Bering Sea).
2. Background presentations on VME presence (using the definition in the FAO Guidelines on Deep-Sea Fisheries) and their significance in the ecology of seamounts.
3. Vulnerability of VMEs to bottom fishing over seamounts.
4. Where has bottom fishing and research already occurred and/or is likely to occur?
5. What data are available of bottom fishing encounters on these VMEs; how reliable are they?

Day 2:

6. Catch and encounter rates of VMEs over Pacific seamounts, what we know and what we would like to know.
7. What are the experiences and recommendations of encounter protocols in other areas (e.g., NAFO, South Pacific, Australia, internal EEZs, other areas)?
8. Which encounter protocol models are appropriate for the NPFC area?
9. Which data collection protocols are appropriate?
10. What issues should the U.S. Delegation to NPFC focus on?
11. Plans to follow up after workshop – email exchanges and compilation of a report.

KEY ISSUES TO ADDRESS IN AGENDA DISCUSSIONS

Participants considered the following questions in their discussions:

1. Determine the key components that a science-based encounter protocol framework should include. For example: definition of an "encounter", identification manuals, observer coverage, enforcement, and other mitigation measures that could be implemented when an "encounter" has occurred (e.g., "move-on" provisions, time-area closures, buffer zones, reporting requirements, etc.).

2. Determine what constitutes an "encounter" by:

    a. Describing the interaction between a fishing event and the benthic attribute (i.e., corals and/or sponges in their natural habitat). Note that the interaction may or may not be evident onboard the fishing vessel; and

b. Describing the information/data that could be available to an individual onboard a fishing vessel to assist in indicating that such an interaction had occurred. How reliable are the information/data?

3. Review various techniques which could be used to estimate encounter thresholds for certain species, groups of species, areas, and/or fisheries.

4. Considering both immediate and cumulative effects. Identify and discuss the factors that may influence the effectiveness of specific mitigation measures and other components of an encounter protocol; where considerations are particularly relevant to corals and sponges, discuss their implications.

5. Identify the key sources of uncertainty that may affect the efficacy of the implementation of an encounter protocol and how these sources may be reduced (e.g., gear catchability, point of recognition vs. point of encounter, etc.). Are sources of uncertainty and the implications of major uncertainties adequately explained?

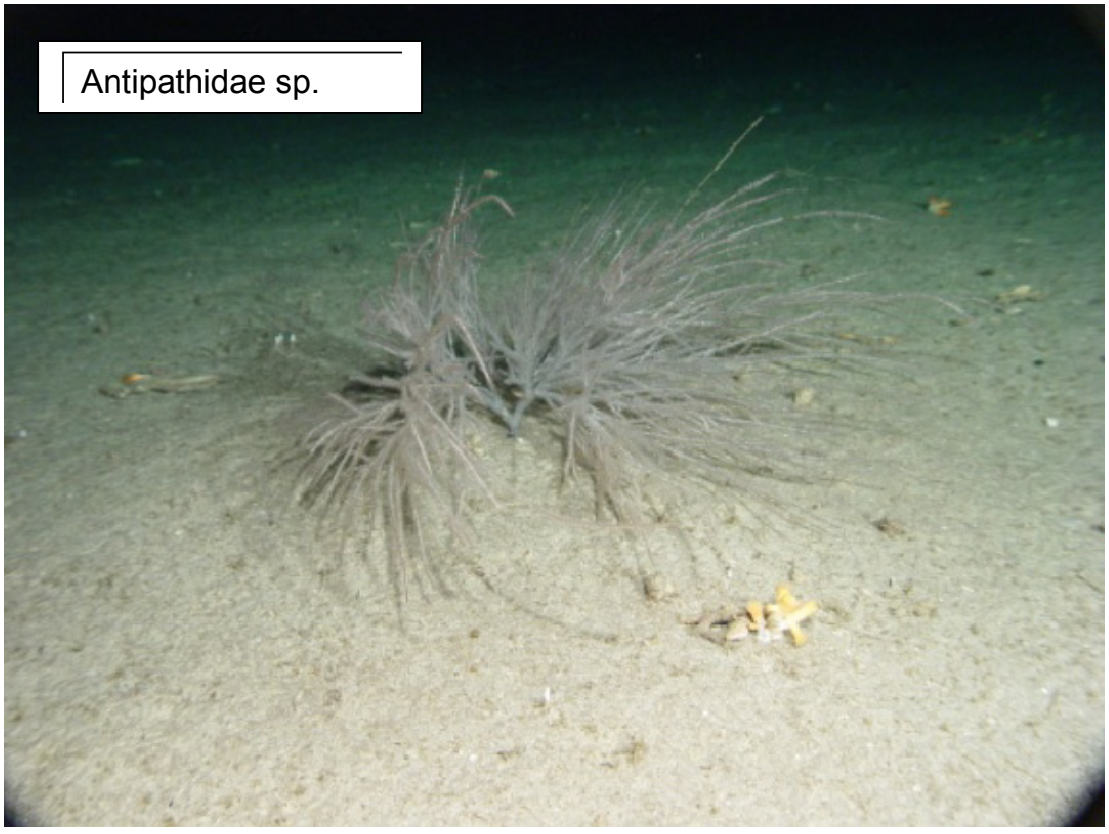
6. Identify the circumstances or areas where encounter protocols would afford the best protection to corals and sponges from serious or irreversible harm.

