deepsea conservationcoalition

How much longer will it take?

A ten-year review of the implementation of United Nations General Assembly resolutions 61/105, 64/72 and 66/68 on the management of bottom fisheries in areas beyond national jurisdiction

FULL REPORT – AUGUST 2016

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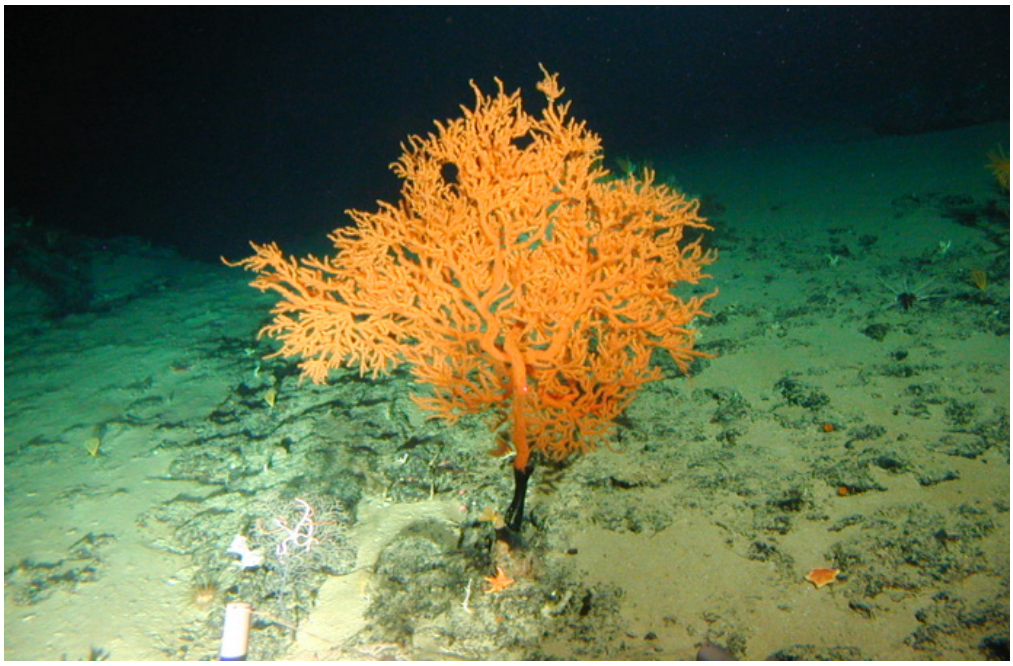

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Leiopathes sp., a deepwater black coral, has lifespans in excess of 4,200 years (Roark et al., 2009*), making it one of the oldest living organism on Earth. Specimen was located off the coast of Oahu, Hawaii, in ~400 m water depth.

** Roark, E.B., Guilderson, T.P., Dunbar, R.B., Fallon, S.J., and Mucciarone, D.A., 2009. Extreme longevity in proteinaceous deep-sea corals. Proceedings of the National Academy of Sciences, 106: 520–5208, doi: 10.1073/pnas.0810875106.*

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Citation:

Gianni, M., Fuller, S.D., Currie, D.E.J., Schleit, K., Goldsworthy, L., Pike, B., Weeber, B., Owen, S., Friedman, A.
How much longer will it take? A ten-year review of the implementation of United Nations General Assembly resolutions 61/105, 64/72 and 66/68 on the management of bottom fisheries in areas beyond national jurisdiction. Deep Sea Conservation Coalition, August 2016.

Executive Summary

The United Nations General Assembly (UNGA) in 2002 adopted the first in a series of resolutions regarding the conservation of biodiversity in the deep sea. Prompted by serious concerns raised by scientists, non-governmental organizations (NGOs) and numerous States, these resolutions progressively committed States to act both individually and through regional fishery management organizations (RFMOs) to either manage bottom fisheries in areas beyond national jurisdiction to prevent significant adverse impacts on deep-sea species, ecosystems and biodiversity or else prohibit bottom fishing from taking place.

It has now been almost fifteen years since the debate over deep-sea bottom fisheries first began in the UNGA. Ten years have passed since the adoption of resolution 61/105 in 2006, calling on States to take a set of specific actions to manage bottom fisheries in areas beyond national jurisdiction to protect vulnerable marine ecosystems (VMEs) from the adverse impacts of bottom fishing and ensure the sustainability of deep-sea fish stocks. Despite the considerable progress by some RFMOs, there remain significant gaps in the implementation of key elements and commitments in the resolutions. This year, the UNGA will review progress toward the implementation of its resolutions and identify areas for improvement.

The Deep Sea Conservation Coalition (DSCC), together with its member organizations, has advocated for the application of the precautionary and ecosystem approach to the management of deep-sea fisheries since 2004. It has worked since 2006 to achieve the implementation of the UNGA's resolutions at relevant RFMOs and through other regional negotiating processes, as well as in the national capitals of a number of high seas fishing States. Based on this experience, supplemented by extensive research, the DSCC has prepared this report to assist the UNGA in its review in 2016 and to address the following question: How effectively have the resolutions been implemented?

KEY FINDINGS

The report of the UNGA's First Global Integrated Marine Assessment, published in 2015, states that the deep-sea constitutes the largest source of species and ecosystem diversity on Earth. These ecosystems are crucial for global functioning and there is strong evidence that the richness and diversity of organisms in the deep sea exceed that in all other known biomes from the metazoan to the microbial realms.[1] At the same time, the documented extent of deep-water trawl fisheries has led to pervasive concern for the conservation of fragile benthic habitats associated with seamounts and other deep-sea environments.[2] The report further states that the vast majority of deep-water fisheries have been carried out unsustainably, or at least without satisfactory assessments of impacts and sustainability. This has led both to the serial depletion of dozens of targeted stocks and severe impacts reported for bycatch species, including other fishes and benthic invertebrates from diverse coral and sponge communities. The report concludes that although the impacts have not been assessed globally, extrapolations from local and regional studies indicate that deep-sea fishing – and in particular deep-water trawling – has likely caused severe, widespread, long-term destruction of deep-sea environments globally.[3]

The conclusions of the Global Marine Assessment mirror those of a study published in 2014 which looked at the impact of bottom trawling on deep-sea sediment areas in the Mediterranean and concluded that "intensive and chronic bottom trawling is deemed to transform large portions of the deep continental slope into faunal deserts and highly degraded seascapes" and that bottom trawling "represents a major threat to the deep seafloor ecosystem at the global scale".[4] The adverse impacts of deep-sea bottom fishing are not confined to the degradation or destruction of VMEs. Another study published in 2014 looked at the feeding habits of bottom dwelling fish inhabiting depths between 500–1,800 meters along the Irish and United Kingdom continental slopes and estimated that this community of fish alone captures and stores a volume of carbon equivalent to over 1 million tonnes of CO_2 every year.[5]

The UNGA first expressed concern over the threats to the biodiversity of seamounts and other deep-sea areas beyond national jurisdiction in resolution 57/141 adopted in 2002.[6] At that time, virtually no management measures were in place to protect deep-sea benthic ecosystems in these areas from the harmful impacts of bottom fishing, in particular bottom trawling. Moreover, there were few RFMOs with the legal competence to manage bottom fisheries on the high seas. In the North Pacific, South Pacific, Southwest Atlantic and Indian Oceans, there were no RFMOs or arrangements of any kind to manage high seas bottom fisheries, although substantial bottom fisheries were occurring in each region. Where competent RFMOs did exist, high seas bottom fisheries in these

[1] Group of Experts of the Regular Process. (2016). *The First Global Integrated Marine Assessment (World Ocean Assessment 1)*, (New York: United Nations), Chapter 36F: Open ocean deep sea, p. 1. Retrieved from http://www.un.org/depts/los/global_reporting/WOA_RPROC/Chapter_36F.pdf.

[2] Ibid, Chapter 51: Biological communities on seamounts and other submarine features potentially threatened by disturbance, p. 9. Retrieved from http://www.un.org/depts/los/global_reporting/WOA_RPROC/Chapter_51.pdf.

[3] Ibid, p. 15.

[4] Pusceddu, A., Bianchelli, S., Martin, J., Puig, P., Palanques, A., Masque, P., & Danovaro, R. (2014). Chronic and intensive bottom trawling impairs deep-sea biodiversity and ecosystem functioning. *Proceedings of the National Academy of Sciences of the United States,* 111(24), 8861–8866. Retrieved from http://www.pnas.org/content/early/2014/05/14/1405454111.full.pdf+html?sid=3bf67eb5-90d3-4b3b-b3b5-d151a358cde9.

[5] Trueman, C.N., Johnston, G., O'Hea, B., & MacKenzie, K.M. (2014). Trophic interactions of fish communities at midwater depths enhance long-term carbon storage and benthic production on continental slopes. *Proceedings of the Royal Society B, 281*: 20140669. Retrieved fromhttp://dx.doi.org/10.1098/rspb.2014.0669.

[6] United Nations General Assembly (UNGA). (2002). *Resolution 57/141. Oceans and the law of the sea* (UN Doc. A/Res/57/141, 21 February 2003).

areas were unregulated insofar as impacts on the marine environment were concerned.[7]

Beginning in 2004, UNGA resolutions 59/25 (2004), 61/105 (2006), 64/72 (2009), and 66/68 (2011) called for urgent action to protect VMEs from the harmful impact of destructive bottom fishing practices.[8] They committed States and RFMOs to (i) conduct impact assessments of individual bottom fisheries and cumulative impacts of bottom fishing, (ii) close areas where VMEs are known or likely to occur to bottom fishing unless the fishing can be managed to prevent significant adverse impacts on VMEs, and (iii) ensure sustainable levels of catch and bycatch of deep-sea species, including the rebuilding of depleted stocks or else not authorize bottom fisheries to proceed.

As a result of the adoption of the UNGA resolutions, there have been significant improvements in the management of deep-sea fisheries in areas beyond national jurisdiction. Far more information on the impact of deep-sea fishing is now available in most high seas regions as a result of the efforts of States and RFMOs to implement these resolutions. This includes information on the known or likely occurrence of VMEs, the impact of various gear types on VMEs, and the catch and bycatch of fish species in deep-sea fisheries. The information has been derived from several sources: (i) scientific research prompted by the UNGA resolutions, such as the multinational Nereida, Ecovul-arpa, Atlantis and Rap-Sur expeditions led by the Spanish Institute of Oceanography and other national and multinational programs led by Norway, Japan, Canada, New Zealand and others; (ii) independent scientific initiatives; (iii) observer programs onboard many high seas bottom fishing vessels; (iv) catch reporting requirements; and (v) other information-gathering measures adopted by RFMOs in response to the UNGA resolutions.

In regard to the management of deep-sea bottom fisheries, important achievements since the adoption of the UNGA resolutions include:

1. Three new agreements establishing RFMOs to manage high seas bottom fisheries in the North Pacific, South Pacific and Southern Indian Ocean have been negotiated and entered into force.

2. The North East Atlantic Fisheries Commission (NEAFC), the Northwest Atlantic Fisheries Organization (NAFO) and the South East Atlantic Fisheries Organisation (SEAFO) have closed substantial areas of the high seas at fishable depths to bottom fishing, including a number of areas where VMEs are known to occur. NEAFC and SEAFO have further closed large 'representative' areas where VMEs are likely to occur and there have been a number of area closures and/or restrictions to fishing within a bottom fisheries 'footprint' in other regions.

Table 1. Extent to which key provisions of the UNGA resolutions and FAO Guidelines have been incorporated into interim measures and/or binding regulations adopted by RFMOs and regional negotiating processes

Area/region	Require Impact Assessments		Incorporated the criteria in the FAO International Guidelines for the Management of Deep-Sea Fisheries in the High Seas for identifying VMEs, conducting impact assessments and determining SAIs into RFMO regulations			
	Inside footprint	Outside footprint	SAIs (paras 17–20)	VMEs (para 42)	IAs (para 47)	Requirement to assess impact on 'low productivity fish' as well as VMEs
NAFO [a]	By 2016	Y	Y	Y	Y	N
NEAFC [a]	N	Y	Y	Y	Y	N
SEAFO	N	Y	Y	Y	Y	N
SPRFMO	Y	Y	Y	Y [b]	Y	N
GFCM	N	N	N	N	N	N
CCAMLR	Y	Y	Y [c]	Y [c]	Y [c]	Y [c]
NPFC	Y	Y	Y	Y	Y	Y
SIOFA [d]	Y	Y	N	Y	Y [e]	N
EU: SW Atlantic/Non RFMO Areas [f]	Y	Y	Y	Y	Y	N

KEY

Y = Yes; N = NO; VMEs = vulnerable marine ecosystems; IAs = impact assessments; SAIs = significant adverse impact

[a] NAFO and NEAFC have both assessed a number of areas within the fisheries footprint for the presence or likely occurrence of VMEs

[b] SPRFMO – Incorporated into SPRFMO Benthic Fishery Impact Assessment Standard

[c] CCAMLR measures are largely equivalent to those found in the FAO Guidelines

[d] Measures to take effect beginning in 2018

[e] Under the SIOFA regulation adopted in July 2016, impact assessments are required to "be prepared, to the extent possible, in accordance with the FAO Deep-sea Fisheries Guidelines" (CMM 2016/01, paragraph 18(a))

[f] Adopted in July 2008, prior to completion of the FAO Guidelines but contains definitions and provisions similar to those in the Guidelines.

3. Measures adopted by the States involved in negotiating the new North Pacific Fisheries Commission (NPFC) and the regulations adopted by the South Pacific RFMO (SPRFMO) restrict bottom fishing on the high seas in these regions to a historic fisheries footprint unless a prior impact assessment is conducted to allow vessels to bottom fish outside of the footprint. (See the maps in each regional section and the table in Annex 4 for estimated percentages of closed areas, areas open to bottom fishing and areas outside of the footprint for which impact assessments are required for each RFMO/region).

4. Bottom trawling has been prohibited by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) on the high seas in the Southern Ocean. The General Fisheries Commission of the Mediterranean (GFCM) has prohibited bottom trawling below 1,000 meters.

5. Several RFMOs – CCAMLR, SPRFMO and NEAFC (the latter for areas below 200 meters) – have established bans on the use of bottom gillnets in their regulatory areas. SEAFO has a standing "recommendation" (since 2009) that gillnets be banned in the SEAFO Convention Area until more information becomes available.

6. Most RFMOs and States involved in regional negotiating processes to establish new RFMOs to manage bottom fisheries in the high seas have adopted (although not fully implemented) binding regulations or multilateral "interim measures" to manage bottom fisheries largely consistent with the UNGA resolutions. In most cases the regulations have incorporated key provisions of the International Guidelines for the Management of Deep-Sea Fisheries in the High Seas (FAO Guidelines).[9] These establish internationally agreed criteria for identifying VMEs, conducting impact assessments and determining significant adverse impacts of bottom fisheries. (See Table 1)

7. In areas of the high seas where no RFMO exists or is under negotiation, the European Union (EU) has adopted and implemented measures pursuant to paragraph 85 of resolution 61/105 with respect to vessels flying the flag of EU member States. As a result, Spain conducted a comprehensive impact assessment of the potential impact of bottom fishing on VMEs on the high seas in the southwest Atlantic and closed most of the area below 400 meters to Spanish trawlers to protect VMEs.

8. Transparency in the work of the RFMOs managing bottom fisheries in the high seas has improved considerably over the past decade, both for the already established RFMOs such as NEAFC and NAFO as well as the new RFMOs in the North and South Pacific and Indian Oceans.

However, many of the commitments in the UNGA resolutions – in particular the specific actions called for in the resolutions beginning with resolution 61/105 – remain either partially or entirely unfulfilled, leaving vast areas of ocean unprotected.

The regional sections of this report highlight specific shortcomings in each region, which are summarized as follows:

- **Inadequate assessments:** Many of the impact assessments that have been carried out for bottom fisheries in the high seas are not consistent with the criteria established in the FAO Guidelines and endorsed by the UNGA beginning with resolution 64/72. The impact assessments are often partial or inconclusive, or both, as a result of a lack of good baseline information, substantial scientific uncertainties and/or other reasons.

- **No cumulative assessments:** Cumulative impact assessments as called for in resolution 66/68 have not been conducted in any region. This includes in relation to the current status of VMEs impacted or degraded by bottom fishing in the years prior to the adoption of the UNGA resolutions.

- **VME areas remain open to bottom fishing:** Some high seas areas have been closed to bottom fishing, but many areas where VMEs are likely to occur remain open to bottom fishing without having been properly assessed. Moreover, there has been a general reluctance on the part of a number of States and RFMOs to close areas identified as VMEs where bottom fishing currently takes place, or has taken place in recent years. In some cases, bottom trawl fisheries occurring in VMEs identified by scientific bodies have been neither assessed nor prohibited. This is true, for example, for several VMEs in the NAFO and NEAFC areas. No areas have been formally closed to bottom fishing by the South Pacific or Indian Ocean RFMOs although some of the individual flag States in these regions have closed some areas to their fleets (e.g. New Zealand in the South Pacific).

[7] Gianni, M. (2004). *High seas bottom trawl fisheries and their impacts on the biodiversity of vulnerable deep-sea ecosystems: Options for international action*. Gland: IUCN.

[8] UNGA. (2004). *Resolution 59/25. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments* (UN Doc. A/RES/59/25, 17 January 2005); UNGA. (2006). *Resolution 61/105. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments* (UN Doc. A/RES/61/105, 6 March 2007); UNGA. (2009). *Resolution 64/72. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments* (UN Doc. A/RES/64/72, 19 March 2010); UNGA. (2011). *Resolution 66/68. Sustainable fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments* (UN Doc. A/RES/66/68, 28 March 2012).

[9] Food and Agriculture Organization of the United Nations (FAO). (2009). *International guidelines for the management of deep-sea fisheries in the high seas*. Rome: FAO. Retrieved from http://www.fao.org/docrep/011/i0816t/i0816t00.htm [FAO Guidelines].

- **Overlarge footprints:** Fishing 'footprints' are the areas which have been delineated by a number of States and RFMOs to allow bottom fishing to continue based on 'historical' bottom fishing in the region. In some cases these are very large and include half or more of the entire area of the seabed at various fishable depths (e.g. South Pacific, Northwest Atlantic).

- **Widespread bottom trawling:** Deep-sea bottom trawling continues to be the most pervasive form of bottom fishing on the high seas. This is despite concerns repeatedly highlighted in scientific studies and assessments over the past ten years regarding the destructive impact of bottom trawling on deep-sea species, ecosystems, biodiversity and, more recently, the capacity of deep-sea species and sediment ecosystems to capture and sequester carbon.

- **Insufficient move-on rules:** 'Move-on' rules require fishers to cease fishing when they encounter a VME. They are often the only conservation measure in place to protect VMEs in areas where bottom fishing is permitted (so-called "open" or "existing" bottom fishing areas generally corresponding to an historical bottom fisheries footprint). Yet these rules are of limited value given the high threshold levels required to trigger cessation of fishing and movement from the area and the reliance on skippers to report the encounter. Even under the best case scenario, the move-on rules established by most RFMOs are not likely to prevent continued damage to VMEs from bottom trawl fishing because significant damage will likely have already occurred as a result of an 'encounter'. Outside the CCAMLR area few (if any) areas have been closed as a result of the move-on rule over the past ten years.

- **Overfished stocks:** Many deep-sea species for which stock assessments have been conducted and/or quotas have been established are considered overexploited or depleted.

- **Unregulated catch in deep-sea fisheries:** Information provided by observer programs and other sources indicates that hundreds of species are caught as either target or bycatch species in bottom fisheries on the high seas. Yet only a few dozen species are subject to quotas or catch limits. Quotas have been established by SEAFO, NAFO and NEAFC for a number of the target species taken in deep-sea fisheries. However, in the South Pacific for example, over 130 species have been reported caught in the high seas bottom fisheries. Yet there are no restrictions on the catch of any species other than a general measure adopted by SPRFMO to limit each Contracting Party to a level of "bottom fishing catch" that does not exceed its annual average level between 2002 and 2006.

- **Lack of information on status of stocks:** For most deep-sea species there is insufficient information to determine the status of the stocks or the impact of fishing on the species (in particular bycatch species) although most are recognized or likely to be slow growing, long lived, low fecundity species particularly vulnerable to overexploitation. In the North Pacific for example, the stock of the main target species in the deep-sea fisheries is assessed based on a "depletion analysis" which essentially is an after-the-fact assessment of the status of the stock to determine how much it has been depleted by fishing in a given year.

- **Endangered species:** A number of deep-sea species in the Northeast Atlantic have been classified by the IUCN as vulnerable, endangered or critically endangered. These include three of the main species targeted in deep-sea fisheries in the region – orange roughy, roundnose grenadier and blue ling – as well as several species of deep-sea sharks taken as bycatch in deep-sea fisheries.[10]

- **Flag States:** Most flag States whose vessels engaged in bottom fisheries on the high seas in the years leading up to the adoption of resolution 61/105 in 2006 continue to authorize vessels to bottom fish on the high seas today. The majority of vessels currently authorized to bottom fish on the high seas are flagged to a relatively small number of States, including several EU Member States (e.g. Spain and Portugal); New Zealand; Japan; Russian Federation; South Korea; Australia; and the Cook Islands.

- **Numbers of vessels:** The numbers of vessels engaged in bottom fisheries and/or the volume of catch in deep-sea fisheries on the high seas has varied considerably over the past fifteen years in at least two ocean regions (Northwest Atlantic and Southern Indian Ocean). But in general it appears that the number of such vessels has declined somewhat over the past few years compared to the estimated numbers of vessels involved in high seas bottom fishing in the years 2001 (IUCN)[11] and 2006 (FAO).[12] In several regions the number of vessels authorized to fish is considerably higher than the number that has actually engaged in bottom fishing in recent years.

As indicated, the extent to which the UNGA resolutions have been implemented varies widely by region. CCAMLR, for example, has adopted and implemented measures consistent with the resolutions that require comprehensive impact assessments for high seas bottom fisheries in the Southern Ocean and prohibits bottom trawling in all high seas areas. It has also established measures to limit the bycatch of a number of deep-sea species, implemented a comprehensive scientific observer program, and continues to conduct scientific research into the impact of bottom longline fishing on VMEs.

By contrast, multilateral implementation of the resolutions in the Southern Indian Ocean has been very poor. Although some flag States adopted unilateral measures, no regional measures were adopted in response to UNGA resolution 61/105 for almost ten years, despite continued high seas bottom fishing in the region since 2006. While the RFMO responsible, SIOFA, has had three meetings of the Contracting Parties since the entry into force of the SIOFA convention in 2012, they have only recently adopted measures to regulate bottom fishing. A proposal for a ban on bottom gillnet fishing put forward at the last meeting of the Contracting Parties was not adopted and only a non-binding recommendation was passed.

In the Southwest Atlantic – a region of extensive high seas bottom fishing but where no RFMO exists or is under negotiation – the UNGA called on flag States to unilaterally implement the provisions of the resolutions. Here flag State practice has varied widely. Management measures consistent with the resolutions have been implemented by the EU and Spain for Spanish fleets operating on the high seas in the region. These include area closures to protect VMEs on the basis of an extensive impact assessment conducted by the Spanish Institute of Oceanography. However, as far as DSCC is aware, none of the other flag States whose vessels bottom fish in the region have implemented similar measures.

CONCLUSIONS AND RECOMMENDATIONS

UNGA Resolutions 61/105, 64/72, and 66/68 are the products of extensive negotiation and review by the UNGA over the past 10 years. They express the will and commitment of the international community of nations to ensure effective management of deep-sea fisheries in the context of the ecosystem approach and precautionary approach. Moreover, they have important implications for the conservation of biodiversity and the protection and preservation of the marine environment in areas beyond national jurisdiction. As such, the specific actions called for in the resolutions regarding managing deep-sea fisheries to prevent significant adverse impacts on VMEs and the sustainable exploitation of fish stocks reflect important obligations in Articles 5 and 6 of the 1995 UN Fish Stocks Agreement and in Part XII of the United Nations Convention on the Law of the Sea.

While important progress has been made to implement the provisions of the UNGA resolutions, there are numerous shortcomings. These shortcomings are not trivial. The UNGA placed increasing emphasis in 2009, and again in 2011, on the need to conduct prior impact assessments or else *ensure* that such fisheries are not authorized to occur. The international community expended considerable effort in negotiating internationally agreed standards and criteria for conducting such assessments as reflected in the FAO Guidelines.
However, there are numerous instances where RFMOs have allowed areas to remain open to bottom fishing where VMEs are known or are likely to occur, without having assessed the bottom fisheries in these areas to determine whether significant adverse impacts would occur. In some cases, within the areas where bottom fishing is permitted, VMEs identified by scientific bodies have not been closed, or have only partially been closed, to avoid restricting fishing in the area rather than preventing significant adverse impacts on VMEs. This is the fundamental opposite of what the UNGA resolutions have called for and committed high seas bottom fishing States to do.

On the question of the sustainable exploitation of fish stocks – arguably the core business of RFMOs – there are serious shortcomings as well. In the North Pacific, South Pacific and Indian Oceans, stock assessments have not been conducted for most, if not all, target species and thus sustainability cannot be ensured. In most ocean regions, the number of species taken as bycatch is high and many (if not most) are likely to be slow growing, long lived, and vulnerable to even limited exploitation. Yet very little is known about the status of most of the stocks of these deep-sea bycatch species (or even how many distinct stocks there may be) or the impact of fishing mortality. In some cases, regulators may assume that the impact is low because the volume of bycatch of some or all species is relatively low. But these are assumptions only and in the case of the most vulnerable deep-sea species, such as deep-sea sharks, even limited fishing mortality may well be having a significant adverse impact, whether these species are targeted (as in the deep-sea gillnet and longline fisheries in the Indian Ocean) or taken as bycatch.

More generally, the very limited scientific information on the life-history characteristics of most deep-sea species, and the even lesser understanding of food-web and trophic interactions of communities of deep-sea species (which themselves may qualify as VMEs), call into question whether it is even possible in the near term to 'sustainably' manage non-selective or multi-species deep-sea fisheries. In 2004, the DSCC called for a moratorium on bottom trawl fishing on the high seas unless or until these fisheries are managed consistently with international law. The UNGA essentially agreed in 2006, extending the call to include all bottom fisheries, by committing States and RFMOs to adopt and implement the specific set of measures contained in resolution 61/105 paragraph 83 by December 2008 and ensuring that bottom fishing does not proceed after that date "unless conservation and management measures have been established to prevent significant adverse impacts on vulnerable marine ecosystems". This was reaffirmed in resolution 64/72 adopted in 2009 in which the UNGA committed States "not to authorize bottom fishing activities" until the measures in resolutions 61/105 and 64/72 have been "adopted and implemented".

The question for the UNGA review this year is what more needs to be done and how much longer will it, or should it, take to fully implement the resolutions?

[10] Nieto, A., Ralph, G.M., Comeros-Raynal, M.T., Kemp, J., Criado, M.G., Allen, D.J., Williams, J.T. (2015). *European Red List of marine fishes*. Prepared by the International Union for Conservation of Nature (IUCN). Luxembourg: Publications Office of the European Union. Retrieved from http://cmsdata.iucn.org/downloads/iucn_european_red_list_of_marine_fishes_web_1.pdf [IUCN Red List].

[11] Gianni, above note 7.

[12] Bensch, A., Gianni, M., Gréboval, D., Sanders, J. S., & Hjort, A. (2009). *Worldwide review of bottom fisheries in the high seas*. FAO Fisheries and Aquaculture Technical Paper No. 522, Rev.1. Rome, FAO.

The DSCC recommendations in 2016 can be summarized as follows:

1. **Impact assessments:** Comprehensive impact assessments, consistent with the FAO Guidelines, should be done in all areas where bottom fisheries are permitted or authorized to occur in areas beyond national jurisdiction. This would include collecting sufficient baseline information on the ecosystems, habitats and communities in the fishing area against which future changes are to be compared; the identification, description, and mapping of VMEs known or likely to occur in the fishing area; and assessing the impact of fishing mortality on "low-productivity" fish species" among other things, as called for in paragraph 47 of the FAO Guidelines. Low or non-impact technology and methods are available and should be used to map VME areas. High impact technology, in particular bottom trawl gear (whether used in research trawl surveys or commercial 'exploratory' bottom fisheries) should be avoided or prohibited in such surveys.

2. **Area closures:** All areas where VMEs are known or are likely to occur, particularly within established bottom fisheries 'footprints', should be closed unless bottom fishing in these areas is assessed prior to authorizing bottom fishing and a scientific based determination is made that significant adverse impacts will not, or are not likely to, occur.

3. **Significant adverse impacts:** In determining whether significant adverse impacts may occur, impacts on slope sediment ecosystems also should be assessed. This includes assessment in relation to impacts on infaunal biodiversity and the capacity of these ecosystems to act as carbon sinks.

4. **VME criteria and the ecological role of VME species:** VMEs must be defined on the basis of the full suite of criteria outlined in the UN FAO Guidelines, not only on the basis of one (e.g. significant concentrations of VME indicator species only) or a few of the criteria in paragraph 42 of the Guidelines. Communities of deep-sea fish species should also be considered VMEs where they fit the criteria in the FAO Guidelines. A better understanding of the role or ecosystem function of VME species at appropriate bioregional scales is essential for determining the temporal, spatial and ecological extent of impacts and their significance as per the criteria in paragraphs 17-20 of the FAO Guidelines.

5. **Cumulative impact assessments:** Cumulative impact assessments should be conducted to, among other things, determine the extent to which existing VMEs have been impacted over time by bottom fishing (e.g. are they remnant populations of VMEs only) and/or are under threat from other stressors such as ocean acidification. They should be protected accordingly.

6. **Recovery:** Where VMEs have been degraded over time, portions of areas where they have previously occurred should be set aside to allow for regeneration or recovery.

7. **Stock assessments:** The UNGA should reaffirm paragraph 119(d) of resolution 64/72 to require conservation and management measures on the basis of stock assessments and the best available scientific information, including precautionary reference points, and management strategies or plans for fisheries based on such reference points, as well as analyses of conservation and management alternatives, such as the establishment of total allowable catch or total allowable fishing effort at different levels, to ensure the long-term sustainability of deep sea fish stocks and non-target species, and the rebuilding of depleted stocks, and call on States not to authorize bottom fishing activities until such measures have been adopted and implemented.

8. **Multispecies deep-sea fisheries:** Multispecies deep-sea fisheries should be prohibited unless or until a scientific understanding of the impact or risk of impact on all affected species can be determined. Only selective deep-sea fisheries should be permitted on the basis of comprehensive stock assessments of the target species, with sustainable limits on the catch established accordingly, and depleted stocks rebuilt consistent with paragraph 119(d) of resolution 64/72.

9. **Full implementation:** The UNGA should reaffirm, in no uncertain terms, the call in paragraph 120 of resolution 64/72 on flag States and members of RFMOs or arrangements with the competence to regulate bottom fisheries to adopt and implement measures in accordance with resolutions and international law, and not to authorize bottom fishing activities until such measures have been adopted and implemented.

10. **RFMO biodiversity protection mandates:** States should be called on to amend, as necessary, the mandates of RFMOs with competence over bottom fishing to ensure that RFMOs take all necessary action to protect biodiversity in the marine environment as required under Article 5(g) and other relevant provisions of the 1995 UN Fish Stocks Agreement.

It is important that all States respect the rights and interests of the international community as a whole. The UNGA has a key role to play in ensuring that this occurs in ocean areas beyond national jurisdiction – our global ocean commons. It should no longer be acceptable for States, whether individually or through RFMOs, to exercise a right to fish on the high seas without ensuring the conservation of marine biological diversity in areas beyond national jurisdiction, sustainable exploitation of fish stocks, minimal impact on bycatch species, and the preservation and protection of the marine environment as called for in the UNGA resolutions and required under international law.

1.0 Introduction

The Deep Sea Conservation Coalition (DSCC) is a coalition of over 70 organizations worldwide promoting the conservation and protection of biodiversity on the high seas. Since its creation in 2004, the DSCC has been actively involved in the international debate and negotiations to address the adverse impacts of high seas bottom fishing on deep-sea biodiversity and fish stocks in areas beyond national jurisdiction, and more recently has also been engaged in the work of the International Seabed Authority regarding the regulation of seabed mining.

Member organizations and advisors to the DSCC are involved in a variety of regional and national efforts to implement the provisions of the United Nations General Assembly (UNGA) resolutions related to the management of high seas bottom fisheries. Over the past decade, DSCC representatives have participated in numerous meetings (including working group and scientific committee meetings as well as Annual Meetings) of the North-East Atlantic Fisheries Commission (NEAFC), the Northwest Atlantic Fisheries Organization (NAFO), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the North Pacific Fisheries Commission (NPFC), the South Pacific Regional Fisheries Management Organisation (SPRFMO) and the Southern Indian Ocean Fisheries Agreement (SIOFA), as well as consultative and legislative processes in a number of countries designed to implement regional agreements and the UNGA resolutions at the national level. DSCC representatives also participated in the development of the International Guidelines for the Management of Deep-Sea Fisheries in the High Seas, negotiated under the auspices of the Food and Agriculture Organization of the United Nations (FAO) in 2008,[13] and several workshops organized by FAO to review the implementation of the International Guidelines since then.

METHODS AND ANALYSIS

On the basis of the experience outlined above, and a review of the publicly available information on the actions taken by States and RFMOs to date, the DSCC has compiled the following review of the extent to which high seas bottom fishing nations and RFMOs have adopted and implemented the measures called for in UNGA resolutions 61/105, 64/72 and 66/68[14], specifically the actions taken by States and RFMOs to conduct impact assessments, identify areas where VMEs are known or likely to occur, and establish measures to protect VMEs and ensure the long-term sustainability of deep-sea fish stocks. This review builds on the DSCC reviews published in May 2009, June 2010 (jointly with the International Programme on Science and the Oceans) and September 2011,[15] as well as on numerous scientific studies, papers and reports, and the records and reports associated with meetings of the relevant RFMOs.

For the maps of RFMOS, publicly available coordinates for areas designated for bottom gear and bottom trawl closures as well as previously existing fisheries footprints were gathered for each RFMO. These closures and footprints were clipped to include only areas beyond national jurisdiction (ABNJ), areas greater than 200 nautical miles (nm) from shore. The areas were analyzed using Esri software ArcGIS 10.3.1 to merge and dissolve to calculate the total amount of area in each RFMO region that is open, closed, or requiring further assessment prior to fishery activity. These management areas were then overlaid with areas of "fishable" depth, seamounts at "fishable" depth, as well as two globally available models of predicted habitat for deep-sea corals (within "fishable" depths) as an indicator of possible VME area. The total amount of each that is currently closed to bottom fishing, open to bottom fishing, and that requires assessment prior to fishery activity was calculated. All calculations were done using geodetic calculations which account for the curvature of the earth (see Annex 3 for further information).

Fishable depth was variable for each RFMO area and was defined based on a best estimate of the maximum depth of bottom fishing known to occur in each region, the depth of the historic fisheries footprint where such footprints have been established, and/or the maximum depth at which scientific advisory bodies have indicated that VME areas should be considered or designated. They are as outlined in Table 2.

Table 2. Maximum fishable depth (meters) by RFMO

NAFO	Northwest Atlantic Fisheries Organization	2000m
NEAFC	North East Atlantic Fisheries Commission	1500m
GFCM	General Fisheries Commission for the Mediterranean	1500m
SEAFO	South East Atlantic Fisheries Organisation	2000m
NPFC	North Pacific Fisheries Commission	1500m
SPRFMO	South Pacific Regional Fisheries Management Organization	1500m
SIOFA	South Indian Ocean Fisheries Agreement	1500m
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources	2200m

[13] FAO Guidelines, above note 9.

[14] Above note 8.

[15] Gianni, M. (May 2009). *Review of the implementation of the provisions of UNGA resolution 61/105 related to the management of high seas bottom fisheries* (Submission to the UN Division for Oceans Affairs and the Law of the Sea); Rogers, A. D., & Gianni, M. (May 2010). *The implementation of UNGA resolutions 61/105 and 64/72 in the management of deep-sea fisheries on the high seas* (Report prepared for the DSCC). London: International Programme on the State of the Ocean; Gianni, M., Currie, D. E. J., Fuller, S., Speer, L., Ardron, J., Weeber, B., Kavanagh, A. (September 2011). *Unfinished business: a review of the implementation of the provisions of United Nations General Assembly resolutions 61/105 and 64/72, related to the management of bottom fisheries in areas beyond national jurisdiction*. Amsterdam: Deep Sea Conservation Coalition.

2.0 NORTH ATLANTIC

2.1 NORTH EAST ATLANTIC

The regulation of bottom fisheries on the high seas of the Northeast Atlantic is governed by the North East Atlantic Fisheries Commission (NEAFC). The ocean region covered by the NEAFC Convention is one of the most abundant fishing areas in the world, stretching from the southern tip of Greenland, east to the Barents Sea, and south to Portugal. The NEAFC Regulatory Area (NEAFC RA) consists of the areas beyond national jurisdiction located within the NEAFC region.

The five Contracting Parties of NEAFC as of 2016 are: Denmark (in respect of the Faroe Islands and Greenland), the European Union (EU), Iceland, Norway, and the Russian Federation. Cooperating Non-Contracting Parties include: Bahamas, Canada, Liberia, New Zealand, and St Kitts and Nevis.

2.1.1. DESCRIPTION OF HIGH SEAS BOTTOM FISHERIES

2.1.1.1 Main high seas bottom fishing nations

EU (Spain), Faroe Islands, Norway, Iceland.

2.1.1.2 Number of high seas bottom fishing vessels operating in the region in 2014/2015 (or latest year for which information is available):

This information is not publicly available.

2.1.1.3 Main high seas bottom fisheries

The main high seas bottom fisheries target roundnose grenadier, roughhead grenadier, smoothheads, black scabbardfish, rabbitfish, blue ling, ling and tusk, and, until recently, orange roughy. There is also a newly developing snow crab fishery. Other target species include Greenland halibut and conger eel. Some high seas bottom fishing for cod, haddock and redfish also occurs. Bottom fisheries are predominantly bottom trawl fisheries with some bottom longline fishing also taking place.

2.1.1.4 Catch

The reported catch of regulated deep-sea species in the high seas of the Northeast Atlantic that makes up the NEAFC RA for the year 2014 was 6,002 tonnes (Table 3).[16]

Table 3. Total reported catch of deep-sea species in the NEAFC Regulatory Area in 2014

Contracting Party	Tonnes
European Union	5,430
Denmark/Faroes Islands	380
Norway	123
Iceland	69
Russia	0
Denmark/Greenland	0
TOTAL	6,002
Percentage caught by EU fleets	90.5%

SOURCE: NEAFC, AT NOTE 16

2.1.1.5 Vessels authorized to fish in 2015/16

The NEAFC Secretariat maintains a list of vessels authorized by Contracting Parties to fish in the NEAFC RA, but this list is not publicly available.

2.1.1.6 Changes in numbers of vessels active in bottom fisheries and volume of catch since 2004/6 to 2014 if known

Information on the number of vessels authorized to bottom fish in the NEAFC RA is not publicly available. There are also significant discrepancies between the reported catch figures and estimates provided by various sources. Moreover, the International Council for the Exploration of the Sea (ICES), the multilateral scientific body that provides advice on fisheries and other marine conservation and management issues to NEAFC and governments in the region, has periodically indicated that the reported catch of deep-sea species issued by one Contracting Party in particular is not entirely reliable.

[16] North East Atlantic Fisheries Commission (NEAFC). (2014). *Aggregated catch statistics*. Retrieved from http://www.neafc.org/system/files/Aggregated-catch-statistics-2014-final.pdf.pdf

[17] NEAFC. (2012). *Symposium on NEAFC's Review of its Bottom Fishing Regulations*. Retrieved from http://www.neafc.org/pecmas/symposium.

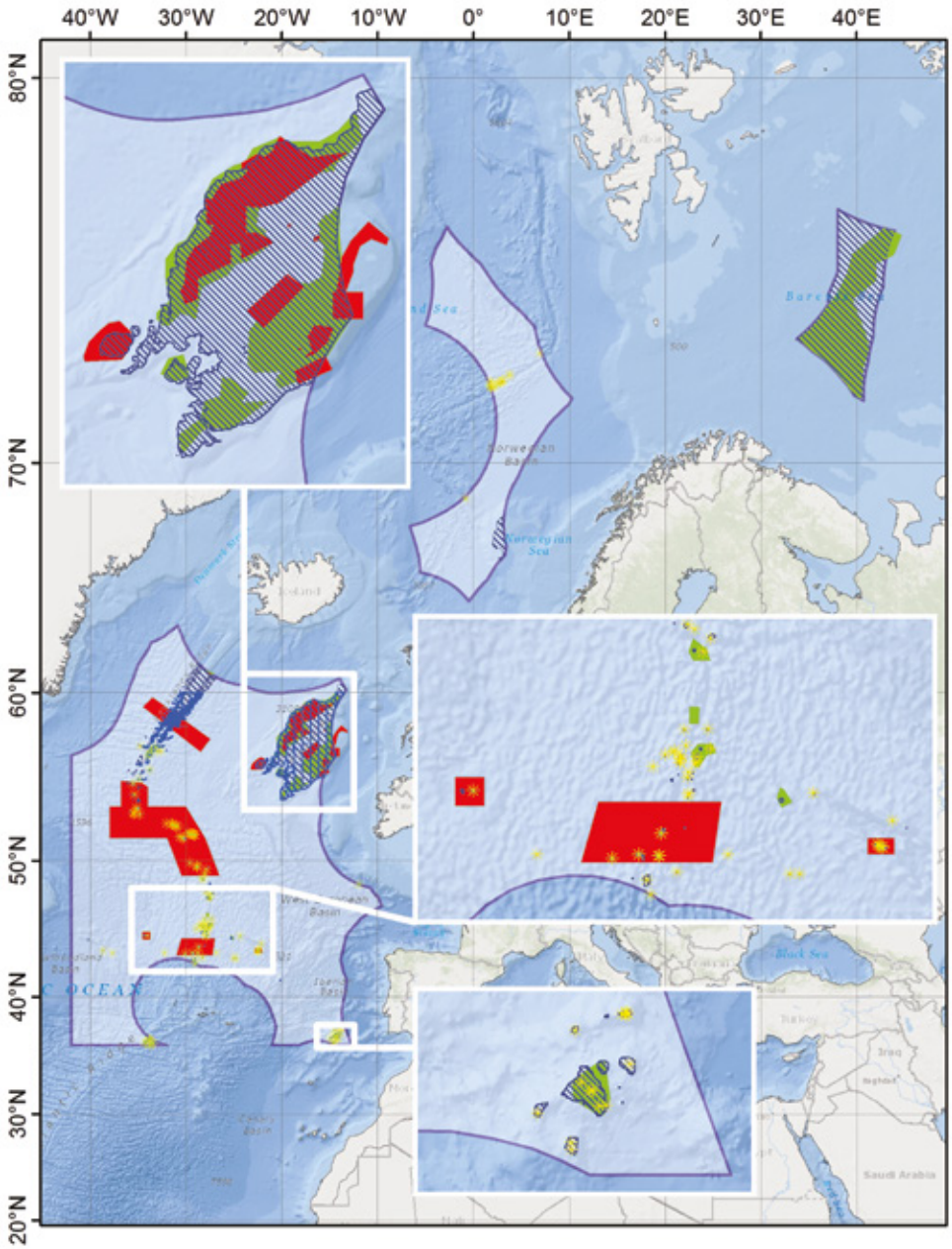
[18] NEAFC. (2014). *Recommendation 19:2014: Protection of VMEs in NEAFC Regulatory Areas as Amended by Recommendation 09:2015*. Retrieved from http://www.neafc.org/system/files/Rec_19-2014_as_amended_by_09_2015_fulltext_0.pdf.

2.1.2 THE IMPLEMENTATION OF MEASURES TO PROTECT VULNERABLE MARINE ECOSYSTEMS FROM SIGNIFICANT ADVERSE IMPACTS AND ENSURE THE LONG-TERM SUSTAINABILITY OF DEEP-SEA FISH STOCKS – PARAGRAPHS 83 TO 87 OF UNGA RESOLUTION 61/105; PARAGRAPHS 113, 117 AND 119 TO 124 OF UNGA RESOLUTION 64/72; AND PARAGRAPHS 121, 126, 129, 130 AND 132 TO 134 OF UNGA RESOLUTION 66/68

In 2008, NEAFC adopted a framework regulation for the management of high seas bottom fisheries in the NEAFC RA to implement the provisions of UNGA resolution 61/105. Following the adoption of UNGA resolutions 64/72 and 66/68, NEAFC decided in 2011 to undertake a thorough review of all its bottom fisheries regulations, which had been adopted piecemeal over the previous decade, in order to ensure consistency with the UNGA commitments. The review began with a special Symposium in June 2012[17] and concluded with the adoption of a significantly enhanced set of regulations for the management of bottom fisheries in the NEAFC RA, which entered into force in September of 2014. These regulations were further amended in November 2014 to incorporate additional area closures.[18]

FIGURE 1

NEAFC



NEAFC	% "Fishable" Area	% "Fishable" Seamounts
Areas closed to all bottom fishing	16.7%	33.1%
Areas where bottom fishing is permitted	37.3%	8.6%
Areas where prior impact assessment required before bottom fishing can occur	46.0%	58.3%
TOTAL	300,646 km²	139 seamounts

- Seamounts <1500m deep
- 1500m Isobath
- VME/Bottom fishery closure
- Existing bottom fishery
- Regulatory Area

SOURCE: MARINE CONSERVATION INSTITUTE 2016

The revised regulations also formally incorporated the definitions of, and criteria for, the terms "significant adverse impacts" and "vulnerable marine ecosystems" set out in the FAO Guidelines (paragraphs 17–20 and 42–43 of the Guidelines respectively). In addition, while the previous version of the regulations only mentioned "corals" and "sponges" as VMEs, the revised regulations added a large number of new VME species/taxa, including species other than corals and sponges (e.g. sea pens, tube dwelling anemone patches, and mud and sand emergent epifauna such as xenophyophores). NEAFC essentially manages bottom fisheries for impacts on VMEs in four ways: by having established a series of "existing bottom fishing areas" (a bottom fisheries footprint based on historic patterns of fishing in the NEAFC RA) where bottom fishing is permitted; by exercising a 'move-on' rule; by closing certain areas to all bottom fishing to protect known or representative areas of VMEs; and through a requirement that any bottom fishing in the areas outside the existing fishing areas and the closed areas can only be fished provided a prior impact assessment is submitted to NEAFC and reviewed by a scientific body, and a permit for "exploratory" fishing is approved by NEAFC. Depending on the outcome and review of the results of an exploratory fishery, it is possible for an area to be reclassified as an "existing bottom fishing area" by a decision of the NEAFC Parties though this has not yet occurred as no exploratory fishing has yet been approved by NEAFC.

The management of fishing for deep-sea species is carried out using a combination of quotas for some species and a general effort limitation regulation.