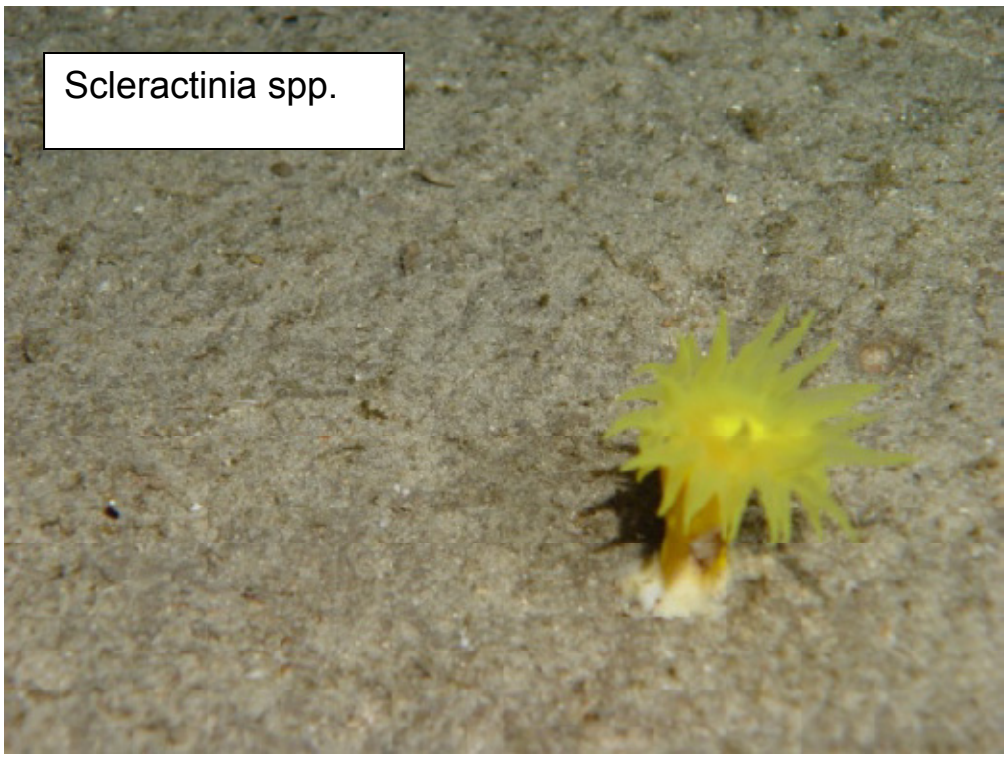
APPENDIX IV: Example Photos of VMEs/Corals
(from NPFC Interim Secretariat website: http://nwpbfo.nomaki.jp/)