2.1.2.1 Impact assessments

In 2008, NEAFC adopted the following regulation regarding impact assessments, which entered into force in 2009: *"Each Contracting Party proposing to participate in bottom fishing shall submit to the Secretary information on and, where possible, an initial assessment of the known and anticipated impacts of its bottom fishing activities on vulnerable marine ecosystems, in advance of the next meeting of PECMAS* [Permanent Committee on Management and Science]*. These submissions shall also include the mitigation measures proposed by the Contracting Party to prevent such impacts".*[19]

Despite this provision, no impact assessments were submitted to the NEAFC Secretariat or PECMAS by any Contracting Party until 2015. Assessments based on fisheries and non-fisheries related surveys (including a major multinational survey led by Spain in the Hatton Bank area[20]) have, however, been done for a significant portion, of the areas where bottom fishing is permitted – the so-called "existing bottom fishing areas" or fisheries footprint – to determine whether there are likely to be VMEs. As a result, a number of (though not all) areas where VMEs are either known or deemed likely to occur within the footprint have been closed to bottom fishing.

In 2010, NEAFC designated a set of "existing bottom fishing areas" within which bottom fishing was permitted to occur based on a historical fisheries footprint (see Figure 1).[21] NEAFC subsequently amended its bottom fisheries regulation to require an "initial" assessment of the impacts of bottom fishing in "new" fishing areas (i.e. areas outside of the "existing" fishing areas). The amended regulation also required an "initial" assessment in existing fishing areas, but only "if there are significant changes to the conduct, or technology of existing bottom fisheries, or new scientific information indicating a VME in a given area".[22] The NEAFC regulation was further amended to require that the impact assessments be conducted consistent with the criteria for conducting impact assessments presented in paragraph 47 of the FAO Guidelines. These criteria were incorporated into the NEAFC regulations as an Annex. However, NEAFC omitted one crucial aspect of the criteria in paragraph 47: assessing the impacts of bottom fishing on the long-term sustainability of low productivity fish stocks is not required under the NEAFC regulations.[23] Due to this omission, the impact assessments required by NEAFC only need to cover the impacts of bottom fisheries on VMEs.

Another concern, noted by DSCC in its review in 2011, was that it was not clear at the time these 2010 amendments were made whether or not impact assessments in new fishing areas would be mandatory.[24] As a result of the extensive NEAFC review mentioned in the previous section, the revised NEAFC bottom fisheries regulations that entered into force in 2014 now specifically require that any application for exploratory bottom fishing in areas outside those designated by NEAFC as "existing" fishing areas must include a full, and prior, impact assessment consistent with criteria in the Annex to the NEAFC regulations, and stipulate that exploratory fishing will only be permitted if the Commission approves it, based on a review of the impact assessment and "any advice" from ICES.[25] This is a significant improvement as, under the previous regulations, any Contracting Party was able to unilaterally permit its vessels to engage in exploratory fishing in new areas as long as it submitted an exploratory fisheries plan to the Commission.

Exploratory fisheries and extended continental shelf claims

Three impact assessments were submitted in 2015, as part of applications for permission to engage in exploratory bottom fisheries in new fishing areas in the Barents Sea for snow crabs. However, as far as the DSCC is aware, none of these applications or the associated impact assessments have been made public. Although NEAFC's Permanent Committee on Management and Science recommended that the applications fulfilled the conditions established in the NEAFC regulations for exploratory fisheries, they were ultimately denied as a result of opposition from Norway and Russia. The proposed exploratory fisheries would take place in a portion of the NEAFC RA where both countries have claimed an extended continental shelf and target species was a sedentary species. They apparently argued that NEAFC therefore does not have the legal authority to grant the applicants permission to fish the species as the coastal State has sole jurisdiction over the exploitation

of sedentary species on its extended continental shelf.[26] (Interestingly, a number of vessels from one or both of these Contracting Parties may have engaged in bottom fishing targeting the same species in areas where the NEAFC regulations require a prior impact assessment and an application for exploratory fishing.)

This was not the first occasion extended continental shelf claims had entered into the debate over measures to manage bottom fisheries. For several years, the EU has opposed the adoption of an area closure recommended by ICES – the Josephine Seamount – due to the Portuguese government's argument that, although the seamount is in international waters, it is part of Portugal's extended continental shelf and thus NEAFC does not have jurisdiction to set management measures for the protection of VMEs in the area. In fact, a large portion of the seabed area that NEAFC has closed to bottom fishing is located in areas where States bordering the region have claimed extended continental shelves. It remains to be seen whether recent assertions by coastal states have the potential to unravel many of the measures to protect VMEs that NEAFC has adopted to date.

2.1.2.2 Identify and close areas where VMEs are known or likely to occur, unless bottom fisheries are managed to prevent SAIs

NEAFC first adopted several area closures to bottom fishing in 2004, the year UNGA resolution 59/25 first called on States and RFMOs to take urgent action to protect VMEs from the harmful impacts of bottom fishing, and has closed many more areas since then. Having reviewed the areas designated by NEAFC as closed, the existing bottom fishing areas, and all areas outside of the existing fishing areas which are not technically closed, DSCC estimates that approximately one-third (33.1%) of seamounts and 16.7% of the area of seabed shallower than 1,500 meters depth has been closed to bottom fishing within the NEAFC Regulatory Area. Only 8.6% of the seamounts and a little over one-third (37.3%) of the seabed is currently open to bottom fishing (i.e. located within the "existing bottom fishing areas"). Approximately half of the seamounts and seabed (58.3% and 46%) of the NEAFC Regulatory Area at fishable depths are in areas which are off limits to bottom fishing unless a prior impact assessment and an exploratory fisheries program determines that bottom fishing can be done in one or more portions of the area and NEAFC approves incorporating the area or areas into the existing bottom fishing areas (see Figure 1 above).

A substantial portion of the area at fishable depths along the Hatton and Rockall Banks (two large underwater features that straddle the boundary between EU waters and the high seas west of Ireland and Scotland) has been identified as areas where corals are known to occur. This finding is based on research trawl surveys conducted by Spain, bycatch information from commercial deep-water fisheries inside EU waters provided to ICES by the UK, Scottish trawl surveys, and other sources of information including non-fisheries related deep-sea surveys. Over the past decade much of these areas have been closed to bottom fishing, but ICES has indicated that there are still areas where VMEs are likely to occur that remain open to bottom fishing.

Among the first areas closed by NEAFC were a section of the Mid-Atlantic Ridge (MAR) and adjacent seamount areas, which were temporarily closed in 2004. These area closures were renewed and greatly expanded in 2009, as a result of a proposal made by Norway and adopted by NEAFC to close three large "representative" areas of the MAR to bottom fishing. The Norwegian proposal, based on information obtained by the Mar-ECO expedition led by Norway as part of the Census of Marine Life, stated that "*[t]he existence of fragile benthic macrofauna (corals, sponges etc.) on the MAR has been documented in several studies and it is a fair assumption that most hard-bottom areas of the hills and slopes have or are likely to have such fauna albeit in varying density.… In summary, there is a high likelihood that most upper slope areas and the associated range of species have to some extent been affected by past fisheries, and that fragile invertebrate communities occur on many hills*".[27]

The proposal further stated that the "aims of the closures are to protect and/or facilitate restoration of resources and associated invertebrate communities, and to protect, as called for by UNGA and further defined by FAO, representative vulnerable ecosystems against future potentially significant adverse impacts from present and future fisheries activity". However, as noted in the DSCC reviews in 2009 and 2011, the DSCC pointed out at the time that paragraph 83c of UNGA resolution 61/105 calls for closing areas where VMEs are known or likely to occur unless fisheries can be managed in such areas to prevent significant adverse impacts on VMEs, a commitment that was further reinforced in paragraph 119b of UNGA resolution 64/72. It is clear that both resolutions call for the protection of *all* VMEs from SAIs, not for only closing

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[19] NEAFC. (2008). *Recommendation 16: 2008 Recommendation by the North-East Atlantic Fisheries Commission in accordance with Article 5 of the Convention on future multilateral cooperation in North-East Atlantic fisheries at its extraordinary meeting on 1-2 July 2008 to adopt the following recommendation on bottom fishing activities in the NEAFC regulatory area*, art. 5.3(i). Retrieved from http://www.neafc.org/system/files/%252Fhome/neafc/drupal2_files/16-rec_bottom_fishing_em_2008.pdf.[20] Duran, P.M., Sacau, M., Del Rio, J.L., Lopez-Abellan, L.J., & Sarraide, R. (2014). Seabed mapping and vulnerable marine ecosystems protection in the high-seas fisheries: Four case studies on progress in the Atlantic Ocean. [Poster, ICES ASC 2014, A Coruna, Spain, Theme Session B: The science and tools for the management of networks of marine protected areas, ICES CM 2014/3527 B:22]. Retrieved from http://www.repositorio.ieo.es/e-ieo/bitstream/handle/10508/2456/Poster%20Duran%20et%20al%20ICES%202014_10sept04_Final.pdf?sequence=5

[21] NEAFC (2010). *Recommendation 9 2010. Recommendation by the North-East Atlantic Fisheries Commission in Accordance with Article 5 of the Convention on Future Multilateral Cooperation in North East Atlantic Fisheries at its Annual Meeting in November 2008 to adopt the following recommendation on operational procedures for fishing in existing and new bottom fishing areas*.
Retrieved from http://www.neafc.org/system/files/rec11_threshholds_plus_new_and_existing_fishingareas_and_maps.pdf.

[22] NEAFC. (2011). *Recommendation na 2011 Consolidated text on all NEAFC recommendations on regulating bottom fishing*, art. 5(3)(i).
Retrieved from http://www.neafc.org/system/files/Consolidated%20bottom%20regulations%20amended%20by%20recommendation%2012%202013.pdf.

[23] Ibid.

[24] Gianni *et al*, above note 15, p. 6.

[25] NEAFC, above note 18, art. 7(3).

[26] NEAFC. (2015). *34th annual meeting of the North-East Atlantic Fisheries Commission, 9–13 November 2015 report*, pp. 3 & 7.
Retrieved from http://www.neafc.org/system/files/AM-2015-report-final_0.pdf.

[27] NEAFC. (2008). *Proposal for revision of areas closed to bottom fisheries in the NEAFC RA on the mid-Atlantic Ridge and in the adjacent abyssal plains. Report of the Meeting of the Permanent Committee on Management and Science (PECMAS) of the North-East Atlantic Fisheries Commission*, 17–18 June 2008, Annex 2 (references omitted). Retrieved from http://www.neafc.org/system/files/annex2%20from%20june_08.pdf.

"representative" areas of VMEs.[28] Closing representative areas will protect the VMEs located within the area closures, assuming that they are effectively enforced; however, the effective implementation of the resolutions requires that bottom fisheries in areas that remain open to fishing still need to be managed to prevent SAIs on VMEs. As discussed below, the move-on rule is the main conservation measure currently in place in areas open to bottom fishing. While this management measure may reduce SAIs it does not prevent SAIs, and thus the commitment to manage bottom fisheries to prevent SAIs on VMEs is not being entirely fulfilled by only closing 'representative' areas to bottom fishing where VMEs are known or likely to occur.

Also in 2009, the EU had proposed two additional large area closures along the northern part of the MAR known as the Reykjanes Ridge. After evaluating the proposal, ICES noted that "*given the character of the Mid-Atlantic Ridge between Iceland and the Azores, and the increasing depths from north to south, it is highly likely that all of the ridge, but in particular the northern Reykjanes Ridge, will feature VME indicator habitats and species*" and that "*evidence from these representative areas provides support for the occurrence of VME indicators such as Lophelia pertusa, gorgonian corals and deep-water sponge aggregations associated to the hills and seamounts all along the ridge. Therefore, any expansion of the closures that affects relatively shallow hills of the Mid-Atlantic Ridge (i.e. areas shallower than 1500–2000 m) may protect additional VMEs against adverse effects of bottom fisheries*". [29]

In 2010, ICES formally advised NEAFC that "[***e***]*xtending closures on the Mid-Atlantic Ridge will protect any Vulnerable Marine Ecosystem (VME) in the areas concerned against significant adverse impacts resulting from bottom fishing activities on the Reykjanes Ridge*".[30] In spite of this advice, NEAFC did not adopt the additional area closures proposed by the EU. Although the European Commission expressed disappointment that the EU proposal was not accepted, it ultimately decided to support the above mentioned Norwegian proposal as a "first step" that would "need to be extended urgently if NEAFC is to respond to the expectations of the international community and protect vulnerable marine ecosystems in the Atlantic effectively".[31]

In 2013, ICES recommended that another large area of the Mid Atlantic Ridge be closed to bottom fishing to protect VMEs, a proposal that was also rejected by NEAFC. This time the rationale was that, as the area in question was located outside of the "existing bottom fishing areas", no closure was necessary because, it was argued, if there are any VMEs in the area, and a Contracting Party wished to bottom fish in the area, then the impact assessment now required under the new NEAFC regulation would determine whether the fishery could be managed to prevent significant adverse impacts on the VMEs.

Elsewhere in the region, NEAFC has adopted a series of additional closures since 2010 to protect VMEs. Most of these new area closures were put in place on the Hatton and Rockall Banks on the basis of scientific recommendations from ICES. In several cases, however, NEAFC did not adopt the area closures originally recommended by ICES, primarily to avoid closing areas where one or more Contracting Parties were (or were interested in) bottom fishing (see Box 1).

> ***" This truly vast deep-sea realm constitutes the largest source of species and ecosystem diversity on Earth. "***
>
> Global Marine Assessment/World Ocean Assessment (UNGA 2015).
> Chapter 36F: Open Ocean Deep Sea (p. 1)

[28] WWF, Seas At Risk and DSCC. (2009). *Recommendations for the meeting of the North-East Atlantic Fisheries Commission, 9–13 November 2009*. Retrieved from http://www.savethehighseas.org/publicdocs/WWF-NEAFC-09-recommendations.pdf.

[29] International Council for the Exploration of the Sea (ICES). (2010). "Advice to NEAFC on vulnerable deep-water habitats. Special request Advice August 2010." *ICES Advice 2010, Book 9*.
Retrieved from http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2010/Special%20Requests/NEAFC%20Vulnerable%20deep-water%20habitats.pdf.

[30] Ibid.

[31] European Commission. (2009, 3 April). "North East Atlantic: Only limited progress made to protect Vulnerable Marine Ecosystems," *Midday Express EXME09/03.04*. Retrieved from http://ec.europa.eu/fisheries/press_corner/press_releases/2009/com09_15_en.htm.

[32] ICES. (2013). "1.5.5.1: General advice to NEAFC on vulnerable deep-water habitats. Special request, Advice June 2013." *Report of the ICES Advisory Committee 2013*. ICES Advice 2013, Book 1. Retrieved from http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Advice/2013/Book%201%20-%20Introduction,%20Overviews%20and%20Special%20Requests.pdf.

[33] Ibid, pp. 78–80.

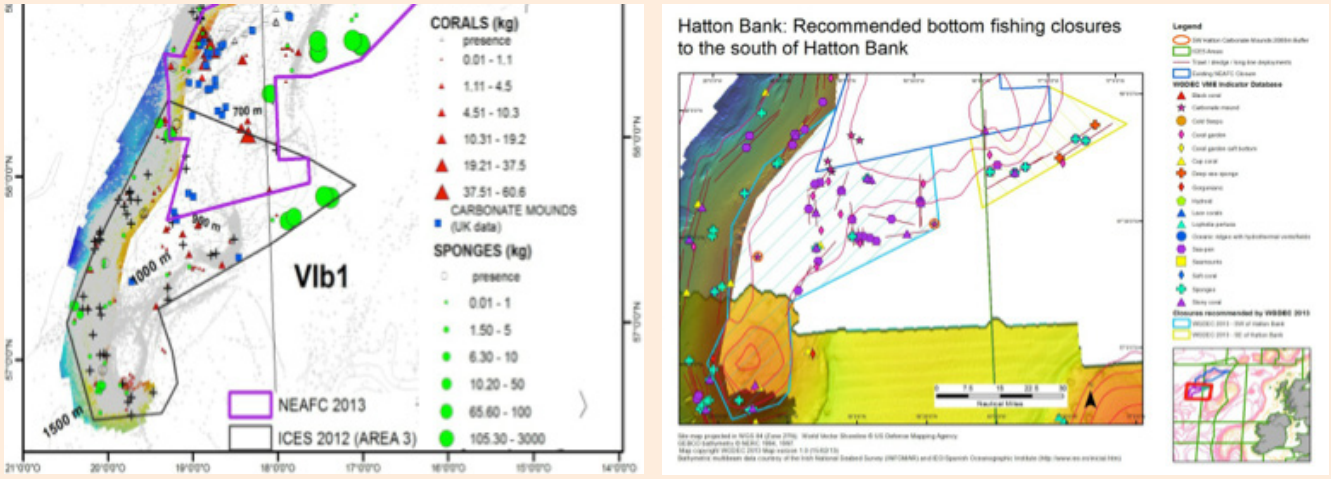
[34] ICES, (2012). Report of the ICES/NAFO *Joint Working Group on Deep-water Ecology* (WGDEC), 26–30 March 2012, Copenhagen, Denmark, ICES WGDEC Report 2012. (ICES CM 2012/ACOM:29), p. 17.

BOX 1. Case study – VMEs remain open to bottom trawling impacts, no determination of SAIs

Two ICES proposals to close portions of the Hatton and Rockall Banks to protect VMEs[32] have been modified in order to accommodate the deep-water trawl fishery:

a. Southern Hatton Bank

FIGURE 2. SOUTHERN HATTON BANK AREA CLOSURE PROPOSED BY AND ADOPTED BY NEAFC



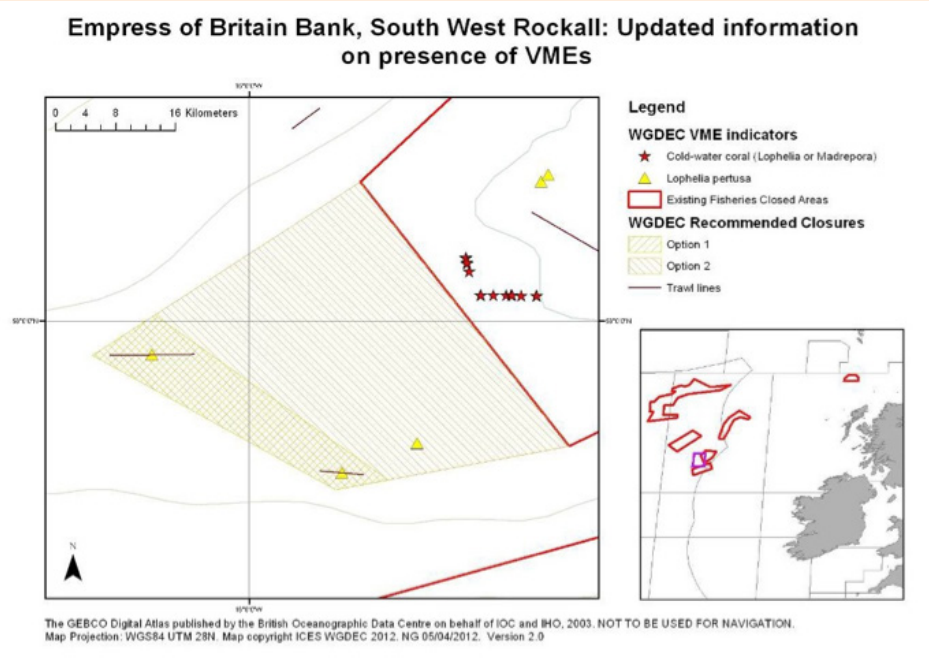
SOURCE: ICES, AT NOTE 32, PP. 79–80.

The figure on the left is a recommendation made by ICES in 2012 to close a portion of southern Hatton Bank (area within the grey lines) by extending the southern boundaries of an area of the Hatton Bank previously closed by NEAFC (the area within the purple lines). The grey shaded areas in the figure represent the bottom trawl activity taking place within the boundaries of the area closure proposal according to VMS data. This proposal was rejected by NEAFC in 2012. The figure on the right shows the modified boundaries of the revised – much smaller – closure proposal submitted by ICES for the same area in 2013. The boundaries were redrawn by ICES to avoid including areas where bottom trawling occurs. The rationale that ICES gave was that VMEs were unlikely to be present due to intensive trawling in spite of the clear indications that VME indicators species such as sponges, cup corals, seapens and gorgonians occurred throughout the area. As a result of these changes to the original proposal, the bottom trawl fishing was not assessed to determine whether SAIs on VMEs in the area of the original proposal would occur. The modified proposal was adopted by NEAFC in 2014.[33]

b. Southwest Rockall Bank

A similar situation occurred in the case of an ICES proposal to close an area of the southwest Rockall Bank. Two research trawls conducted in the area in 2011 brought up 3.8 tonnes and 250 kilograms of the reef forming cold-water coral *Lophelia pertusa* respectively. As a result, ICES proposed extending the southern portion of the closure that had been previously adopted to also cover these areas. The boundaries of the proposed closure were presented on the map in Figure 3, below, based on the assumption that, given the similar topography of the area as a whole, coral is likely to occur between the encounter areas (in yellow triangles) where the research trawls had found the coral and the area that was already closed to protect known occurrences of coral VMEs. The grey line and hatched areas of the map show Option 1 and Option 2, the latter of which was proposed by ICES as a less "precautionary" alternative representing "the minimum that can be done to protect both sites within one closure".[34]

FIGURE 3. ICES PROPOSAL FOR AREA CLOSURES ON SOUTHWEST ROCKALL BANK



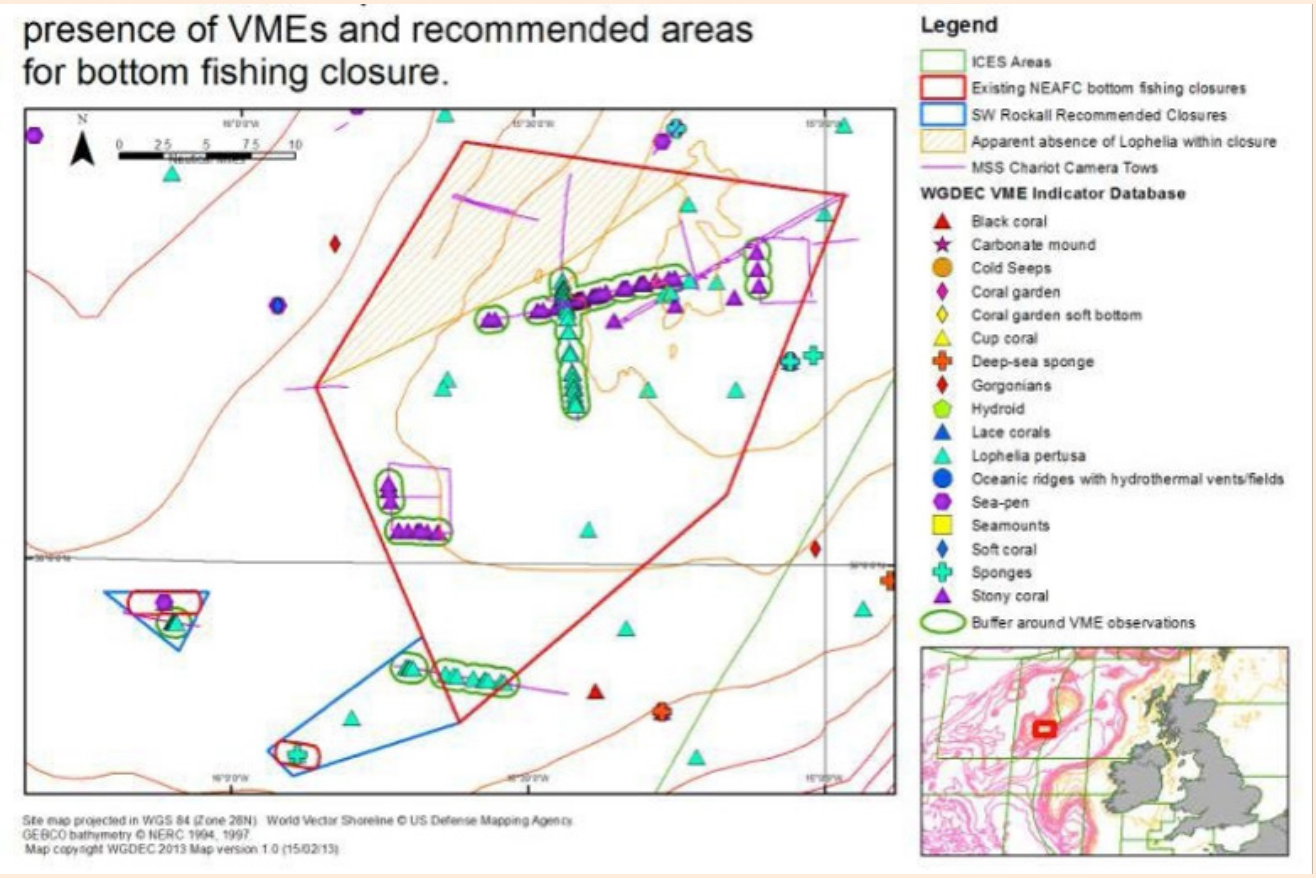
SOURCE: ICES, AT NOTE 34, P. 18.