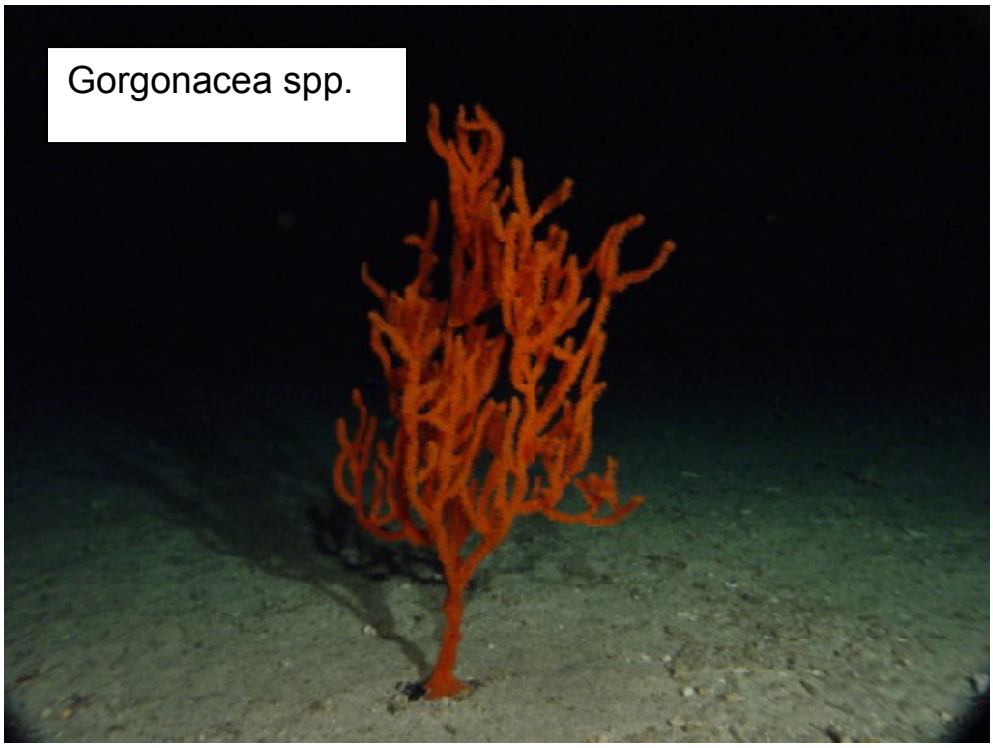
Report on Distribution of Corals by Japan (Japan Appendix H-1, pdf file from NPFC website, Takashi Yanagimoto, National Research Institute of Far Seas Fisheries Yoshimi Takao, Koki Abe, National Research Institute of Fisheries Engineering, FRA, Japan)

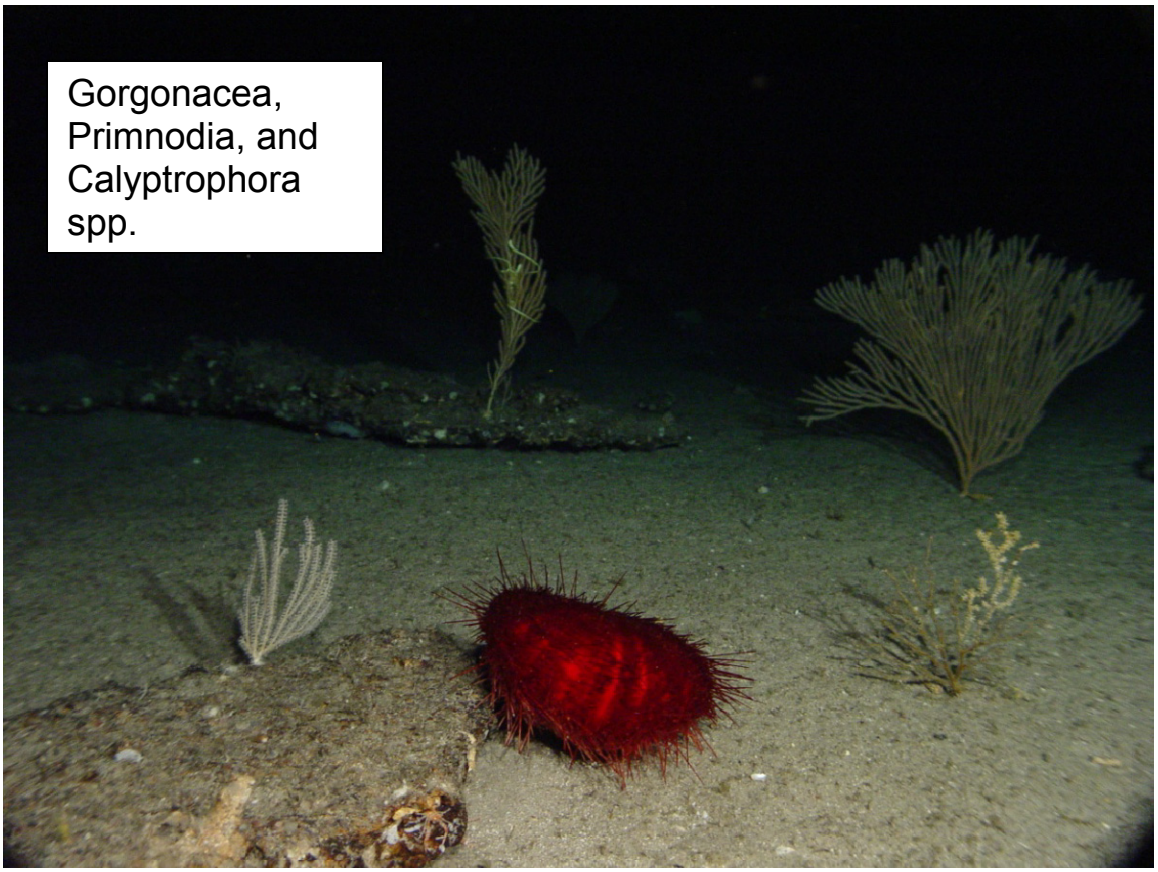
The authors reported of observations using ROVs at 16 stations in 5 seamounts in the Emperor Seamount areas. These were the orders: Alcyonacea, Gorgonacea, Scleractina, and Actipatharia.

The following images are some examples of the coral encounters:

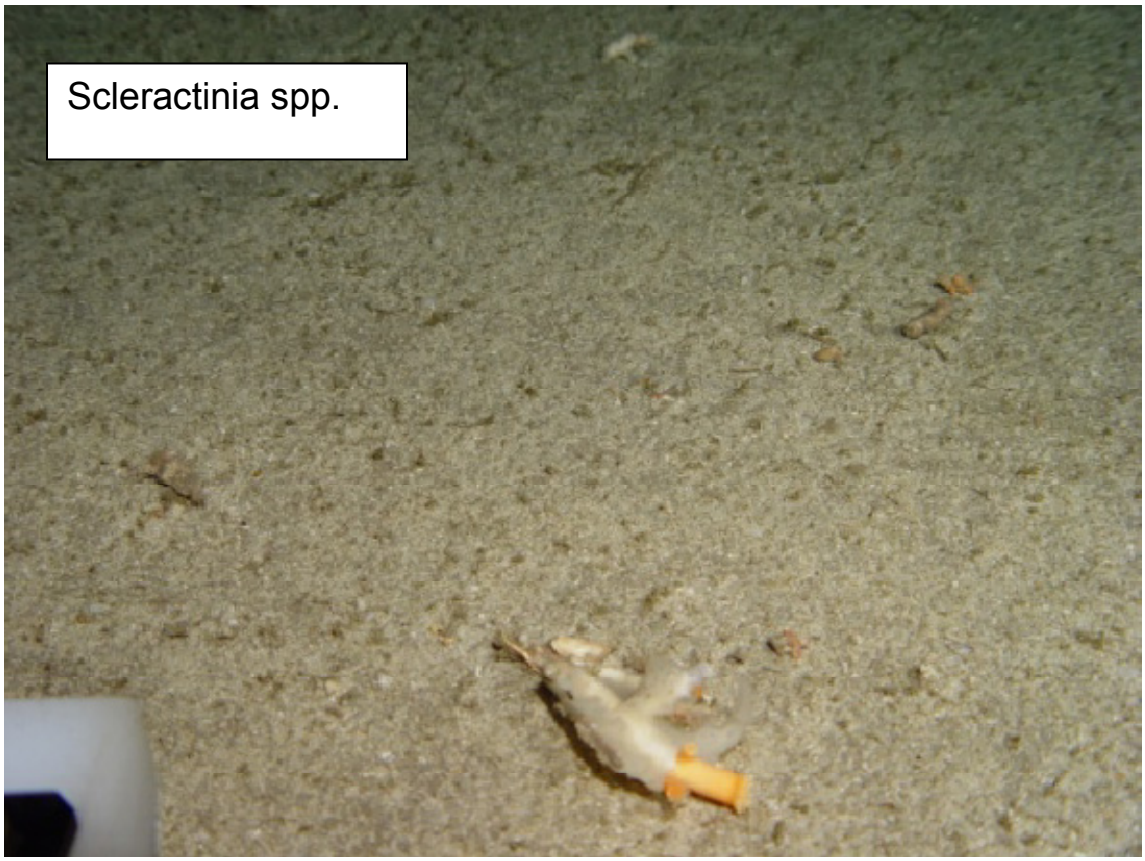



Scleractinia spp.


Gorgonacea spp.


Gorgonacea, Primnodia, and Calyptrophora spp.


Alcyonacea spp.



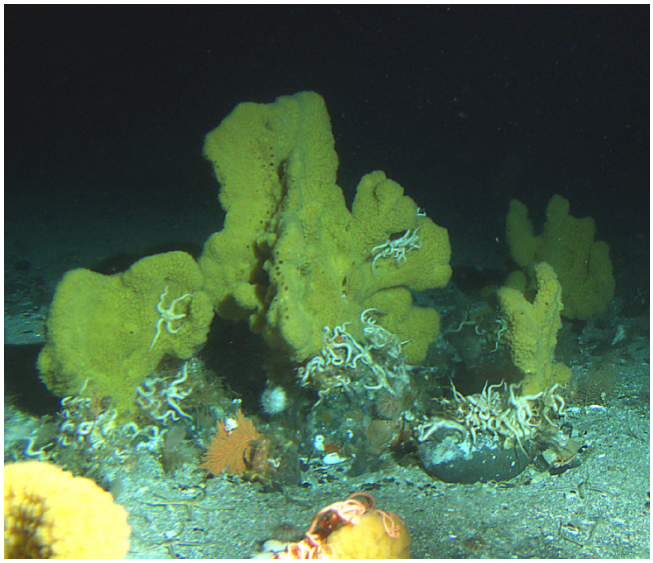
Comments:

There were few corals of the four orders in the slope and deep area of the Emperor Seamounts. Some corals were observed by drop camera system in the slope area of Colahan Seamount and Koko Seamount. The coral encounters seem to be infrequent and the corals do not appear to be clumped together in dense concentrations.

APPENDIX V: Example Photos of Two Other VMEs Suggested by the NMFS Workgroup

Example of Hydrocoral (order Anthothecatae)

Example of Demosponges -- *Artimisina stipitata*



Example of Demosponge – *Mycale loveni*

Example of Glass Sponge -- Hexactinellid -- *Acanthascus staurocalyptus*

Example of Glass Sponge -- Hexactinellid - *Farrea occa*

APPENDIX VI: Draft Exploratory Fishery Protocol in the Northwest Pacific Ocean

1. From 1 January 2009, all bottom fishing activities in new fishing areas or with bottom gear not previously used in the existing fishing areas, are to be considered as "exploratory fisheries" and be conducted in accordance with this protocol.

2. When Participating States would like to conduct exploratory fisheries, it is to follow the following procedure:

(1) The Participating State is to submit the information in Appendix I to the Interim Secretariat for forwarding to the Scientific Working Group (SWG) for review and to all Participating States for information, together with the impact assessment.

(2) The assessment in (1) above is to be conducted in accordance with the procedure set forth in "Science-based Standards and Criteria for Identification of VMEs and Assessment of Significant Adverse Impacts on VMEs and Marine Species (Annex 1 to the Interim Measures), with the understanding that particular care will be taken in the evaluation of risks of the significant adverse impact on vulnerable marine ecosystems, in line with the precautionary approach.

(3) The SWG is to review the information and the assessment submitted in (1) above in accordance with "SWG Assessment Review Procedures for Bottom Fishing Activities (Annex 2 to the Interim Measures)."

(4) The exploratory fisheries are to be permitted only where the assessment concludes that they would not have significant adverse impacts (SAIs) on marine species or any VME. Any determinations, by any Participating State or the SWG, that the exploratory fishing activities would not have SAIs on marine species or any VME, will be made publicly available through the NWPBFO website.

3. The Participating State is to ensure that vessels flying their flag conducting exploratory fisheries are equipped with a satellite monitoring device and have an observer on board.

4. The Participating State is to provide within 3 months of the end of the exploratory fishing activities a report of the results of such activities to the Interim Secretariat for circulation to the SWG and all Participating States. The information to be included in the report is Appendix II.

5. The SWG is to review the report in 4 above, and decide whether the exploratory fishing activities had SAIs on marine species or any VME. The SWG then is to send its recommendations to the Inter-governmental Meeting on whether the exploratory fisheries can continue and whether additional management measures will be required if they are to continue.

6. The Inter-governmental Meeting is to adopt conservation and management measures to prevent SAIs on marine species or any VME, taking account of the recommendations provided by the SWG.

Information to be Provided Before Exploratory Fisheries Start

1. A harvesting plan
   - Name of vessel
   - Flag state of vessel
   - Description of area to be fished (location and depth)
   - Fishing dates
   - Anticipated effort
   - Target species
   - Bottom fishing gear-type used
   - Area and effort restrictions to ensure that fisheries occur on a gradual basis in a limited geographical area.

2. A mitigation plan
   - Measures to prevent SAIs to VMEs that may be encountered during the fishery.

3. A catch monitoring plan
   - Recording/reporting of all species brought onboard to the lowest possible taxonomic level
   - 100% satellite monitoring
   - 100% observer coverage.

4. A data collection plan
   - Data is to be collected in accordance with "Type and Format of Scientific Observer Data to be Collected" (Annex 4 to the Interim Measures).

Information to be Included in the Report

- Name of vessel
- Flag state of vessel
- Description of area fished (location and depth)
- Fishing dates
- Total effort
- Bottom fishing gear-type used
- List of VME encountered (the amount of VME indicator species for each encounter specifying the location: longitude and latitude)
- Mitigation measures taken in response to the encounter of VME
- List of all organisms brought onboard
- List of VME indicator species brought onboard by location: longitude and latitude