In the end both options were rejected by NEAFC, with one Contracting Party expressing the view that the closures should only encompass the area where the corals and sponges had actually been trawled (i.e. areas where they were definitely 'known' to occur but not areas where the scientists deemed that the corals were 'likely' to occur). As a result, ICES revised the boundaries of the area closure proposals and resubmitted a proposal to NEAFC the following year with the boundaries (delineated by the green lines in the lower right hand corner of Figure 4, below, drawn much closer to the sites where the corals were found. These smaller area closures were adopted by NEAFC.

Box 1 continues on page 16

Box 1: continued from page 15

FIGURE 4. AREA CLOSURES ON SOUTHWEST ROCKALL BANK ADOPTED BY NEAFC



SOURCE: ICES, AT NOTE 32, P. 76.

The original proposals by ICES for the southern Hatton Bank and Southwest Rockall Bank were both rejected by NEAFC in 2012 because of opposition from the same two Contracting Parties, the EU and the Russian Federation. As a result, ICES proposed smaller area closures in both areas in 2013 as indicated in the figures above. It is known that vessels flagged to an EU Member State bottom trawl fished in a portion of the area originally proposed for closure on Hatton Bank.

In addition to the above, as mentioned previously, areas of the Mid-Atlantic Ridge where VMEs are known or likely to occur, including areas proposed for closure by the EU and ICES, have not been closed to bottom fishing nor has the Josephine Seamount been closed in spite of a recommendation by ICES to do so. Portions of all of these are incorporated in the "existing bottom fishing area" delineated by NAEFC where bottom fishing is permitted to occur without an impact assessment.

2.1.2.3 Move-on rule/cease fishing in areas where VMEs are encountered

A VME encounter protocol which triggers a move-on rule when 100 kg of 'live' corals or 1,000 kg of sponges are brought up in the fishing gear (trawl, longline, gillnet or pot) was agreed by NEAFC in 2008. In 2009, the thresholds were revised down to 60 kg of 'live' corals or 800 kg of sponges. At this time, the move-on rule required a vessel to cease fishing within an area of 2 nm from the position that the "evidence suggests is closest to the exact encounter location" (trawl tows along continental slope areas can be up to 20 nm in length). Within 'historically fished' areas, the vessel must report the encounter and cease fishing in the area, but other vessels can continue to bottom fish in the area. In "new fishing areas", defined as areas outside of the agreed NEAFC bottom fisheries footprint, the area where the encounter occurs is closed to all vessels, pending a review.[35]

In 2010, the joint NAFO/ICES Working Group on Deep-Sea Ecology (WGDEC) reviewed the move-on rules adopted by NEAFC and NAFO and concluded that "Reactionary management strategies such as the 'encounter clauses' and 'move-on rules' are of limited benefit to prevent significant adverse impacts because they still allow damage to occur which will gradually degrade ecosystems over time".[36] The Working Group recognized that, to be effective, separate threshold levels would need to be established, on a scientific basis, for each VME indicator species or species group, each individual gear type or gear configuration, and each biogeographic region within the Regulatory Areas of the RFMOs. ICES instead recommended a new approach based on reversing the burden of proof, i.e. requiring that prior impact assessments be conducted to determine where VMEs are likely to occur before allowing bottom fishing to take place, and spatial zoning.[37] In addition, the Working Group

concluded that move-on rules were ineffective for bottom trawling on seamounts, and that seamounts should be closed to bottom trawl fishing.

In 2012, ICES advised that the encounter thresholds at the time for corals (60 kg) and sponges (800 kg) were still too high and recommended that they be reduced by 30% to 70%. ICES also stressed the urgent need for more quantitative information on bycatch of VME indicator species, including those below threshold levels, to assist the ongoing debate regarding appropriate VME indicator thresholds required to classify an area as a VME. It therefore recommended that NEAFC ensure full reporting of all bycatch of VME indicator species. ICES also effectively reiterated the advice of the 2010 Working Group that the move-on rule was "inappropriate" in seamount areas as well as steep slope areas and in areas outside of the existing NEAFC bottom fishing areas. It was again proposed that that alternative approaches to the move-on rule should be used, including promoting gear developments that reduce bottom contact, and undertaking high resolution seabed mapping and visual monitoring of gear impacts; and that an alternative management strategy be employed for steep slopes, seamounts, and new fishing areas, that requires the fishery to demonstrate that it does not cause adverse impacts on VMEs. After receiving these detailed proposals in 2012, NEAFC did agree to adopt a 50% reduction in the threshold levels for corals and sponges, but did not implement any of the other ICES recommendations.[38]

However, additional improvements were made to the move-on rule in 2014 as part of the NEAFC review of its bottom fisheries regulations. The regulations now require that, in the event a bottom trawl vessel "encounters" a VME during the course of fishing operations, an area extending 1 nm from both sides of the entire length of the tow will be temporarily closed, as opposed to the previous move-on rule which required that a vessel cease fishing in an area with a 2 nm radius from the precise point at which the captain believed the encounter occurred. Moreover, the closure applies to all vessels as soon as the NEAFC Secretariat notifies all parties that an encounter has occurred. The area closure remains in effect until an assessment of the closed area has been done and a determination made, on the basis of scientific advice from ICES, as to whether the area should stay closed or could be reopened (partially or wholly) to bottom fishing. Reopening an area can only be done on the basis of a decision by the NEAFC Commission. In addition, for the first time NEAFC adopted measures specifically for bottom longline and pot fisheries similar to those established by CCAMLR. The threshold levels for "corals" and "sponges" still remain high however, and threshold levels have yet to be adopted for the range of additional taxa/VME indicator species incorporated into the NEAFC regulations in 2014.

It is not possible to assess the effectiveness of either the improved move-on rule or the previous measures given that, to date, no encounters with VMEs have ever been reported by any vessels bottom fishing in the NEAFC Regulatory Area.

2.1.2.4 Ensuring the long-term sustainability of deep-sea fish stocks (UNGA resolution 61/105, paragraph 83b)

There is a serious lack of scientific information on the stock structure, stock size, age structure of the stocks, recruitment, status of the stocks, population size, and the range or distribution of the stocks of deep-sea species in the Northeast Atlantic.[39] This lack of information is a major impediment to managing these fisheries for sustainability.[40]

The deep-sea fisheries in the NEAFC area have been characterized by extensive discarding, misreporting and non-reporting of catches. In 2009, in response to a request by NEAFC to evaluate the use and quality of VMS data and records of catch, ICES found that 70% of the vessels reporting catches of deep-sea demersal species reported only one species in a given reporting period. ICES noted that it is very unlikely that these demersal, deep-water species are caught in single species fisheries, especially as most of these fisheries are bottom trawl fisheries, and concluded that the catch reports are likely to be incomplete, with vessels reporting only their target or most abundant species. ICES also indicated that the species composition of the data showed very high inter-annual variation, which could be due to unexplained variation in exploitation patterns but may also indicate significant amounts of missing data and/or high levels of misreporting.[41] More recently, ICES has specifically highlighted the unreliability of catch data for two of the largest deep-sea bottom fisheries in the NEAFC RA – the deepwater bottom trawl fishery by Spanish vessels targeting roundnose grenadier on the Hatton Bank and the Spanish bentho-pelagic trawl fishery targeting the same species on the Mid-Atlantic Ridge.[42]

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[35] NEAFC. (2011). Consolidated text of all NEAFC *recommendations on regulating bottom fishing*. Retrieved from http://www.neafc.org/system/files/consolidated_bottomfishing_regulations.pdf.

[36] ICES. (2010). *Report of the ICES/NAFO Joint Working Group on Deep-water Ecology (WGDEC), 22-26 March 2010*. (ICES CM 2010/ACOM:26), p. 52. Retrieved from http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2010/WGDEC/wgdec_final_2010.pdf.

[37] Ibid.

[38] ICES. (2012). "1.5.4.3 Review of NEAFC bottom fisheries regulations." *Report of the ICES Advisory Committee 2012. ICES Advice, 2012, Book 1*. Retrieved from http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Advice/2012/ICES%20ADVICE%202012%20BOOK%201.pdf.

[39] "Available information on deep-sea stocks does not allow scientists to fully assess the stock status, neither in terms of population size nor fishing mortality. There are several reasons for this, which hamper progress permanently: These species are often very long-lived and slow-growing, making it impossible to structure the stock into age classes and to assess the effect of fishing on the stock through changes in the length or age structure of catches. The frequency of recruitment of young fish to the stocks is not known. The stocks are widely distributed in depths that are difficult to examine for practical reasons. Data from scientific surveys are often not available due to the reduced commercial importance of these stocks, or do not cover the whole distribution area. Fishing activities are only partly focusing on these species and some have a relatively short history". European Commission. (2010, October 6). *Proposal for a Council Regulation fixing for 2011 and 2012 the fishing opportunities for EU fishing vessels for certain deep-sea fish stocks* (COM(2010) 545 final).

[40] ICES. (2010). "9.3.1.2 Assessments and advice for deep-water fisheries: ECOREGION: Widely distributed and migratory stocks." Report of the ICES Advisory Committee, 2010. ICES Advice 2010, Book 9; ICES. (2011). "9.3.2.1 EC request on scientific surveys for deep water fisheries: ECOREGION: Widely distributed and migratory stocks." *Report of the ICES Advisory Committee, 2011. ICES Advice 2011, Book 9*.

[41] ICES. (2009). "9.3.2.2 NEAFC request to evaluate the use and quality of VMS data and records of catch and effort for providing information on the spatial and temporal extent of current deepwater fisheries in the NE Atlantic." *Report of the ICES Advisory Committee, 2009*. ICES Advice 2009, Book 9.

[42] ICES. (2015). *Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP), 20–27 March 2015, Copenhagen, Denmark*. (ICES CM 2015/ACOM:17), p. 318; NEAFC. (2014, November). *Recommendation on the conservation and management of roughhead grenadier (Macrourus berglax) in the NEAFC Regulatory Area (Divisions Xb and XIIc, and Subdivisions XIIa1 and XIVb1): Proposal from Norway*, AM 2014/74,33rd Annual Meeting of the North East Atlantic Fisheries Commission, November 2014.

Bycatch rates are particularly high in the mixed species deep-sea trawl fisheries in the Northeast Atlantic, causing extensive adverse impacts on whole communities of deep-sea species. ICES sums up the effects of deepwater trawls catching, and usually discarding, huge quantities of unwanted, vulnerable species as follows: *"At depths between about 400 and 1500m there may be between 40 and 50 demersal species present in depending on gear type. Maximum species diversity occurs between 1000–1500m before declining markedly with depth. Deep water species, are typically slow growing, long lived, late maturing and have low fecundity. Fishing has a greater effect on species with such life history traits…making them particularly vulnerable to overexploitation. This applies to both the target and non-target species. A large proportion of deep-water trawl catches (upwards of 50%) can consist of unpalatable species and numerous small species, including juveniles of the target species, which are usually discarded...The survival of these discards is unknown, but believed to be virtually zero due to fragility of these species and the effects of pressure changes during retrieval…Therefore such fisheries tend to deplete the whole fish community biomass".*[43]

This concern was reinforced by several studies published over the past few years which concluded that the populations of some 77 species of deep-sea fish, most with no commercial value, inhabiting the continental slope in the Northeast Atlantic off the coast of Ireland have declined by an average of almost 70% as a result of deep-sea bottom trawl fishing in the 1980s and 1990s. These declines were observed well below and well beyond the area of seabed actually fished (i.e. the 'footprint' of the decline in the species was estimated to encompass an area almost three times the actual size of the area where the bottom trawl fishery had taken place).[44] More recently, in June of 2015, IUCN published the first ever European Red List of Marine Fishes, which identified roundnose grenadier and blue ling – two of the most important commercial species targeted by deep-sea bottom trawl fleets in the NEAFC RA adjacent to the UK and Irish EEZs – as "Endangered" and "Vulnerable" respectively. The IUCN Red List report also listed several species of deep-sea sharks known to be taken as bycatch in the bottom fisheries as endangered or critically endangered.[45]

The declining status of these species supports the conclusions reached several years earlier by the European Commission in its 2007 review of the management of deep-sea fish stocks fished by EU vessels in the Northeast Atlantic, which stated, among other things, that "*many deep-sea stocks have such low productivity that sustainable levels of exploitation are probably too low to support an economically viable fishery… Moreover, stock recovery times are so long that the reductions in exploitation must be regarded as permanent, not as a means to rebuild stocks to allow higher exploitation rates in the longer term*". The Commission also concluded that very little is known of the ecosystem impacts of deep-sea fisheries beyond the actual physical impact of bottom fishing gear on deep-sea habitats.[46]

NEAFC regulation for the catch of deep-sea species

In 2004, NEAFC established a cap on fishing effort (no more than the highest level in previous years) for deep-sea species in the NEAFC RA – the first ever measure introduced to regulate fisheries for deep-sea species on the high seas of the Northeast Atlantic. In 2006, NEAFC Contracting Parties agreed to further reduce fishing effort by 35% in fisheries for deep-sea species. Although this measure was recognized by NEAFC at the time as being inadequate to conserve deep-sea species, ten years later it still remains in force pending the adoption of a more comprehensive management regime for deep-sea species. Meanwhile, the "general approach" to managing the catch of deep-sea species which NEAFC has adopted on an interim or provisional basis in the past two years prioritizes the management of the fisheries for stocks of deep-sea species fished primarily or substantially in the NEAFC RA as opposed to stocks of deep-sea species fished primarily in the EEZs of adjacent to the NEAFC RA. This is an important distinction as most deep-sea stocks in the Northeast Atlantic are recognized or assumed to be straddling fish stocks.

Over the past five years, NEAFC began to adopt TACs for some deep-sea species, progressively adopting catch limits for orange roughy (see Box 2), deep-sea sharks, and roundnose grenadier. However, bycatch measures have yet to be adopted, in particular in relation to the bycatch of deep-sea sharks, orange roughy and blue ling, which ICES has repeatedly advised needs to be reduced or eliminated in mixed species deep-sea fisheries.

Altogether, NEAFC lists 49 species as 'regulated' under its deep-sea fisheries regulations. Reports from Contracting Parties indicate that some 30 of these species on average are caught on an annual basis. It is worth noting that, as indicated in Table 3, the EU reports catching approximately 90% of the regulated deep-sea species in the NEAFC RA. The EU sets unilateral TACs and quotas in the NEAFC RA for its own fleets and, in all cases, these have been established before any TACs were adopted by NEAFC. In the case of deep-sea sharks, the EU led the way in obtaining a NEAFC prohibition on directed fisheries for deep-sea sharks by first banning such fisheries by EU fleets in the NEAFC RA. The EU is currently in the process of developing new legislation for EU fisheries for deep-sea species in the Northeast Atlantic, likely to be finalized in 2016, although it is not yet clear whether the 'scope' of the new regulation will include all or any portion of the NEAFC RA.

BOX 2. Case study – orange roughy

Since 2008, ICES has recommended a prohibition on all directed fishing for orange roughy and that the bycatch of orange roughy in mixed species fisheries targeting other deep-sea species be reduced as much as possible. The EU first proposed a ban on the directed fishery for orange roughy in the NEAFC RA, consistent with the advice from ICES, at the Annual Meeting in 2008. The proposal went to a vote: the EU and Norway voted for the prohibition, Denmark (on behalf of the Faroe Islands) and Russia voted against it, and Iceland abstained. In 2009, the EU again proposed a ban on directed fishing for orange roughy. Denmark (on behalf of the Faroe Islands and Greenland) proposed instead that each Contracting Party be allowed a quota of 150 tonnes, equivalent to the amount that a Faroese vessel caught in the NEAFC RA. The EU proposal was again rejected and, instead, NEAFC adopted the quota of 150 tonnes per Contracting Party.

However, in voting for the Faroes proposal, both Norway and Iceland declared that, though it would be better to have a quota in place than no quota for orange roughy at all, they would not permit their vessels to fish for orange roughy – a tacit recognition that the effort regulation adopted by NEAFC was not sufficient. At each Annual Meeting of NEAFC since then, the EU proposed a prohibition on the fishery for orange roughy and the proposal was defeated and the Faroe Islands proposal to allow each Party a quota of 150 tonnes was adopted, with the exception of one year when neither the Faroes' nor the EU proposals were adopted which technically meant there was no cap or limit on the amount of orange roughy that could be fished the following year. In each of these years ICES repeatedly recommended a ban on directed fishing for orange roughy and that bycatch of orange roughy in other fisheries by minimized.

Finally, in 2015, the EU proposal to ban directed fishing for orange roughy was adopted by ICES, with the EU, Norway and Iceland voting to support it, Denmark (for the Faroes Islands and Greenland) voting against the proposal, and the Russian Federation abstaining. The Faroes Islands has been the only Contracting Party reporting fishing for orange roughy in the NEAFC RA in recent years.

As part of the enhanced bottom fisheries regulation adopted by NEAFC in 2014, a new objective for the management of deep-sea fisheries was agreed to "ensure the long-term sustainability of deep sea fish stocks and non-target species, and the rebuilding of depleted stocks and, where scientific information is uncertain, unreliable, or inadequate, conservation and management measures be established consistent with the precautionary approach" drawing on the language of UNGA resolution 64/72, paragraph 119(d).[47] This provision remains to be effectively implemented in practice.

2.1.2.5 Other/gear restrictions

NEAFC has adopted a total prohibition on bottom gillnet fishing below a depth of 200 meters. This has been an important step towards addressing the depletion of deep-sea fish stocks. However, in response to a request from NEAFC on identification of VMEs, in 2008 ICES provided the following assessment of the relative impacts of various types of bottom fishing gear:

"The impact of fishing gear on vulnerable deep water habitat depends on the type of gear, the degree of contact with the seabed and the frequency of contact. Based on extensive research reported by ICES and the wider science community, bottom trawl gears are expected to have the greatest impact on complex biogenic habitats, followed by bottom-set gill-nets and longlines. Any other gear that has bottom contact also has the potential to impact deep-water habitats. The impact of fishing gears is greatest when contact with the seabed is continuous and intense (e.g. trawl gears)…".[48]

[43] ICES. (2008). *Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP), 3–10 March 2008, Copenhagen, ICES Headquarters*. (ICES CM 2008/ACOM:14), p. 70.

[44] Bailey, D. M., Collins, M.A., Gordon, J. D. M., Zuur, A. F. & Priede, I. G. (2009). Long-term changes in deep-water fish populations in the northeast Atlantic: a deeper reaching effect of fisheries? *Proceedings of the Royal Society B*. doi: 10.1098/rspb.2009.0098.

[45] IUCN Red List, above note 10.

[46] European Commission. (2007, 29 January). *Communication from the Commission to the Council and the European Parliament: Review of the management of deep-sea fish stocks* (COM(2007) 30 final).

[47] NEAFC 2014, above note 18, art. 1(2).

[48] ICES. (2005). *NEAFC and OSPAR Request on Seamounts and Vulnerable Habitats*. Extract from the ICES Advisory Report 2005. Retrieved from http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2005/sept/NEAFC%20Request%20and%20OSPAR%20request%2027%209%20without%20annex.pdf.

Compliance with spatial management measures for bottom fisheries

Recently, the question of compliance with the area closures and exploratory fisheries regulations has become a significant issue at NEAFC following a request by Norway to review compliance with the NEAFC bottom fishing regulations. In 2014, information provided by the NEAFC Secretariat indicated that extensive bottom fishing had been occurring outside of the existing bottom fishing areas, including in both closed areas and in areas where fishing is only permitted on the basis of a prior impact assessment and an agreement by NEAFC that the exploratory fishing can proceed. VMS tracks for vessels coded or authorized to bottom trawl, bottom longline and bottom gillnet, indicating that they were likely to have been fishing (as opposed to transiting), were observed in many portions of the NEAFC RA outside of the existing bottom fishing areas. No Contracting Party at that point had applied for, or been permitted to, engage in exploratory fishing. An updated review was provided to the Annual Meeting of NEAFC in 2015 which indicated that significant illegal, unreported and unregulated (IUU) fishing in contravention of the spatial management scheme was still likely to be occurring.[49]

In 2015, NEAFC agreed to establish an "interim" arrangement with the Secretariat in 2016 to better monitor whether bottom fishing is occurring in closed areas and other areas outside of the existing bottom fishing areas, pending the future adoption of enhanced mechanisms for monitoring compliance with the regulations.

2.1.3 CONCLUSION

NEAFC has made significant progress in implementing UNGA resolutions 61/105, 64/72 and 66/68, although not all areas that are open to bottom fishing have been fully assessed for potential significant adverse impacts of bottom fishing on VMEs. On the positive side, NEAFC adopted a substantially improved set of bottom fisheries regulations in 2014 to more fully incorporate the UNGA resolutions and the FAO Guidelines into the NEAFC bottom fisheries regulations, including establishing an objective to manage deep-sea species for long-term sustainability.

However, further actions are required to ensure effective implementation of the improved NEAFC regulations and the UNGA resolutions including the following:

- Closing all areas to bottom fishing recommended by the scientific advisory body ICES
- Requesting ICES to propose area closures and move-on rules for the additional species on the expanded list of VME indicator species adopted by NEAFC in 2014
- Establishing science-based, precautionary quotas or limits for the catch of all deep-sea species targeted in fisheries in the NEAFC Regulatory Area
- Establishing measures to prevent, avoid or eliminate bycatch of non-target deep-sea species, in particular the most vulnerable deep-sea species such as species of deep-sea sharks
- Ensuring effective monitoring, control and surveillance mechanisms are in place to prevent or penalize bottom fishing in closed areas or in areas outside of the footprint without a prior impact assessment and approval from NEAFC

This last recommendation is critically important to the effectiveness of the NEAFC measures adopted to date and the credibility of the efforts of NEAFC Contracting Parties to implement the UNGA resolutions.

" Deep-sea ecosystems are crucial for global functioning. "

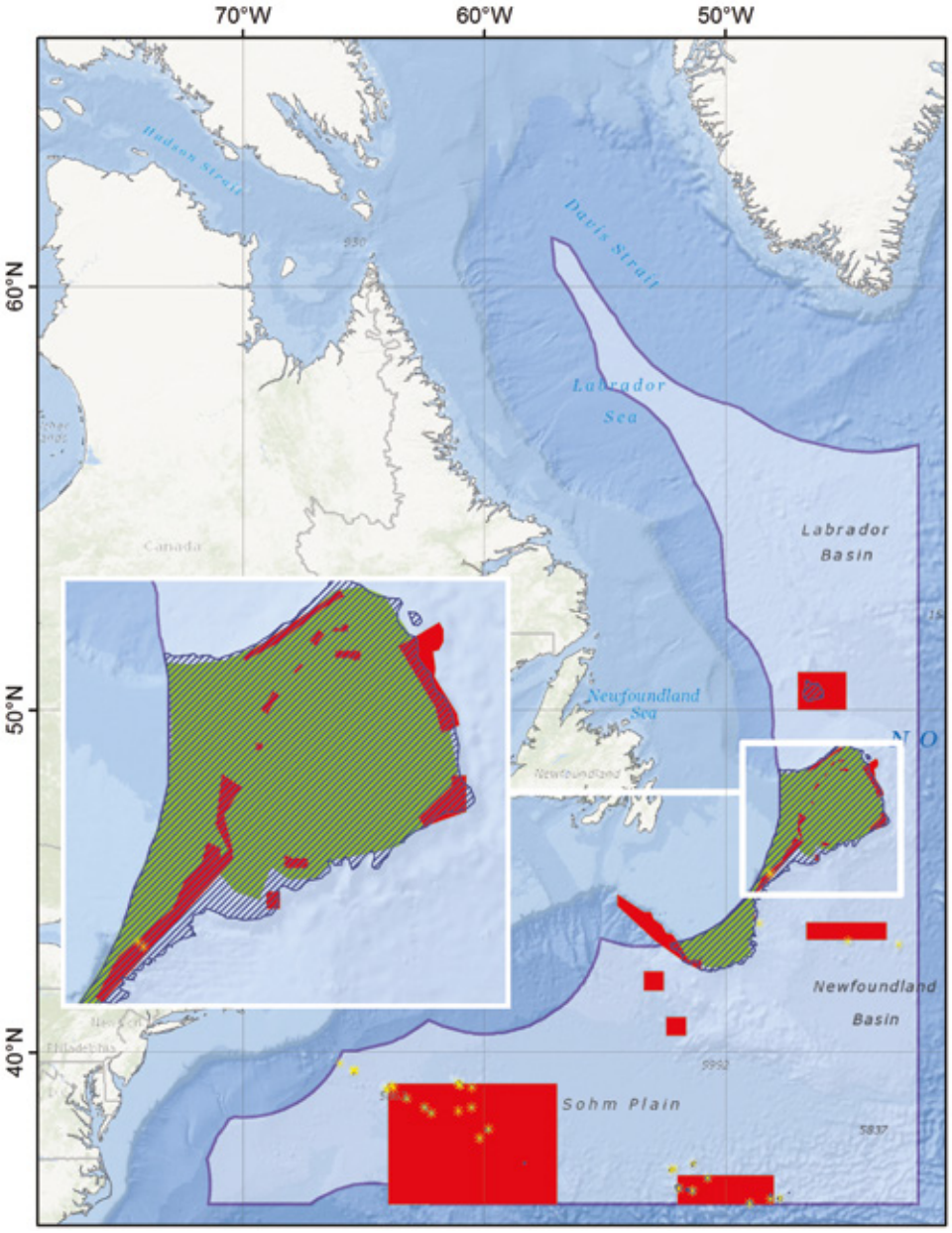
Global Marine Assessment/World Ocean Assessment (UNGA 2015).
Chapter 36F: Open Ocean Deep Sea (p. 1)

2.2 NORTHWEST ATLANTIC

The regulation of bottom fisheries on the high seas of the Northwest Atlantic is governed by the Northwest Atlantic Fisheries Organization (NAFO). The NAFO Convention Area encompasses a very large portion of the Atlantic Ocean, covering a total of 6,551,289 km2 and including the 200-mile EEZs under the jurisdiction of four coastal states (the United States, Canada, St. Pierre et Miquelon and Greenland).[50] Management by NAFO, however, applies only to the 2,707,895 km2 of ocean outside the EEZs, known as the NAFO Regulatory Area (NRA).[51]

FIGURE 5

NAFO



NAFO	% "Fishable" Area	% "Fishable" Seamounts
Areas closed to all bottom fishing	12.9%	57.6%
Areas where bottom fishing is permitted	79.0%	0.0%
Areas where prior impact assessment required before bottom fishing can occur	8.1%	42.4%
TOTAL	140,368 km2	33 seamounts

Seamounts <2000m deep
2000m Isobath
VME/Bottom fishery closure
Existing bottom fishery
Regulatory Area

SOURCE: MARINE CONSERVATION INSTITUTE 2016

[49] NEAFC. (2015, November). *Annual overview of bottom fishing in the NEAFC Regulatory Area* (AM 2015-53, 34th Annual Meeting of the North East Atlantic Fisheries Commission).

[50] Northwest Atlantic Fisheries Organization (NAFO). (n.d.). *The NAFO Convention Area*. Retrieved from http://www.nafo.int/about/frames/area.html.

[51] Ibid.

As of 2016, the 12 Contracting Parties of NAFO are Canada, Cuba, Denmark (in respect of Faroe Islands and Greenland), the EU, France (in respect of St. Pierre et Miquelon), Iceland, Japan, Norway, South Korea, the Russian Federation, Ukraine and the United States of America.

2.2.1 DESCRIPTION OF HIGH SEAS BOTTOM FISHERIES

2.2.1.1 Main high seas bottom fishing nations

Nations fishing in the NAFO Regulatory Area in 2014 include the following: Canada, the EU (Estonia, Lithuania, Portugal, Spain), the Faroe Islands, France (in respect of St. Pierre et Miquelon), Norway, the Russian Federation and the United States of America.

2.2.1.2 Number of high seas bottom fishing vessels operating in region in 2014/2015 (or latest year for which information is available)

In 2014 there were 59 vessels operating in the NRA, a decrease from 64 vessels in 2013.[52] Five of these vessels targeted pelagic redfish using midwater trawl gear; 54 used bottom trawl fishing.[53]

2.2.1.3 Main high seas bottom fisheries

The main bottom fisheries target the following species: redfish, Atlantic cod, yellowtail flounder, Greenland halibut, skates and white hake. All of these fisheries are prosecuted using bottom trawl gear, with the exception of pelagic redfish fisheries and the seamount fishery for splendid alfonsino, both of which are fished with midwater trawl. In 2014, 97.4% of fishing days were spent targeting demersal or bottom dwelling (groundfish) species, 1.4% of fishing days targeted deep-water prawns, and 1.2% of fishing days targeted pelagic redfish.[54]

2.2.1.4 Catch (including catch per main target species)

The total catch in the NRA in 2014 was 51,828 tonnes. While this catch is almost entirely comprised of groundfish taken in bottom trawl fisheries, the total also includes the redfish midwater trawl catch. Allocations for 2016 were agreed at 88,929 tonnes for all NAFO groundfish fisheries (squid is excluded from this total).[55] However, the 2016 catch is likely to be considerably lower than the permitted quotas for reasons explained in section 2.2.2.4 below.

2.2.1.5 Vessels authorized to fish in 2016 (or latest year for which information is available)

NAFO does not publish an authorized vessel list. The majority of the high seas bottom fishing in the area is conducted by bottom trawl vessels.

2.2.1.6 Changes in numbers of vessels active in bottom fisheries, volume of catch since 2004/6 – 2014 if known

Fishing activities in the NRA show an overall declining trend for the period 2004–2014, from 134 active vessels in 2004 to 59 in 2014, which represents a 56% decrease. It is important to note that this decline has not been continuous: while the number of vessels fishing for groundfish decreased from 2004–2008, since then there has been a gradual increase.[56] In 2009, only 51 vessels were active in the NRA; by 2013 the number had risen to 64, before dropping again in 2014.

In terms of overall fishing days, a decline of approximately 71% occurred between 2004 and 2014, dropping from 16,480 days in 2004 to 4,822 days in 2014. The average number of days each vessel operated in the NRA also declined from 123 days in 2004 to 82 days in 2014. Effort in the groundfish fisheries in 2004 was ~ 60%, but in 2014 this had increased to 97.4%.

One of the principal reasons for the decline in both the number of vessels since 2004 and the fishing days is the collapse of the trawl fisheries for northern prawns, which was the largest bottom fishery for several years during this period in terms of tonnage of catch. The northern prawn fisheries in on the Flemish Cap (NAFO area 3M) were placed under moratorium in 2011, and the 3NO prawn fishery on the southern portion or 'tail' of the Grand Banks was closed to directed fishing in 2015.[57]

“ The documented widespread extent of deep-water trawl fisheries has led to pervasive concern for the conservation of fragile benthic habitats. ”

Global Marine Assessment/World Ocean Assessment (UNGA 2015).
Chapter 51: Biological communities on seamounts and other submarine features potentially threatened by disturbance (p. 15)

2.2.2 IMPLEMENTATION OF MEASURES TO PROTECT VULNERABLE MARINE ECOSYSTEMS FROM SIGNIFICANT ADVERSE IMPACTS AND ENSURE THE LONG-TERM SUSTAINABILITY OF DEEP-SEA FISH STOCKS - PARAGRAPHS 83 TO 87 OF UNGA RESOLUTION 61/105; PARAGRAPHS 113, 117 AND 119 TO 124 OF UNGA RESOLUTION 64/72; AND PARAGRAPHS 121, 126, 129, 130 AND 132 TO 134 OF UNGA RESOLUTION 66/68

At an Extraordinary Meeting in May 2008, NAFO adopted a framework regulation for the management of high seas bottom fisheries aimed at implementing UNGA resolution 61/105 in the NRA. This followed initial measures taken in 2006 to protect seamounts. NAFO has also established science and management mechanisms to address the requirements of 61/105 and subsequent resolutions including the Scientific Council Working Group on Ecosystem Approach to Fisheries Management – later renamed the Working Group on Ecosystem Assessment (WGESA) in 2014. WGESA meets annually and reports to the Scientific Council in June of each year. At its 2011 Annual Meeting, NAFO also established the Joint Working Group of Fisheries Managers and Scientists to review scientific advice regarding protecting VMEs, and to make recommendations to the Fisheries Commission for management measures. This group was changed in 2014 to the Joint Fisheries Commission and Scientific Council Working Group on Ecosystem Approach Framework to Fisheries Management (WG-EAFFM).

WGESA responds to requests from the Fisheries Commission for scientific advice, which is then submitted to the Scientific Council. It is important to note that not all advice or information developed by WGESA is ultimately included in final Scientific Council reports, particularly when there is disagreement between Contracting Parties. For example, while WGESA included deep-sea fish in its review of VME indicators, and as part of the initial candidate areas for closure developed in 2008, in keeping with the guidance provided in the FAO Guidelines, there was no agreement at the 2009 Scientific Council meeting to include deep-sea or vulnerable fish species, and therefore no additional protections have been afforded.

NAFO has made progress in identifying and protecting seabed VMEs. In 2009, NAFO agreed to adopt a bottom fishing footprint and, since then, a number of measures to protect VMEs have been agreed, including area closures to protect corals, sponges and sea pens. These measures are now included in the NAFO Conservation and Enforcement Measures (NCEM).[58] NAFO has also identified areas of high concentrations of VME indicator species using a kernel density analysis approach based on data collected using trawl surveys, and habitat suitability modelling has been done for sponges, corals and sea pens at the request of the Fisheries Commission. However, the latter analysis has not been agreed by Scientific Council, and as such is not considered when identifying potential areas for closure. NAFO expanded its list of VME indicator species in 2015 to recognize 67 species that signal evidence of potential VMEs,[59] and adopted a new list of VME elements[60] in line with the FAO Guidelines. In 2015, NAFO also updated its 2010 VME indicator species guide, which acts as a tool to aid observer identification of VME species. The updated guide includes additional VME indicator species apart from corals, sponges and sea pens, such as tunicates, anemones and bryozoans.[61]

In response to a 2013 request from the Fisheries Commission regarding the effectiveness of agreed closed areas, the Scientific Council, through WGESA, assessed the level of protection afforded to various VME indicator species and elements (Table 4), and identified a range of protection from "poor" to "good" based on area closures of known VME locations. This assessment used existing scientific data collected, analyzed and presented by WGESA related to areas where VMEs were known to occur and determined the extent to which areas of high concentrations of VME indicator species were, or were not, being protected by VME area closures. Some areas were found to provide "good" protection to known VME species, including sponges, corals and sea pens. However, several areas of sponges and large gorgonians, particularly on the southern edge of the Flemish Cap, including the Beothuk Knoll, were identified as poorly protected. Areas identified as having high concentrations of sea pens, and where no agreement to close these areas had been reached as of 2015, were also found to be poorly protected. It is clear from this assessment that, while NAFO has made some progress towards protecting VMEs, it has not fully implemented the requirements of the UNGA resolutions as many areas of known VMEs remain poorly protected. As part of its impact assessment process, in 2015 NAFO completed a preliminary analysis of a number of VME indicators to determine the ratio of protected vs unprotected; this analysis is discussed further below.

[52] NAFO. (2015). *Annual Compliance Review 2015. Compliance Report for Fishing Year 2014* (Serial No. N6517; NAFO/FC 15/21), p. 18. Retrieved from http://archive.nafo.int/open/fc/2015/fcdoc15-21.pdf [NAFO 2015 Compliance Review].

[53] Ibid, p. 1.

[54] Ibid.

[55] NAFO. (2016). *Annex I.A - Annual Quota Table*. Retrieved from http://www.nafo.int/fisheries/regulations/quotas/2016.pdf. The TACs allocated for the 2016 fishing year in the NAFO Regulatory Area are: 3M cod: 13,391 t, 3LN red fish: 10,400 t, 3M redfish: 7,000 t, 3O redfish: 20,000 t, 3LNO yellowtail flounder: 17,000 t, 3NO witch flounder: 2,172 t, 3NO white hake: 1,000 t, 3LNO skates: 7,000 t, 3LMNO Greenland halibut: 10,966 t, Sub Areas 3 & 4: squid: 34,000 t. There are no directed fisheries (i.e. 0 TAC) for 3M shrimp, 3LNO shrimp, 3LNO American plaice, 3NO capelin, and 3LNO cod.

[56] NAFO 2015 Compliance Review, above note 52, pp. 2 & 18.

[57] Ibid, pp. 2 & 7.

[58] NAFO. (2015). *Conservation and Enforcement Measures (CEM) 2015* (Serial No. N6409; NAFO/FC Doc 15/01), Chapter II [NAFO CEM 2015].

[59] Ibid, Annex I.E. The list of VME indicator species is available from http://www.nafo.int/frameworks/ecosystem/vme-indicator-species.html.

[60] Ibid. The list of physical VME indicator elements is available from http://www.nafo.int/frameworks/ecosystem/vme-elements.html.

[61] Kenchington, E., Beazley, L., Murillo, F. J., Tompkins MacDonald, G. & Baker, E. (2015). *Coral, Sponge, and Other Vulnerable Marine Ecosystem Indicator Identification Guide*, NAFO Area (NAFO Scientific Council Studies 47: 1–74; doi:10.2960/S.v47.ml). Retrieved from: http://archive.nafo.int/open/studies/s47/s47.pdf.

Table 4. Status of protection of VMEs as of September 2014 (redrawn from NAFO SC 2014)[62]				
Closure No.	**Area**	**VME inside closure**	**Coverage of VME by closure**	**Reason for Concern**
Div	Coral Closure	Unknown	Moderate	Seapen, Gorgonians, Cerianthids
1	Tail of Grand Bank	Sponge	Good	–
2 (southern)	Flemish Pass / Eastern Canyon	Sponge & large Gorgonians	Good	–
2 (northern)	Flemish Pass	Sponge & large Gorgonians & Seapen	Moderate	Seapens, large Gorgonians, Sponge
3	Beothuk Knoll	Sponge	Poor	Sponge & large Gorgonians
4	Eastern Flemish Cap	Sponge & large Gorgonians	Poor	Sponge, large Gorgonians & Cerianthids
5	Northeast Flemish Cap	Sponge	Good	–
6	Sackville Spurr	Sponge	Good	–
7,8,9,10,11,12	Northwest and Northern Flemish Cap	Seapen system	Good	–
New Area	Tail of Grand Bank (South)	–	Poor	Large & small Gorgonians, large seaquirts and Bryozoans
Candidate Areas 13 & 14	East Flemish Cap	–	Poor	Seapen
Corner Rise Seamounts*	–	Seamount	Good	Seamount
New England Seamounts*	–	Seamount	Good	Seamount

* Status of protection upgraded to good following agreement at NAFO 2015 Annual Meeting to close seamount loophole and fully protect seamounts from all bottom fishing activity[63]

2.2.2.1 Impact assessments

Impact assessments are required under the bottom fisheries regulations established by NAFO in 2008, pursuant to UNGA resolution 61/105. However, for the most part, Contracting Parties submitted fishing plans rather than impact assessments and even these fishing plans were not made publicly available. NAFO agreed in 2010 to require that 'reassessments' of the impact of the bottom fisheries within the NRA be completed by 2016; these are now being conducted by the Scientific Council, and full impact assessments are due at the September 2016 Annual Meeting of NAFO. The work plan for preparing these impact assessments consists of a review all fishing activity – including intensity and frequency – as determined using VMS data, known distribution of VME indicator species (notably corals, sponges and seapens), and the level of protection afforded to known VME areas. The review will also take into consideration the distribution of indicator species in areas outside the fishing footprint, which are considered protected since any fishing outside the fishing footprint requires a prior impact assessment before it can take place. In addition, the assessment of SAIs will include refining known species distributions in accordance with the accepted kernel density analysis, in relation to environmental variables that may influence species distribution.[64]

To assess the risk and extent of SAIs, the Scientific Council is analyzing the first three of the FAO criteria (as defined in paragraph 18 of the FAO Guidelines), namely; intensity/severity of impact, spatial extent of impact, and sensitivity/vulnerability of the ecosystem.

In 2015, NAFO agreed to eliminate the 2008 provision that had allowed exploratory bottom fisheries in the "closed" seamount areas until 2020, when all VME provisions will be subject to review.[65] This decision was reached following advice from the Scientific Council highlighting the potential risk of SAIs. It should be noted that these seamounts were first recommended for closure in 2005, but only finally fully closed to all bottom fishing in 2015. No impact assessments were submitted for any of the fishing activity conducted on seamounts in the ten intervening years, despite the occurrence of unregulated midwater trawl fishing for splendid alfonsino. In 2015, NAFO recommended that this fishery be limited to a 200 tonne quota or a total of 16 fishing days,[66] however not all contracting parties agreed.

2.2.2.2 Identify and close areas where VMEs are known or likely to occur unless bottom fisheries are managed to prevent SAIs

As of 2015, NAFO has closed 20 VME areas to bottom fishing in the NRA. Six areas have been closed for the protection of seamounts, and fourteen areas were closed for the protection of sponge, coral and sea pens. In 2014, the last time that new VMEs areas were afforded protection, NAFO agreed to extend all VME closures until 2020, at which time a review will take place. Since 2011, the boundaries of six closed areas have been extended to protect either sea pens, sponges, or large gorgonian corals. According to the DSCC's estimates, approximately 12.9% of the fishable area of the NAFO RA (areas shallower than 2,000 m) has been closed to protect VMEs.

NAFO has completed an analysis as part of its impact assessment process, determining the area of known VMEs, as identified by the kernel density significant concentration method. VME areas have been categorized as those found within and outside of the agreed fishing footprint. According to preliminary presentations of the impact assessment in 2015, 46% of the total area closed to bottom fisheries to protect VMEs falls outside the agreed fishing footprint and was therefore not considered at risk of SAIs. However, much of this includes deep-ocean areas that are unfishable but which are included within the boundaries of the seamount areas closed to bottom fishing. The remaining 54% of the area of the VME closures covers 6% of the footprint. NAFO concluded that 45% of sponges, 63% of sea pens and 31% of corals, for which there are calculations of significant concentrations, remain at risk of SAIs from current fishing activity (Table 5).

Through a combination of analyzing VMS data (2008–2014) and VME indicator species biomass for sponge, sea pen and large gorgonian corals, the area of VMEs (outside current closures) likely to be still impacted by bottom fishing can be estimated. In addition, VMEs located outside the current closures that are not currently subject to fishing activity, could be at risk of future impact should fishing patterns change over time (as they have in the past) in the absence of suitable mitigation measures. However, these findings are preliminary and do not pre-judge the on-going impact assessments scheduled to be finalized in 2016.

As described above, VME areas have been identified in the NRA through independent surveys using kernel density analysis as well as predictive/habitat suitability modelling. Kernel density analysis is currently viewed as the best method available. However, it is important to note that this analysis only identifies "hotspots" or "significant concentrations" in the biomass distribution of VME indicator species derived from research vessel trawl survey data. Requests from the Fisheries Commission to the Scientific Council have generally been to identify only significant concentrations of accepted VME indicator species, hence precluding the choice of scientific analysis.

Table 5. NAFO's assessment of area (km^2) of known 'significant concentrations' of coral, sponge and sea pen VMEs "inside" and "outside" current fishery closures as well as areas subject to fishing impacts through past fishing activity and those subject to risk of SAI from current fishing activity

	Sponges	%	Sea Pens	%	Coral	%	Notes
Total area of VME (km^2)	22,439	100	6,883	100	3,725	100	
Total area of VME INSIDE Closed Area	8,042	35	1,094	16	1,992	53	Not at risk of SAI
Total area of VME OUTSIDE Closed Area	14,397	54	5,889	84	1,733	47	Total Area of Potential SAI
Area of VME OUTSIDE closure, above "cut off"	4,351	30	1,484	25	668	39	Historic or past SAI
Area of VME OUTSIDE closure below "cut off"	10,045	70	4,404	75	1,064	61	Present day risk of SAI
Proportion of Total VME subject to "historic" or "past" SAI		20		21		16	
Proportion of total VME at risk of present day SAI		45		63		31	

Note: "Cut off" levels refer to thresholds determined by the Scientific Council using the kernel density analysis.[67]

[62] NAFO. (2014). *Scientific Council Report*. Part E: Scientific Council Meeting, 31 May–12 June 2014, p. 84. Retrieved from http://archive.nafo.int/open/rb/2014/SC-parte-2014.pdf.

[63] NAFO. (2015). *Report of the Fisheries Commission and its subsidiary body (STACTIC), 37th annual meeting of NAFO, 21–25 September 2015* (Serial No. N6526; NAFO FC/DOC15/23). Retrieved from http://archive.nafo.int/open/fc/2015/fcdoc15-23.pdf [NAFO Fisheries Commission 2015].

[64] NAFO. (2015). *Recommendations from the WG-EAFFM to forward to FC and SC* (Serial No. N6508; NAFO/ FC Doc. 15/16). Retrieved from: http://archive.nafo.int/open/fc/2015/fcdoc15-16.pdf.

[65] NAFO Fisheries Commission 2015, above note 63, p. 47.

[66] NAFO 2015, above note 64, p. 6.

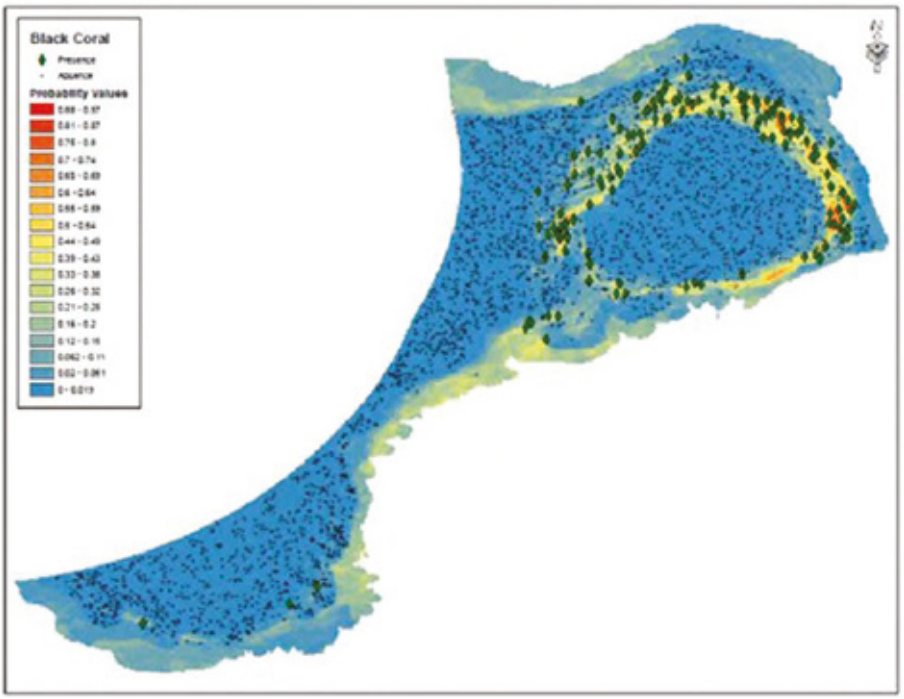
[67] NAFO. (2015). *Report of the NAFO Joint Fisheries Commission-Scientific Council Working Group on Ecosystem Approach Framework to Fisheries* (WG-EAFFM) (Serial No. N6476; NAFO FC/SC Doc. 15/03). Retrieved from http://archive.nafo.int/open/fc-sc/2015/fc-scdoc15-03.pdf.

[68] NAFO. (2015). *Scientific Council Reports. Part C: Report of the Scientific Council and its Standing Committees 29 May- 11 June 2015* (Serial No.6569; NAFO/FC Doc 15-12).

[69] Ibid.

[70] NAFO 2015, above note 67, p. 29.

FIGURE 6. PRESENCE OF BLACK CORALS OVERLAID WITH PREDICTED DISTRIBUTION HABITAT SUITABILITY MODELLING



SOURCE: KNUDBY *ET AL* 2013, AT NOTE 71.

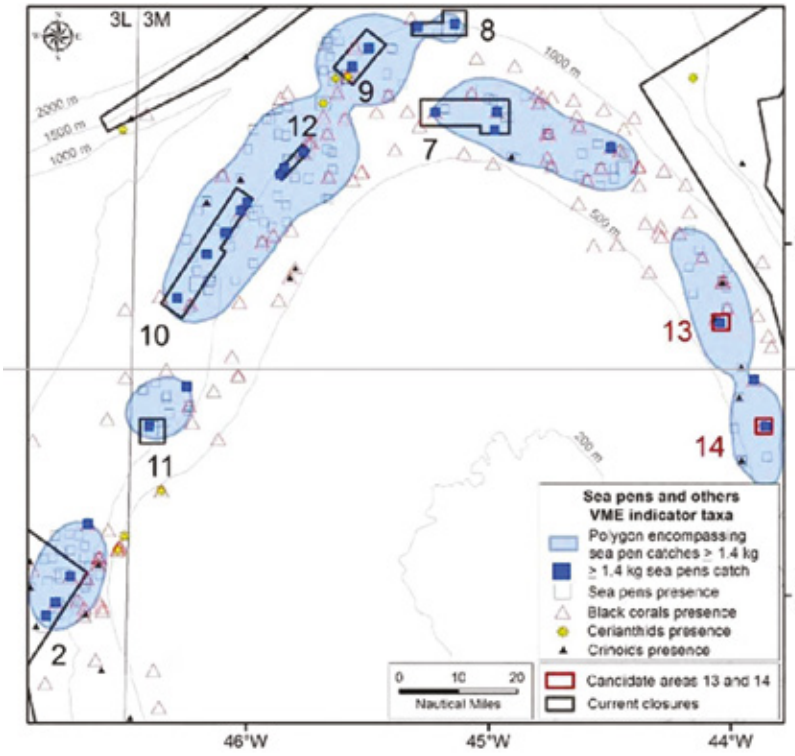
Habitat suitability modelling has been completed for sponges, large gorgonians and sea pens where environmental factors are used to predict where VME indicator species are most likely to occur. While this method has been accepted at the level of the WGESA, it has not been accepted by the Scientific Council or the Fisheries Commission. This is unfortunate as habitat suitability modelling, if done well, has the potential to provide a much broader overview of the likely or historic distribution of VME indicator species and some indication of whether the 'significant concentrations' of sponge, large gorgonians and sea pens found over the past several years represent a large portion of these VME species which have historically existed in the NAFO area or whether these concentrations represent only small or remnant populations of VMEs in the area which have been degraded as a result of many years of bottom fishing. Moreover, a significant concentration of indicator species is only one of the criteria established in paragraph 42 of the FAO Guidelines for identifying VMEs and in some cases is not applicable. For example, no closures exist specifically for black coral, despite the availability of presence data from RV surveys, as well as predictive modelling distribution (Figure 6) because black corals do not generally form dense concentrations but are more evenly distributed along continental slope areas in the NAFO RA.[71]

In addition to the currently closed areas, there are a number of other areas which the Scientific Council has recommended to be closed but which have not been agreed. The NAFO Scientific Council completed a closure review in 2014, and identified four new VME areas that were not protected from fishing activities.[72] At the 2014 Annual Meeting, Canada, the EU and the United States submitted a proposal to close two of the proposed new VME areas. It is not clear why they left out the other two areas (Areas 13 and 14 in Figure 7), but the reasons may be related to concerns that closing these areas could potentially interfere with future bottom fishing activity. The proposals to closes the two areas were extensively debated, and ultimately adopted by a vote of 9 Contracting Parties for and 2 – Japan and the Russian Federation – against. Two new closed areas were therefore established, yet areas 13 and 14 remain unprotected.

These two unprotected areas include significant concentrations of sea pens, as indicated in scientific advice and peer reviewed methodology (Figure 7).[73] This is of particular concern as preliminary information from NAFO's 2015 SAI assessment indicates that sea pen closures in the NRA are under-represented.[74] Figure 7 also indicates that, while a number of areas of high concentration of sea pens have been closed, most areas where sea pens are known or likely to occur have not been closed. Moreover, it is clear that in most of the areas between 500 and 1,000 m where black corals, cerianthids and crinoids have been located, these species are unprotected.

[71] Knudby, A., Lirette, C., Kenchington, E. & Murillo, F. J. (2013). *Species distribution models of black corals, large Gorgonian corals and sea pens in the NAFO Regulatory Area* (Serial No. N6276; NAFO SCR Doc. 13/078). Retrieved from http://archive.nafo.int/open/sc/2013/scr13-078.pdf.
[72] NAFO. (2014). *Scientific Council Reports 2014*. Part E: Report of Scientific Council Meeting, 31 May – 12 June 2014, p. 86
[73] Ibid, p. 48
[74] NAFO 2015, above note 67, p. 29.
[75] NAFO. (2015). *Report of the Scientific Council Meeting, 29 May–11 June 2015, Halifax, Nova Scotia* (Serial No. N6469; NAFO SC Doc. 15-12 rev), p. 30 [NAFO SC 2015].
[76] Knudby *et al*, above note 71.

FIGURE 7. MAP OF NAFO AREA WHERE HIGH CONCENTRATIONS OF SEAPENS HAVE BEEN IDENTIFIED THROUGH RESEARCH TRAWL DATA, WITH ILLUSTRATION OF THE EXISTING CLOSURES, AS WELL AS AREAS 13 AND 14, PROPOSED FOR CLOSURE BY THE SCIENTIFIC COUNCIL IN 2014 BUT WHICH WERE NOT ADOPTED BY NAFO.

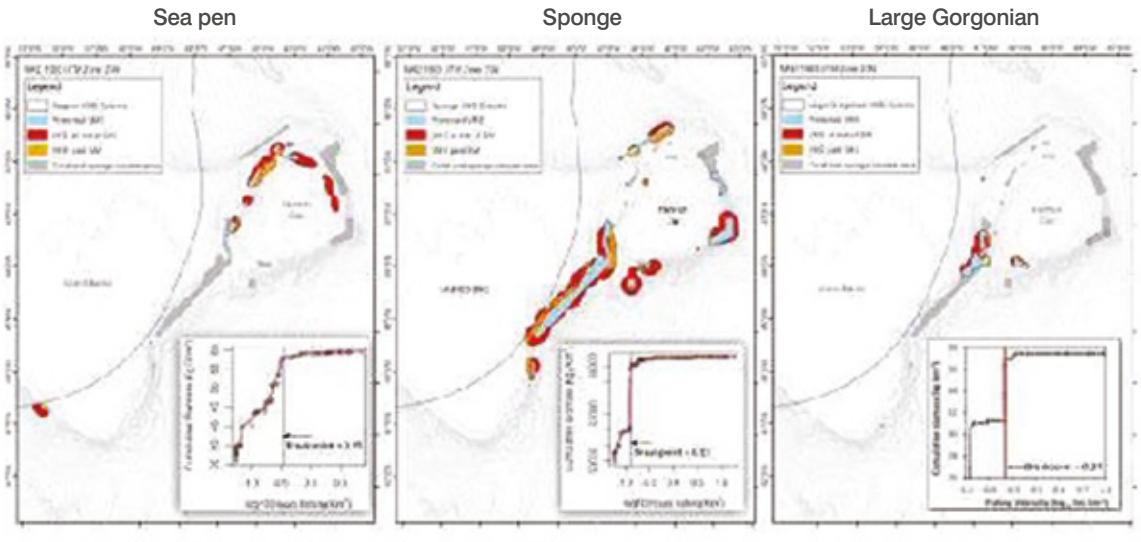


SOURCE: NAFO SCIENTIFIC COUNCIL REPORT 2014, AT NOTE 72, P. 48.

Additionally, in 2015 the NAFO Scientific Council reviewed the known areas of high concentrations of sponges, corals and sea pens and assessed the level of protection and risk of SAIs of these VMEs given the currently agreed closures (Figure 8). According to the initial analysis, 63% percent of significant concentrations of sea pen areas remain at risk of SAIs from bottom fishing; 45% of sponge areas and 31% of large gorgonian areas also remain at risk.[75]

While NAFO has made progress on protecting VMEs, it is clear that many areas remain open to fishing activity, not all known areas of VMEs concentrations have been fully protected, and several VME indicator species, including black corals, remain unprotected, primarily because they do not form concentrations (Figure 6).[76] Finally, NAFO's impact assessments do not include cumulative impact of bottom trawling over time, and the initial identification of the fishing footprint did not include areas of trawling intensity, rather was a blanket footprint across all areas where fishing may have occurred in the past 20 years, prior to 2008.

FIGURE 8. NAFO ASSESSMENT OF LEVEL OF PROTECTION AND REMAINING RISK OF SAIs ON KNOWN VME INDICATOR SPECIES



SOURCE: NAFO SC 2015, AT NOTE 75, P.30

As mentioned in the previous section, in 2015, after several years of debate, NAFO finally agreed to ban all bottom fishing in the areas that had been 'closed' to protect seamounts in 2005 but where 'exploratory' bottom fishing as still permitted under the 2005 closure regulation, and had been conducted by Spanish trawlers. This issue was the subject of a particularly contentious debate at the September 2014 meeting of NEAFC, with Norway highlighting the contradiction by stating that NAFO needed to be honest with the public and the UNGA and either fully close these areas to bottom fishing or else cease classifying them as 'closed' areas and remove them from the NAFO map of closed areas. No action was taken in this regard in 2014, but Contracting Parties eventually agreed to fully close the seamount areas at the Annual Meeting in 2015, in advance of the UNGA review of bottom trawling measures, held in New York on 1-2 August 2016.

Impact of research surveys on VMEs

The impact of fisheries research surveys on VMEs, which continue to take place within VME area closures, has been a matter of concern at NAFO ever since closures were first established. Large catches of sponges, in particular, continue to be caught within VME areas. In 2012, the Scientific Council recommended that a trade-off be considered involving removing survey tows using bottom trawl gear from VME areas when designing annual research trawl surveys for the purpose of conducting fish stock assessments.[77] However, no progress was made on this subject in either 2013 or 2014, despite the WGESA having been provided with direction to assess the impacts.[78] A subcommittee was struck in 2015 during the Joint Fisheries Commission/ Science Council meeting on the Ecosystem Approach to Fisheries Management (WG-EAFM) to further examine the impacts of removing surveys from within VME closed areas. It is known that some areas have been omitted from research surveys, notably the area surrounding the Beothuk Knoll and the southern edge of the Flemish Cap because of incidents of gear loss over time. In 2015, the NAFO Secretariat overlaid research survey tow locations with the closed areas on the Flemish Cap (Division 3M) and found that 15% of the tow locations overlap with the closed area.[79]

2.2.2.3 Move-on rule/cease fishing in areas where VMEs are encountered

In 2008, NAFO Contracting Parties agreed to a VME encounter protocol which would trigger a move-on rule whenever 100 kg of 'live' corals or 1,000 kg of sponges were brought up in a vessel's fishing gear. No scientific analysis was used to assess the appropriateness of these trigger thresholds, and there were no records in NAFO of a commercial bottom fishing vessel or a research trawl vessel ever reporting a catch of 100 kg of coral. In 2009, the threshold levels were reduced to 60 kg live coral and 800 kg of sponges. Thresholds for sponges were further reduced to 300 kg in 2012.

In 2012, NAFO adopted a Proposal for the Establishment of Measures to Protect Sea Pens and Sponges in the NAFO Regulatory Area that further defined the threshold levels for VME encounters as follows: "For both existing bottom fishing areas and unfished bottom areas, an encounter with primary VME indicator species is defined as a catch per set (e.g. trawl tow, longline set, or gillnet set) of more than 7 kg of sea pens, 60 kg of other live coral and 300 kg of sponges. These thresholds are set on a provisional basis and may be adjusted as experience is gained in the application of this measure".[80] These thresholds were decreased from the original levels of 100 kg of coral and 1000 kg of sponges.

In both existing bottom fishing areas and areas outside of the existing fishing areas (fisheries footprint), vessels are required to quantify their catch of VME indicator species. Observers are deployed to identify corals, sponges and other organisms to the lowest possible taxonomical level. If the quantity of VME indicator species caught is higher than the thresholds detailed above, additional measures are triggered. These are further detailed in Article 22 of NAFO's 2015 Conservation and Enforcement Measures,[81] and include reporting the encounter to the Contracting Party, ceasing fishing, and moving at least 2 nautical miles away from where the encounter was recorded. However, it is unclear if other vessels are alerted and subsequently also required to stay out of the encounter area.

Remarkably, no encounters have been reported to the NAFO Secretariat since the original establishment of the Encounter Protocol in 2007. It is unclear why this is, but given that new information on VMEs continues to be documented by research surveys outside the closed areas, it seems impossible that fishing vessels have no encounters with VMEs. Therefore, the system of recording VMEs encounters by the vessel master and observers, or lack thereof, is of considerable concern as are the relatively high threshold levels required to trigger the move-on rule.

This problem is compounded by the ongoing failure to agree on a data collection protocol and the lack of a scientific observer program. The NAFO Observer Catch data form does not include specific codes for any VME indicator species, and only specifies marine invertebrates.[82] Furthermore, according to the Conservation and Enforcement Measures NAFO observers are only required to report VMEs if they are encountered outside the fishing footprint (Article 22 (b)). Under the move-on rule, it is the vessel master who must report VME encounters, but it is not clear if the vessel master actually asks for this information from the observers. According to Article 22, the positions of these vulnerable marine indicators must be reported by the vessel master to the flag state, who in turn must notify the NAFO Secretariat within 24 hours. As mentioned above, no VME encounters have ever been reported.

2.2.2.4 Ensuring the long-term sustainability of deep-sea fish stocks, including bycatch species

NAFO has quotas in place for 11 species and 19 stocks. NAFO also completes assessment for 27 stock units and, as of 2014, the Scientific Council identifies progress in the establishment of reference points for each of these stocks. Approximately 50% of the 27 stock units have reference points. As of 2015, there are no directed fisheries for 3LNO shrimp and 3M shrimp, 3LNO American plaice, 3LNO cod and 3NO capelin. In 2012 the NAFO Scientific Council began reporting stock status against its Convention objectives, which requires state of stock in relation to $B_{MSY,}$ level of fishing mortality (F), application of the precautionary approach, including agreed harvest control rules (HCR), impacts on living marine resources and ecosystems, and preservation of biodiversity. This is an improvement over previous reporting and clarifies the status of the stock as well as impacts of the fishery for management decision making.

The total TAC for 2016 groundfish in the NRA is 88,929 tonnes, which is over 70% above the reported catch in 2014. Similarly, the TAC in 2014 was set at 88,763 tonnes, some 70% higher than the actual reported catch of 51,821 tonnes in 2014.[83] It is clear that NAFO is setting TACs for bottom fisheries far in excess of the actual catch, which is a result of the ongoing lack of agreement on reducing the TAC to more closely correspond to actual catch levels, as Contracting Parties fear that they will then be unable to reach agreement on TAC expansions in future years if catches increase.

One such example is the continued agreement to set the skate TAC at 7,000 tonnes, despite reported catches being below 5,000 tonnes. Catches for white hake have been well below 1,000 tonnes, and scientific advice from 2015 is that catches should not exceed 300 tonnes, yet the white hake TAC is agreed at 1,000 tonnes. The largest contributor to this discrepancy in TAC setting and catch is yellowtail flounder, with a 17,000 tonnes TAC agreed in 2015 as a roll over from 2014, but reported catches in 3NO of just 7,965 tonnes. Canada indicated that it did not want to catch the TAC in 2015, largely because of bycatch of 3NO cod and American plaice, both of which are under moratoria and also in the process of being considered for listing under Canada's *Species At Risk Act* (for the portion of the stock within the EEZ). While countries argue that they are being precautionary in not catching the TAC for many species, the reality is that it is difficult to reach agreements to reduce TAC that is not being caught due to fear that it will be impossible to achieve increases in the TAC if and when stocks of depleted species recover.

In addition to catches being well below the set TACs, discrepancies between NAFO's Statlant A database and STACFIS were noted in NAFO's 2011 Performance Review,[84] particularly with regard to the difficulties caused by not having accurate data to include in NAFO stock assessments which therefore increased the uncertainty in these assessments.[85] In response to the recommendation of the NAFO Performance Review regarding data collection and reporting, NAFO established an Ad Hoc Working Group on Catch Reporting (WG CR) at its 2013 Annual Meeting.[86] In 2015, on the recommendation of the WG CR, NAFO created a Catch Data Advisory Committee,[87] to address the fact that "the reliability of catch data continues to be one of the most significant issues facing NAFO".[88] The WG CR and the Advisory Committee will work together with the Secretariat and the Scientific Council to develop methodologies for catch estimates and data validation.

While the increased attention being paid to these shortcomings marks progress at NAFO, it does not alter the fact that basic catch data and accuracy continues to be a major problem that undermines the sustainable management of fish stocks in the NAFO Regulatory Area. As depicted in the NAFO Scientific Council 2015 report, approximately 50% of stocks assessed by NAFO have established reference points.[89]

Bycatch species

NAFO has recently taken steps towards addressing the serious issue of bycatch through the establishment of a Joint Fisheries Commission / Scientific Council Working Group on Bycatch, Discards and Selectivity (WG-BDS) in 2014. The requirement for tow-by-tow data collection has also been expanded so that it now includes all bycatch species, rather than simply the top three bycatch species. However, significant progress towards actually reducing bycatch has yet to be made.

At the 2015 Annual Meeting, the NAFO Fisheries Commission adopted a bycatch action plan[90] which includes commitments to effective management and the minimization of bycatch and discards, and improvement of selectivity, in all fisheries in the NRA; accurate reporting of target, non-target and incidental catch; accounting for total catch (retained and non-retained) in scientific assessments and management measures; ensuring management regimes are adaptive and address changing fishery conditions over time, and differences

[77] NAFO. (2014), above note 72, p. 85.

[78] NAFO. (2013). *Part B: Report of the Scientific Council, 7–20 June Meeting 2013* (NAFO/SC 7-20), p. 53.

[79] NAFO SC 2015, above note 75, p. 30.

[80] NAFO. (2012). *Proposal for the establishment of measures to protect sea pens and sponges in the NAFO Regulatory Area* (Serial No. N6068; NAFO/FC Doc. 12/12).

[81] NAFO CEM 2015, above note 58.

[82] See "Electronic Observer forms" retrieved from http://www.nafo.int/fisheries/frames/cem.html.

[83] NAFO. (2014). *Annual Compliance Review. Compliance report for fishing year 2013.* (Serial No. 6386, NAFO/FC 14/21), p. 4.

[84] NAFO. (2011). *NAFO Performance Assessment Review 2011*, p. xiii.

[85] Ibid.

[86] NAFO. (2013). *Report of the Fisheries Commission, 35th Annual Meeting, 23–27 September 2013, Halifax, NS, Canada*, p. 5, also Annex 4.

[87] NAFO. (2015). *Report of the Fisheries Commission and its Subsidiary Body (STACTIC), 37th Annual Meeting of NAFO, 21–25 September 2015, Halifax, Canada*, p. 12, also Annex 12.

[88] Ibid, p. 50.

[89] NAFO SC 2015, above note 75, p. 71.

[90] NAFO. (2015). *Report of the Fisheries Commission Ad hoc Working Group to reflect on the rules governing bycatches, discard and selectivity in the NAFO Regulatory Area* (Serial No. N6474; NAFO/FC Doc. 15/06), p. 5–6.

among areas and fleets; ensuring management measures reflect the precautionary and ecosystem approaches to fisheries management; and identifying priority areas for bycatch management, in particular where there is a risk of causing serious harm to bycatch species, and linkages to other NAFO bodies doing work related to bycatch management (e.g. the Standing Committee on International Control, WG-EAFFM, WGESA, WGCR).

Bycatch considerations were taken into account when setting the TAC for yellowtail flounder at the 2015 Annual Meeting. The TAC was not increased, despite advice from the Scientific Council that an increase could occur, because of concerns over the bycatch of American plaice and cod, species which are both currently under review for listing on Canada's *Species at Risk Act,* as previously mentioned

Catch and bycatch of deep-sea and vulnerable species

While NAFO has only just begun its work on bycatch, there are several long-lived and deep-sea species that are known to be caught in research trawl surveys, and as such expected to be caught in commercial fisheries, but are currently unregulated, either through TACs or bycatch reduction mechanisms. Several straddling groundfish stocks, including wolfish, porbeagle shark, white hake, 3NO cod and American plaice, are severely depleted and considered threatened or endangered within Canadian waters,[91] with three species of wolfish listed under Canada's *Species at Risk Act* (Table 6), with varied measures in place by NAFO from a moratorium on directed fishing (American plaice, 3NO cod), reduced TAC (white hake) to no protection (wolfish species, porbeagle shark). While recommendations to protect porbeagle shark through prohibitions on landings as well as a ban on shark finning have been tabled for several years, NAFO has consistently punted all proposed shark measures to ICCAT with the rationale that it is the responsible governing body for highly migratory species although NAFO does report on shark catches in the NRA as reported by Contracting Parties.[92] NAFO does not regulate deep-sea sharks, nor are there assessments of the sustainability of deep-sea shark populations. In addition to alfonsino, which is the primary target of remaining seamount fisheries, additional seamount species include orange roughy, cardinal fish, wreckfish as well as others. None of these species are managed through TAC or bycatch restrictions, however area-based management measures through the seamount closures can be considered some form of protection.

The alfonsino fishery within NAFO remains unregulated and it has not been possible to conduct a reliable stock assessment.[93] This unregulated fishery not only jeopardizes the status of the stock, but also impacts on seamounts and other deep-sea species that might be caught as bycatch.

In 2015, the NAFO Scientific Council noted the potential impacts of fishing gear on deep-sea fish species such as alfonsino in light of their life-history traits which make them vulnerable to exploitation,[94] and in accordance with the FAO Guidelines (paragraph 42 (iv)). The Council also noted that "[a]s a consequence of alfonsino spatial distribution associated with seamounts, their life-history, and their aggregation behaviour, this species are easily overexploited and can only sustain low rates of exploitation".[95]

Given the vulnerable life-history characteristics of alfonsino and other deep-sea species present in the area and that can be caught as bycatch, precautionary conservation measures should be put in place before any fishing is allowed to occur, in accordance with the FAO Guidelines, particularly paragraphs 21–23. Establishing a TAC for stocks without knowing their status would contradict this important requirement.

There have also been changes in the target species and fisheries since the last review by the DSCC in 2011.[96] For example, the Northern shrimp fisheries continue to decline and a moratorium has been put in place. Conversely, witch flounder on the southern Grand Bank was reopened with a total allowable catch (TAC) of 1,000 tonnes after a 20-year moratorium.[97]

WGESA continues to make progress on a *Roadmap for Developing an Ecosystem Approach to Fisheries for NAFO*, originally conceived in 2010, however a fair amount of work remains to be done in order to operationalize the roadmap and fully integrate this into NAFO fisheries management decisions. Studies estimating cod consumption of shrimp, redfish and cod (i.e. cannibalism), and redfish consumption of shrimp, in the Flemish Cap reinforced the notion that strong trophic interactions between these species exist.[98]

2.2.2.5 Other

Impacts on fisheries and VMEs in the NAFO area from non-fishery activities

As a result of increasing concerns about the impacts of non-fishery activities on NAFO fisheries, the NAFO Fisheries Commission requested that the NAFO Scientific Council, through the WGESA, identify harmful activities and their potential impacts. These activities included, for example, oil and gas drilling and seismic testing, marine pollution including microplastics, and shipping.[99] It is significant that NAFO is increasingly concerned about non-fishing activities given the general lack of integrated management of potentially conflicting activities on the high seas.

Table 6. Vulnerable and at risk marine fish and elasmobranch species caught in NAFO NRA fisheries			
Common name	**Scientific name**	**Species designation (Canada)**	**NAFO Measures in place**
Redfish, deep water	Sebastes mentella	COSEWIC assessed	Assessment and TAC, moratoria in place between 1998–2008
Redfish, golden (marinus)	Sebastes marinus	Long-lived, deep-sea species	Assessment and TAC, moratoria in place between 1998–2008
Dogfish, black	Centroscyllium fabricii	Long-lived, deep-sea species	None
Grenadier, roundnose	Coryphaenoides rupestris	Long-lived, deep-sea species	None
Grenadier, roughhead	Macrourus berglax	Long-lived, deep-sea species	None
Cat Shark, deep-sea	Apristurus profundorus	Long-lived, deep-sea species	None
Skate, spinytail	Bathyraja spinicauda	Long-lived, deep-sea species	None
Shark, Portuguese	Centroscymnus coelolepis	Long-lived, deep-sea species	None
Wolffish, striped	Anarhichas lupus	SARA listed in Canada	None
Wolffish, broadhead	Anarhichas denticulatus	SARA listed in Canada	None
Skate, smooth	Malacoraja senta	COSEWIC assessed	None
Wolffish, spotted	Anarhichas minor	SARA listed in Canada	None
White hake	Urophycis tenuis	COSEWIC assessed	NAFO quota 100T
American plaice	Hippoglossoides platessoides	COSEWIC assessed	No directed fishery
Porbeagle	Lamna nasus	COSEWIC assessed	None
Alfonsino	Beryx splendens	Seamount species	None (Attempts to limit TAC and / or days fishing but no agreement as of 2015).
Alfonsino	Beryx decadactylus	Seamount species	None
Orange roughy	Hoplostethus atlanticus	Seamount species	None
Slimehead	Hoplostethus mediterraneus	Seamount species	None
Wreckfish	Polyprin americanus	Seamount species	None
Cardinalfish	Epigonus telescopus	Seamount species	None

[91] COSEWIC. (2015). *Database of wildlife species assessed by COSEWIC*. Retrieved from http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm.
[92] NAFO Fisheries Commission 2015, above note 63, p. 78.
[93] NAFO SC 2015, above note 75, p. 36.
[94] Ibid, p. 39.
[95] Ibid.
[96] Gianni *et al*, above note 15.
[97] NAFO. (2014). *Report of the General Council and its Subsidiary Body (STACFAD), 36th Annual Meeting of NAFO, 22–26 September 2014, Vigo, Spain* (Serial No. N6406; NAFO/GC Doc. 14/03), Annex 19, p. 44.
[98] NAFO. (2010). *Report of the NAFO Scientific Council Working Group on Ecosystem Approaches to Fisheries Management (WGEAFM), Vigo, Spain, 1–5 February 2010*, p. 48.
[99] NAFO SC 2015, above note 75, pp. 41–43.

Transparency

NAFO has made improvements in transparency, particularly with a decision to allow all working groups to be open to observers as of 2014, unless a specific decision is taken not to do so.[100] The NAFO Performance Review remains closed to observers however, and NAFO would benefit from allowing observers at these meetings particularly given the importance of performance reviews to assess the progress of RFMOs towards meeting their obligations under the UN Fish Stocks Agreement as well as under annual United Nations General Assembly sustainable fisheries resolutions.

2.2.3 CONCLUSION

NAFO has made significant progress in implementing UNGA 61/105, 64/72 and 66/68, although not all areas that are known or likely to have VMEs have been protected. On the positive side, NAFO has identified VME indicator species as well as VME elements, and undertaken significant scientific analysis, including habitat suitability mapping, to identify where these VMEs may occur. NAFO has also been proactive in understanding the areas that are not protected and in assessing risk of SAIs as a result of fishing activities.

However, there are several areas where NAFO has not fulfilled its obligations under UNGA resolution 61/105, including:

- NAFO Contracting Parties have failed to agree on additional closures for sea pens, despite known areas of high concentration of VMEs. Essentially, there has been agreement on closures in areas where fishing activity will not be greatly affected, and less agreement on areas where fishing activity will be impacted.
- NAFO has not fully protected all known areas where VME species occur, particularly those that do not appear in high concentrations, and are widely distributed, such as black corals.
- NAFO has yet to complete impact assessments of fishing on all VMEs, however it has completed an assessment of VMEs that remain unprotected from fishing activity.
- Cumulative impact assessments on known VME areas have yet to be conducted.
- Research surveys continue to have serious impacts on VMEs and, despite this issue being raised on an annual basis since 2008, there has been little progress towards altering survey designs to ensure that trawl surveys do not take place within VME closures.
- Since its inception, no encounters have been reported under NAFO's move-on rule. However, it is unclear as to whether this is a result of systemic failure to collect or report data on encounters, the threshold levels are too high, or simply because no encounters have occurred.
- NAFO has begun to address the issue of bycatch in NAFO fisheries. However, there is little protection for deep-sea species or "at risk" marine fish and elasmobranch species caught in NAFO fisheries, including existing seamount fisheries for alfonsino.
- NAFO fisheries have also changed significantly in recent years, notably with the recovery of some groundfish species and all directed shrimp fisheries being closed as of 2016. Prior to the cod collapse in the early 1990s, NAFO did not traditionally have a large shrimp fishery.

" The vast majority of deep-water fisheries have been carried out unsustainably… with fisheries often closed or limited only after severe depletion has already occurred. "

Global Marine Assessment/World Ocean Assessment (UNGA 2015).
Chapter 51: Biological communities on seamounts and other submarine features potentially threatened by disturbance (p. 15)

[100] NAFO. (2014). *Amended Rules of Procedure and Finance Regulations*, p. 21.
[101] South East Atlantic Fisheries Organisation (SEAFO). (n.d.). *Convention Area map*. Retrieved from http://www.seafo.org/.

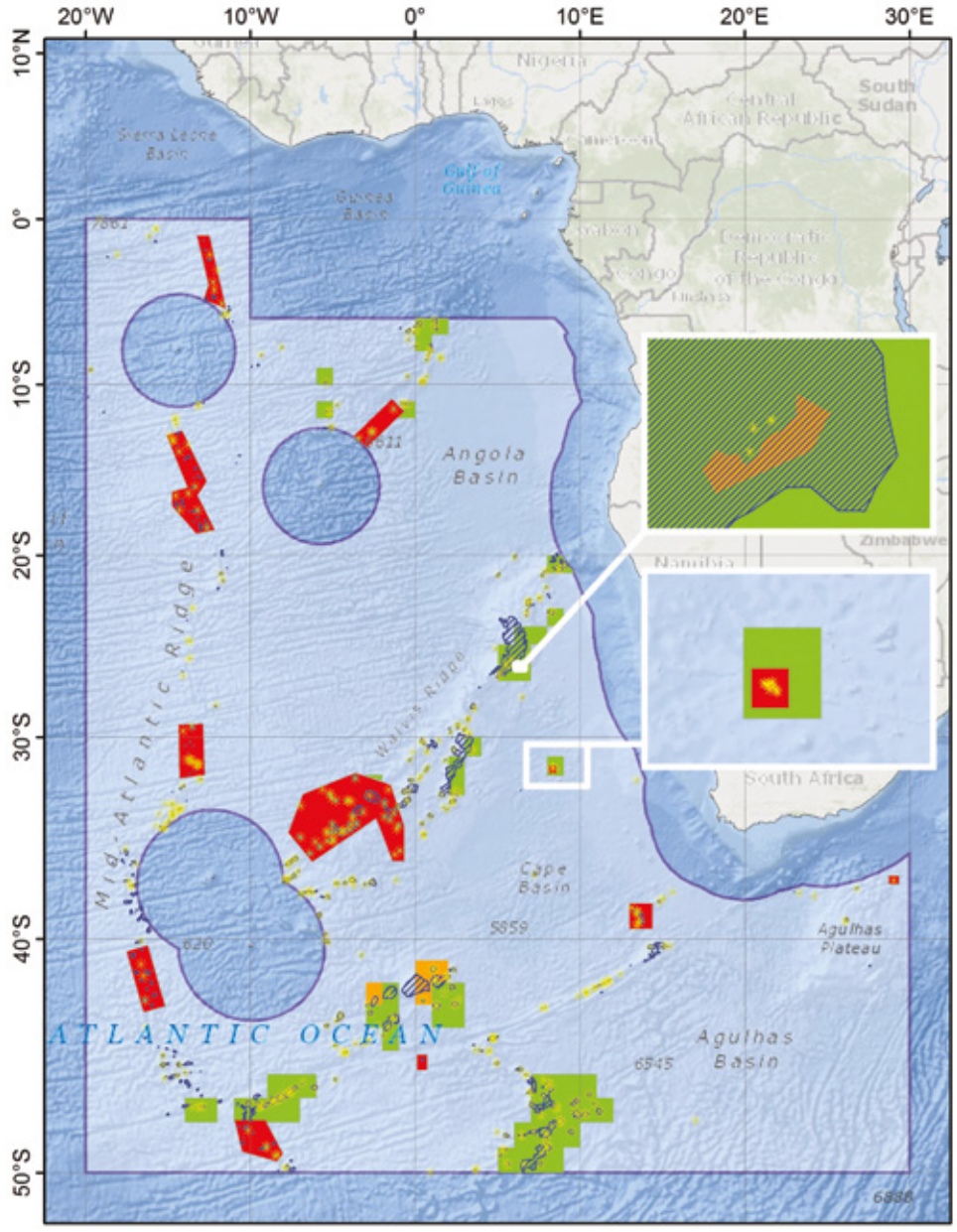
3.0 SOUTH ATLANTIC

3.1 SOUTH EAST ATLANTIC

The regulation of bottom fisheries on the high seas of the Southeast Atlantic is governed by the South East Atlantic Fisheries Organisation (SEAFO). The Convention Area covers a sizable part of the high seas of the South East Atlantic Ocean, encompassing all the waters beyond areas of national jurisdiction in a region bounded by parallel lines of latitude and meridians of longitude, and the EEZs of west and southern African states.[101]

FIGURE 9

SEAFO



SEAFO	% "Fishable" Area	% "Fishable" Seamounts
Areas closed to bottom trawling	5.1%	1.8%
Areas closed to all bottom fishing including bottom trawling	16.1%	21.5%
Areas where bottom fishing is permitted	42.9%	25.5%
Areas where prior impact assessment required before bottom fishing can occur	41.0%	53.0%
TOTAL	175,943 km²	502 seamounts

- Seamounts <2000m deep
- 2000m Isobath
- Bottom trawl closure
- Existing bottom fishery – open to all bottom gear
- Existing bottom fishery – closed to bottom trawl (pots and/or longlines only)
- Regulatory Area

SOURCE: MARINE CONSERVATION INSTITUTE 2016

The Contracting Parties to SEAFO are Angola, EU, Japan, South Korea, Namibia, Norway and South Africa.

3.1.1 DESCRIPTION OF HIGH SEAS BOTTOM FISHERIES

3.1.1.1 Main high seas bottom fishing nations

EU (Spain), Japan, Namibia, South Korea, South Africa (based on authorized vessel list tonnage).

3.1.1.2 Number of high seas bottom fishing vessels operating in region in 2014/2015 (or latest year for which information is available)

During 2015, only two vessels were reported to be bottom fishing in the SEAFO area: one Japanese-flagged vessel targeting Patagonian toothfish, and one South Korean-flagged vessel targeting deep-sea red crab.[102]

3.1.1.3 Main high seas bottom fisheries

Currently the main fisheries are bottom longline fisheries for toothfish and pot fisheries for deep-sea red crabs. In the past other commercial species targeted or taken as bycatch have included alfonsino, southern boarfish, oreos, orange roughy, wreckfish, blackbelly rosefish and other deep-sea species.[103]

3.1.1.4 Catch (including catch per main target species)

Patagonian toothfish: 51 tonnes (provisional 2015)
Deep-sea crab: 104 tonnes (provisional 2015)
Less than 1 tonne of unspecified bycatch reported in 2015[104]

These catches are low compared to the agreed TACs. All other main species reported either zero catch or no fishing at all in 2015.[105] This represents a marked decline from catches of over 500 tonnes in 2006 (for toothfish and red crab).

3.1.1.5 Vessels authorized to fish in 2016 (or latest year for which information is available):

There are 10 vessels authorized to fish in 2016:

- Japan – 2 vessels (both longline vessels; one also a pot fishing vessel);
- Namibia – 3 vessels (1 bottom trawl; 2 longline/pot vessels);
- South Africa – 1 vessel (longline);
- South Korea – 1 vessel (longline/pot vessel);
- Spain – 3 vessels (2 longline; 1 bottom trawl).[106]

3.1.1.6 Changes in numbers of vessels active in bottom fisheries, volume of catch since 2004/6 – 2014 if known

SEAFO published a list of 37 vessels authorized to bottom fish on the high seas in the SEAFO area in 2011. In 2016, that number has been reduced to 10 vessels.

Catches of Patagonian toothfish, orange roughy, alfonsino and deep-sea red crab have all decreased throughout the period from 2004 to 2014.[107]

3.1.2 IMPLEMENTATION OF MEASURES TO PROTECT VULNERABLE MARINE ECOSYSTEMS FROM SIGNIFICANT ADVERSE IMPACTS AND ENSURE THE LONG-TERM SUSTAINABILITY OF DEEP-SEA FISH STOCKS - PARAGRAPHS 83 TO 87 OF UN GA RESOLUTION 61/105; PARAGRAPHS 113, 117 AND 119 TO 124 OF UNGA RESOLUTION 64/72; AND PARAGRAPHS 121, 126, 129, 130 AND 132 TO 134 OF UNGA RESOLUTION 66/68

A framework regulation for the management of high seas bottom fisheries in the SEAFO Area in response to UNGA resolution 61/105 was first adopted as an interim measure in 2008.[108] Additional measures were adopted by SEAFO in subsequent years leading up to 2014, when the SEAFO Commission adopted a revised, consolidated set of measures for the management of bottom fishing, the Conservation Measure on Bottom Fishing Activities and Vulnerable Marine Ecosystems in the SEAFO Convention Area.[109] This new Conservation Measure consolidated all the existing regulations at the time and established new measures for managing bottom fishing. It contains articles related to preventing impacts on VMEs, and lists area closures for the protection of VMEs, as well as improved measures in the event of encounters with VMEs. The 2014 Conservation Measure was amended slightly in 2015 (creating CM 30-15)[110] in order to include some minor text edits, as well as indicating a new area open to longline fishing, and an area closed to all fishing gear except pot and longline gears.

SEAFO's Conservation Measures closely mirror the improved bottom fisheries regulation adopted by NEAFC in 2014.[111]

Like NEAFC, SEAFO essentially manages bottom fisheries for impacts on VMEs through a combination of mechanisms, including the establishment of a series of "existing bottom fishing areas" (a bottom fisheries "footprint" based on historic patterns of fishing in the SEAFO area) where bottom fishing is permitted; a 'move-on' rule; areas closed to all bottom fishing designed to protect "representative" areas of VMEs; and the requirement that any bottom fishing in the remaining areas can only take place provided a prior impact assessment is submitted and reviewed by the SEAFO Scientific Committee, and a permit for "exploratory" fishing is approved by SEAFO. Based on the outcome and review of the results of exploratory fisheries (several have been conducted thus far by Japan), additional areas have been reclassified as "existing bottom fishing areas" by a decision of the SEAFO Parties. The management of fishing for deep-sea species focuses on setting quotas for the principal target deep-sea species.

3.1.2.1 Impact assessments

SEAFO initially adopted a measure in 2008, similar to those adopted by NEAFC and NAFO, requiring that "*[e]ach Contracting Party proposing to participate in bottom fishing shall submit to the Executive Secretary information and an initial assessment, where possible, of the known and anticipated impacts of its bottom fishing activities on*

vulnerable marine ecosystems, in advance of the next meeting of the Scientific Committee. These submissions shall also include the mitigation measures proposed by the Contracting Party to prevent such impacts".[112] However, no 'initial' impact assessments were submitted by any of the Contracting Parties for bottom fishing in the SEAFO under this measure as far as the DSCC is aware.

In 2011, SEAFO adopted a fishing footprint of "existing bottom fishing areas" where bottom fisheries were permitted without requiring an impact assessment. The footprint was based on any area fished during a reference period between 1987 and 2011 (extended from the original end date of 2007) and delineated in 1 degree longitude by 1 degree latitude blocks. Depending on the latitude, blocks of 1 degree longitude by 1 degree latitude in the SEAFO area would be approximately 8,000 to 12,000 square kilometers in size and would likely result in the inclusion of areas or features (e.g. seamounts) that had not been previously fished in the footprint, although much of the footprint would also encompass areas too deep for bottom fishing to occur (e.g. deep abyssal plain). The regulation further stipulated that bottom fishing in areas outside the "existing bottom fishing areas" or footprint would be subject to an Interim Exploratory Bottom Fishing Protocol that required an initial, though undefined, assessment of the known and anticipated impacts of its bottom fishing activities on VMEs.[113]

The move-on rule and the closure of some VME areas (although most closures are not in areas where bottom fishing occurs) are the main measures that have been established to prevent SAIs.[114]

In 2014, SEAFO adopted a new measure, CM 29-14, that defined SAIs according to the criteria established in the FAO Guidelines. It also required that impact assessments for exploratory fisheries be conducted in a manner consistent with the criteria established in the International Guidelines with respect to potential impacts on VMEs. However, the criteria incorporated into Annex 3 of CM 29-14 left out the reference to assessing the impacts on "low-productivity fishery resources" contained in the FAO Guidelines.

In 2014, the SEAFO also adopted Guidelines for fisheries research and basic marine science activity in the Convention Area. The primary purpose of these guidelines is to ensure that high-quality scientific research and analysis can be conducted freely and to the benefit of all, and in a manner which does not cause SAIs on the marine ecosystems and organisms, including fisheries resources.

Japan submitted preliminary impact assessments to the Scientific Committee in conjunction with its proposals for exploratory bottom longline fishing in 2012, 2013, 2014 and 2015. While the impact assessments submitted in 2012, 2013 and 2014 were not consistent with the criteria for conducting impact assessments contained in the FAO Guidelines, the proposal submitted by Japan for exploratory fishing in 2015 was deemed by the Scientific Council and the Commission to have met the new requirements for impact assessments agreed in CM 29-14 and CM 30-15.

Exploratory fishing and areas re-opened to bottom fishing

In 2012, Japan submitted a proposal to review the bottom fishing footprint after having conducted an 'exploratory' bottom longline fishery in several areas outside of, and adjacent to, the footprint in the southern portion of the SEAFO area and proposed that these areas be re-opened to commercial fishing; that is, reclassified as "existing bottom fishing" areas.[115] The Scientific Committee reviewed the proposal and concluded that Japan should re-apply for exploratory fishing access to the same areas during 2013. A concern was raised that, in light of the fact that occurrences of VMEs were recorded in some sections of the exploration area, more information on these areas would be needed before the proposal by Japan to open these areas to bottom fishing could be endorsed. The Commission noted that there were no guidelines at the time regarding the way forward after exploratory fishing had been conducted in the Convention Area. It was therefore agreed that SEAFO would follow guidelines set by NAFO at the time, namely that the Scientific Committee would evaluate bottom fishing activities taking into account the risks of significant adverse impacts on VMEs and that the Commission would then either authorize bottom fishing activity for part or all of the area, discontinue the bottom fishing activity, or authorize continued exploratory bottom fishing to gather more information. The Commission adopted the recommendation for Japan to proceed with the exploratory fishing proposal under the set guidelines for exploratory fishing in the SEAFO Convention Area.

The Commission later adopted new rules regarding the opening of new fishing areas.[116]

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[102] SEAFO. (2015). *Report of the 12th Annual Meeting of the Commission, 30 November – 03 December 2015, Swakopmund, Namibia* (NO), pp. 22–174, Annex 5, *11th Report of the SEAFO Scientific Committee, 30 September – 9 October 2015, Windhoek, Namibia* (SEAFO SC Report 10/2015) at p. 26, para. 8.2.

[103] Ibid, Annex 5.

[104] Ibid, p. 85, Table 2 (toothfish & bycatch) & p. 50, Table 4 (red crab).

[105] Ibid, pp. 46–56, Annex 5, Appendix V.

[106] SEAFO. (n.d.). Authorized Vessel List. Retrieved 21 March 2016 from http://www.seafo.org/Management/Authorized-Vessel-List.

[107] SEAFO 2015, above note 102, Annex 5, Appendix V, Tables 1–4.

[108] SEAFO. (2008). *Report of the 5th Annual Meeting of the Commission, 2008*, pp. 39–47, Annex 6, Conservation Measure 12/08 on bottom fishing activities in the SEAFO Convention Area.

[109] SEAFO. (2014, December 8). *Conservation Measure 29-14 on bottom fishing activities and vulnerable marine ecosystems in the SEAFO Convention Area.*

[110] SEAFO. (2015, December 3). *Conservation Measure 30-15 on bottom fishing activities and vulnerable marine ecosystems in the SEAFO Convention Area.*

[111] NEAFC 2014, above note 18.

[112] SEAFO 2008, above note 108, Annex 6, art. 4.3(i).

[113] SEAFO. (2011, October 14). *Conservation Measure 22-11 on bottom fishing activities in the SEAFO Convention Area*, art. 3.

[114] SEAFO CM 30-15, above note 110, art. 8.

[115] SEAFO. (2012). *Report of the SEAFO Scientific Committee Meeting, 19–30 November 2012* (SEAFO SC Report 11/2012), p. 51, Appendix III-R – Proposal to review the bottom fishing footprint [SEAFO 2012 SC Report].

[116] SEAFO. (2012). *Report of the 9th Annual Meeting of the Commission, 2012*, p. 113, Appendix VIII-R, Rules on opening of new fishing areas after exploration [SEAFO 2012 Commission Report].

Japan also submitted proposals for exploratory fishing for the 2013 fishing year. However, a concern was raised by the Scientific Council that part of proposed areas enveloped Closed Area 12 and that fishing in one of their proposed areas might therefore encroach on this Area. Furthermore, a named seamount, Schwabenland Seamount, is located in one of the proposed areas.[117] Despite these concerns, the Scientific Council concluded that both proposals met the conditions required for exploratory fishing and they were subsequently approved by the Commission.

Japan presented the results of the exploratory longline fishery to the Scientific Committee in 2013. Japan reported that the longline vessel conducting the fishery only caught 1.5 kg of gorgonians in three sets during 28 days of bottom longline fishing targeting Patagonian toothfish. Japan argued that VMEs "will not be significantly affected in the exploratory fishing area" because the amount of bycatch of the VME indicator species was less than the threshold levels established by SEAFO that would define an encounter with a VME and trigger the move-on rule. In 2013, the Commission adopted the recommendation of the Scientific Committee to expand the SEAFO fisheries footprint to include the three new areas proposed by Japan. In doing so, the Commission made it clear that only bottom longline fishing is permitted in these areas.[118]

In 2015, the Scientific Council assessed another proposal submitted by Japan, this time to continue exploratory fishing during 2016, and advised the Commission that the proposal met the requirements as per Annex 3 of CM 29/14. The Commission adopted the recommendation, and approved the extension of Japan's exploratory fishing.

The main criteria used to determine whether bottom fishing in a new fishing area would not cause significant adverse impacts on VMEs is if the bycatch of VME indicator species has been less than the amount, or threshold, established to trigger the move-on rule during the exploratory fishery. A number of studies have indicated that the impact of bottom longline fishing is likely to be considerably less severe on seamount ecosystems than bottom trawling. For example, a study published in 2014 by researchers at the University of the Azores estimated that the negative impact of bottom trawling on deep-water corals and sponges on seamounts in the Northeast Atlantic is likely to be 296–1,719 times higher than the impact of deep-sea longline fishing – the latter a fishing method common in the Azores and Madeira Islands.[119]

While the impact of bottom longlining is likely to be considerably less damaging on VMEs than bottom trawling, nonetheless adverse impacts may occur; for example, from the weights used in the fishery to hold or keep the gear on the seabed that do not result in the bycatch of VME indicator species. The spatial scale of the impact of bottom longlining may also be affected by the extent to which the gear may be dragged across the seabed while hauling the gear back on the vessel (see the discussion in Section 7.2.1). Potential impacts should be assessed by mapping VMEs in areas of interest for exploratory fishing prior to and/or as part of the exploratory fisheries permit and by assessing the impact of the longline gear while deployed, for example by using cameras attached to the gear. Cumulative impact assessments should be also conducted and used to determine the extent to which VMEs in the area have already been degraded by previous fishing and the extent to which further damage or degradation could occur even under limited impact scenarios.

3.1.2.2 Identify and close areas where VMEs are known or likely to occur unless bottom fisheries are managed in such areas to prevent SAIs

In response to the adoption of UNGA resolution 61/105, in 2007 SEAFO closed, on a temporary basis, ten seamount areas where VMEs (e.g. corals) were known or thought likely to occur. These closures were revised in 2010, based on a review of SEAFO's area closures at the time carried out by the UK's National Oceanographic Centre (NOC) at the request of SEAFO.[120] The NOC report noted that "data on South Atlantic seamounts, especially in terms of biologically-significant data is at best described as very patchy and of variable quality" but that "any isolated topographic feature that rises to within 1000m of the ocean/sea surface should be regarded as having the potential to host vulnerable marine ecosystems". The Scientific Committee recognized that this should apply to any topographic feature rising to within 2000 meters of the surface as this is the current maximum depth at which bottom fishing takes place in the SEAFO area. As a result, several closed areas temporarily established in 2007 were reopened to bottom fisheries in 2010 (most, though not all, contained seamounts at depths greater than 2,000 meters and thus were considered too deep to fish) while several new area closures, the majority along the Mid-Atlantic Ridge, were adopted. The Mid-Atlantic Ridge closures – five in all – were designated to close "representative areas" of seamounts along the ridge system. The revisions adopted by SEAFO in 2010 regarding area closures did not always follow the advice of the SEAFO Scientific Committee.[121]

A research survey in 2015 using the R/V *Dr Fridtjof Nansen* conducted basic mapping and identification of VMEs in a selection of seamount areas and seamount complexes, some of which are currently closed to fishing and others of which are being fished. Most seamounts investigated were found to contain VME indicator species.[122]

As a result of the survey, the Commission agreed to maintain three of the existing closed areas – closures nos. 6, 7 and 9 – as these areas were shown to contain seamount summits inhabited by VME indicator species as well as coral gardens. The Commission also agreed to close an additional area of approximately 195 km^2 adjacent to the Valdivia Bank seamount to all fishing gear except pots and longlines. However, the Scientific Committee had recommended either closing the areas where VMEs were found to *all* fishing, or to leave these sub-areas open to pot fishing for crabs only. The Scientific Committee also noted that they did not have sufficient information to assess the risk of pot fishing.[123]

As of 2015, there were 12 areas closed to bottom trawling.[124] Eleven of these areas are closed to all bottom fishing, but one of them is open to bottom fishing with pots and longlines. Seamount areas that fall within the existing bottom fishing areas remain open for fishing, and the

fisheries permitted in these areas have not been assessed for potential significant adverse impacts on VMEs. Two of the open areas are open to bottom longline fishing only; the remainder are open to fishing with all types of bottom fishing gear – e.g. bottom trawls, longlines, pots etc.

In 2011, the Scientific Committee indicated that the seamounts closed in the SEAFO Convention Area represented 19% of total seamounts, but 27% of seamounts with a summit shallower than 2,000 meters deep – i.e. at fishable depths – and that the closed areas combined corresponded to 14% of the bottom area shallower than 2,000 m.[125] Based on the current closed and existing fishing areas as of 2015, the DSCC estimates that 21.5% of the seamounts with a summit shallower than 2,000 m are closed to all bottom fishing with an additional 1.8% closed to bottom trawling as well, corresponding to slightly over 20% of the seabed at fishable depths as indicated in Figure 9. Discrepancies in the Scientific Committee's figures and the more recent estimates of the DSCC may be a result of changes to the open and closed areas since 2011 and differences in methodologies in estimating the numbers of seamounts and the extent of the seabed shallower than 2,000 m in the SEAFO area. That said, both sets of figures are reasonably close.

3.1.2.3 Move-on rule/cease fishing in areas where VMEs are encountered

A move-on rule has been adopted by SEAFO, which is triggered in cases where threshold levels of bycatch of 100 kg of "live" coral or 1,000 kg of sponges or more are encountered per tow or set of the gear. These thresholds were revised down in 2009 to 60 kg of live coral and800 kg of live sponge. The Scientific Committee recommended in 2011 that an adapted version of the CCAMLR encounter protocols be applied in the SEAFO area for non-trawl gear.[126] When the thresholds were again revised for various fishing gears, the levels used by CCAMLR were adopted for longline sets, resulting in a threshold of at least 10 VME indicator units (1 unit = 1 kg or 1 litre of live coral and/or live sponge) in one 1,200 m section of line or 1,000 hooks, whichever is the shorter, in both existing and new fishing areas. For pot sets, a threshold of at least 10 VME indicator units (1 unit = 1 kg or 1 litre of live coral and/or live sponge) in one 1,200 m section of line in both existing and new fishing areas was adopted. For bottom trawls, revised threshold levels of more than 60 kg of live coral and/or 600 kg of live sponge for existing bottom fishing areas, and more than 400 kg of live sponges and/or 60 kg of live coral for new fishing areas, were adopted.[127]

The Scientific Committee recommended in 2012 that the threshold for the trawl tow be further reduced to no more than 300 kg of live sponges and/or 30 kg of live coral in existing fishing areas, and no more than 200 kg of live sponges and/or 30 kg of live coral in new fishing areas. This recommendation was based on a review of available information from NAFO and NEAFC regarding their protocols for threshold levels of VME indicators. However, the Commission did not agree to lower the threshold to these levels.

The current move-on rule adopted by SEAFO stipulates that all encounters above the threshold levels are required to be reported to the Executive Secretary of SEAFO. Bottom trawl vessels are required to cease fishing and move 2 nm away from the end point of the trawl tow "in the direction least likely to result in further encounters". For an encounter involving other fishing gears, the fishing vessel is required to move at least 1 nm away from the position that the evidence suggests is closest to the exact encounter location. For encounters with VMEs in existing fishing areas, the closure only applies to the vessel that reported the encounter. In new fishing areas, a temporary closure applies to all vessels. The Scientific Committee is required to evaluate the temporary closure and advise the Commission on whether to reopen the closure or make it a permanent closure. Pending a decision by the Commission, the temporary closure remains in effect.[128]

While there is data available for the reported bycatch of benthic organism (corals, sponges, etc.), the threshold levels have never been reported as having been exceeded, thus the move-on rule has never been applied.

3.1.2.4 Ensuring the long-term sustainability of deep-sea fish stocks, including bycatch species

In 2012, the Commission adopted a recommendation with the provision that all bycatch of TAC species shall be deducted from the respective TACs. However, the Commission did not reach a consensus on the TAC for armourhead in 2013, leaving this species open to potentially being overexploited.[129]

In 2014, SEAFO adopted a bycatch regime for the trawl fisheries for alfonsino and pelagic armourhead.[130] This regime includes the requirement that, when the Secretariat determines that 95% of the TAC for one of these species is reached in a management area, the fleet should be instructed by the Secretariat to target the other species (second target species). A total bycatch of 5% of the TAC of the first target species is allowed to be taken when targeting

[117] SEAFO 2012 SC Report, above note 115, p. 17, para. 9.3.

[118] SEAFO. (2013). *Report of the 10th Annual Meeting of the Commission, 2013*, p. 4, Agenda item 6.3.2.

[119] Pham, C.K. et al. (2014). *Deep-water longline fishing has reduced impact on Vulnerable Marine Ecosystems*. Sci. Rep. 4, 4837; DOI:10.1038/srep04837 (2014).

[120] Jacobs, C. L., & Bett, B. J. (2010). *Preparation of a bathymetric map and GIS of the South Atlantic Ocean and a review of available biologically relevant South Atlantic Seamount data for the SEAFO Scientific Committee* (NOCS Research and Consultancy Report No. 71). Southampton, UK: National Oceanography Centre, Southampton.

[121] SEAFO. (2010). *Report of the 7th Annual Meeting of the Commission, 2010*, pp. 61–69.

[122] SEAFO 2015, above note 102, Annex 5, para. 11, p. 28.

[123] Ibid, Agenda Point 13, para. 21.7.

[124] SEAFO CM 30-15, above note 110.

[125] SEAFO. (2011). *Report of the 8th Annual Meeting of the Commission, 2011, Windhoek, Namibia, 10–14 October 2011*, Annex 5, Report of the SEAFO Scientific Committee, 28 September – 7 October 2011, p. 30.

[126] Ibid, pp. 50.

[127] SEAFO CM 29-14, above note 109, Annex 6.

[128] SEAFO CM 30-15, above note 110, art. 8.

[129] SEAFO 2012 Commission Report, above note 116, para. 8.11.

[130] SEAFO. (2014, December 8). *Conservation Measure 28/14 on total allowable catches and related conditions for Patagonian toothfish, and deep-sea red crab for 2015, alfonsino, orange roughy and pelagic armourhead for 2015 & 2016 in the SEAFO Convention Area*, art. 3.

the second species in the same management area; and if 95% of the TAC for the second species is already reached by other vessels, the vessel can fish its second target species as long as the TAC is not exhausted.

SEAFO also agreed that, if a bycatch species exceeds the 10% threshold of the existing TAC-specific species, SC will recommend a management measure. However, to date, no bycatch species has exceeded the 10% threshold. Spatial data on fishery-specific bycatch are incorporated in some of the stock status reports. Harvest control rules (HCRs) were also adopted by the Commission in 2014 for all the SEAFO stocks.

The overall catch of deep-sea fish stocks in the SEAFO area decreased from 2011 to 2015, with reported catches only for Patagonian toothfish and deep-sea crab in 2015. Moreover, the catch of both species – Patagonian toothfish: 51 tonnes (provisional 2015) and deep-sea crab: 104 tonnes (provisional 2015) – were well below the TACs set for the two species of 276 tonnes and 400 tonnes respectively.[131] The Scientific Committee noted in 2015 that for the two currently targeted species, deep-sea crab and Patagonian toothfish, catches have been very low compared to the agreed TACs in recent years.[132]

A preliminary analysis published in 2011 of species collected in an independent benthic survey of the Walvis Ridge Seamounts found 138 species of fish, 24 species of crustaceans, 15 species of cephalopods and benthic species from four taxonomic groups: actiniaria (sea anemones), echinoidea (echinoderms), taliacea and opistobranchia.[133] This contrasts with the amount of reported bycatch from vessels operating in the fishing footprint since 2013, which has been relatively small, possibly as a result of decreased fishing effort and the relatively selective nature of the pot fishery for crabs. However, altogether some 100 tonnes of bycatch, consisting of some 20 different species or species groups, were observed or reported as taken – and mostly discarded – in the longline fishery for Patagonian toothfish in the period between 2009 and 2014, suggesting that bycatch impacts could be significant over time, particularly for long-lived, low productivity deep-sea species and/or if a significant increase in effort in the fishery were to occur in the future.[134]

3.1.2.5 Other/gear restrictions

The Scientific Committee of SEAFO in 2007 recommended a temporary prohibition on bottom trawling and bottom gillnet fishing in the Convention Area. The recommendation to prohibit bottom gillnet fishing was 'adopted' by the SEAFO Commission in 2009, though no formal prohibition was agreed. The recommendation to prohibit bottom trawling was not adopted and deep-sea bottom trawling continues to be permitted by SEAFO.

In 2015, in response to a request made by the EU, the Scientific Committee drafted a proposal for a binding Conservation Measure based on the bottom gillnet recommendation. The SEAFO Commission did not accept the EU proposal and instead asked the Scientific Committee to evaluate the impact of possible gillnet fisheries in the SEAFO Convention Area in light of scientific information that has become available since the recommendation to prohibit gillnet fishing was adopted in 2009.

3.1.3 CONCLUSION

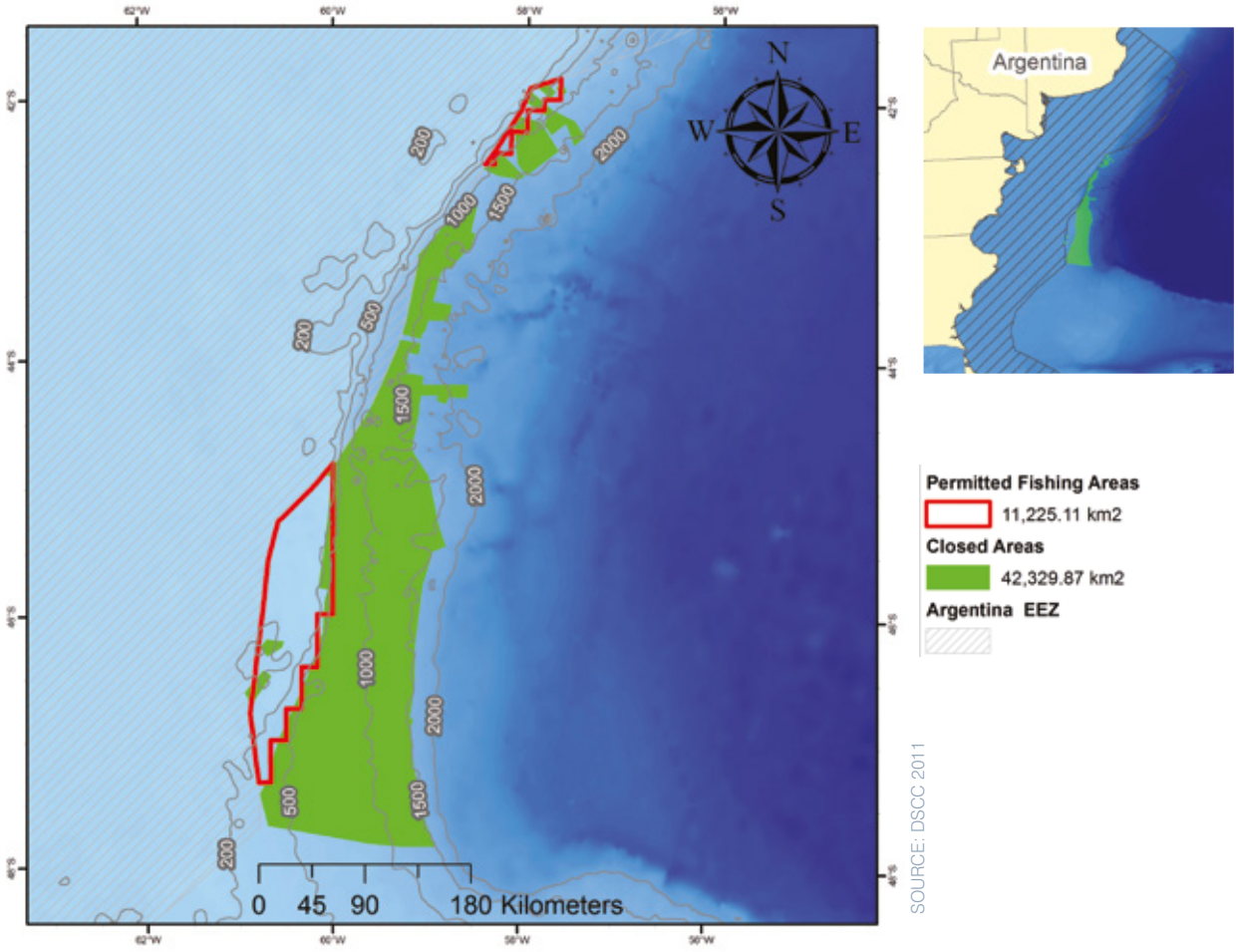
SEAFO has taken considerable steps to adopt new regulations and conservation measures that take into account the UNGA resolutions, the FAO Guidelines, and the regulations of other RFMOS. However, not all areas that are known to contain VMEs have been protected, and the Commission does not always follow the advice of its Scientific Committee. In summary:

- SEAFO has strengthened the move-on rule since the 2011 review and lowered threshold levels. However, the move-on rule has never been applied or triggered. Threshold levels should be reviewed ad revised accordingly, taking into consideration the advice from the Scientific Committee regarding further reductions in the threshold levels for tow surveys.
- The overall catch of deep-sea species has declined substantially in recent years.
- SEAFO has closed one new VME area to bottom trawling since 2011, but the new VME area is not closed to all fishing gears.
- Not all seamount areas and other identified VME areas have been closed to bottom fishing nor has the bottom fishing permitted in these areas, particularly bottom trawling, been assessed for significant adverse impacts.
- Several new areas have been opened to bottom longline fishing on the basis of exploratory fisheries. The main criteria used to determine whether bottom fishing in a new fishing area would not cause significant adverse impacts on VMEs is if the bycatch of VME indicator species has been less than the amount, or threshold, established to trigger the move-on rule. While the impact of bottom longlining is likely to be considerably less damaging than bottom trawling, nonetheless adverse impacts may occur that do not result in the bycatch of VME indicator species. Potential impacts should be assessed by mapping areas of interest for exploratory fishing before or as part of the exploratory permit and assessing the impact of the longline gear while deployed, for example by using cameras attached to the gear.
- Cumulative impact assessments should be also conducted and used to determine the extent to which VMEs in open or exploratory fishing areas have already been degraded by previous fishing and the extent to which future damage could occur.
- Using bycatch threshold levels and the move-on rule as the main criteria to determine whether an exploratory bottom trawl fishery does or does not cause significant adverse impacts on VMEs would be a highly problematic approach for the reasons discussed in the regional sections of this report concerning the shortcomings and limitations of the move-on rule. Although SEAFO has not yet permitted or assessed an exploratory bottom trawl fishery to date, the DSCC sees this as a potentially serious concern.

3.2 SOUTHWEST ATLANTIC AND OTHER NON-RFMO AREAS

FIGURE 10

EU/SPANISH BOTTOM FISHERY SOUTHWEST ATLANTIC



SOUTHWEST ATLANTIC

No RFMO or any multilateral interim measures have been established to regulate the high seas bottom fisheries of the Southwest Atlantic, nor are any negotiations currently underway to establish an RFMO in the region.

3.2.1 DESCRIPTION OF HIGH SEAS BOTTOM FISHERIES

3.2.1.1 Main high seas bottom fishing nations

Spain, South Korea, possibly other countries.

3.2.1.2 Number of high seas bottom fishing vessels operating in the region in 2014/2015 (or latest year for which information is available)

This information is not publicly available as far as the DSCC is aware. The DSCC would note that

[131] Ibid, art. 1. See also SEAFO SC 2015, above note 102Error! Bookmark not defined..

[132] SEAFO SC 2015, above note 102, pp. 46–56, Annex 5, Appendix V.

[133] López-Abellan, L. J., Holtzhausen, J. A., Agudo, L. M., Jiménez, P., Sanz, J. L., Gonzalez-Porto, M., . . . , Ferrer, M. (2011). *Preliminary Report of the Multidisciplinary Research Cruise on the Walvis Ridge Seamounts (Atlantic Southeast-SEAFO) Namibia 0802*. (Spain/Namibia: IEO and National Marine Information and Research Centre). Annex III.

[134] SEAFO. (2015, October 9). *Status Report: Dissostichus eleginoides (Patagonian toothfish)*, p. 6.

[135] Bensch, above note 12, p. 65, Table 4

3.2.1.3 Main high seas bottom fisheries

The main high seas bottom fisheries are bottom trawl fisheries for hake and squid along portions of the Patagonian shelf and upper slope in international waters. There is also a longline fishery for Patagonian toothfish in deeper waters.

3.2.1.4 Catch (including catch per main target species)

Current catch: Unknown. Estimated catch in 2006 was 111,000 tonnes.[135]

3.2.1.5. Vessels authorized to fish in 2016 (or latest year for which information is available)

Unknown.

3.2.1.6 Changes in numbers of vessels active in bottom fisheries, volume of catch since 2004/6 – 2014 if known

In 2006 it was estimated that 55 vessels from Spain, Estonia, South Korea and Ukraine were engaged in high seas bottom fishing in the region.[136] Other countries such as China and Chinese Taipei, often referred to as a fishing entity, may also have had bottom fishing vessels operating on the high seas in the region according a FAO report.[137]

In 2011, Spain published a list of 44 vessels authorized to ("that can opt to") bottom fish on the high seas in the Southwest Atlantic. No other country has issued a list of vessels authorized to fish in the region.

3.2.2 IMPLEMENTATION OF MEASURES TO PROTECT VULNERABLE MARINE ECOSYSTEMS FROM SIGNIFICANT ADVERSE IMPACTS AND ENSURE THE LONG-TERM SUSTAINABILITY OF DEEP-SEA FISH STOCKS - PARAGRAPHS 83 TO 87 OF UN GA RESOLUTION 61/105; PARAGRAPHS 113, 117 AND 119 TO 124 OF UNGA RESOLUTION 64/72; AND PARAGRAPHS 121, 126, 129, 130 AND 132 TO 134 OF UNGA RESOLUTION 66/68

The EU, in July 2008, adopted a framework regulation for the management of high seas bottom fisheries by EU vessels operating in areas of the high seas where no RFMO exists, and where no multilaterally agreed interim measures have been established, including in the Southwest Atlantic.[138] The regulation was adopted by the EU to implement the key provisions of UNGA resolution 61/105 for areas of the high seas where no RFMO exists or is under negotiation, pursuant to paragraph 86. The DSCC is not aware of any measures adopted by other flag States whose vessels engage in high seas bottom fisheries in the region.

3.2.2.1 Impact assessments

The Spanish Instituto Español de Oceanografía (IEO) conducted a series of research surveys between 2007 and 2010 to identify VMEs on the high seas of the Southwest Atlantic in the area where Spanish vessels had historically operated, and prepared a comprehensive assessment regarding the potential impact of Spain's bottom trawl fisheries in the region (see 3.2.2.2 below).[139] No impact assessments have been conducted or published for any high seas bottom fisheries by other countries whose vessels conduct bottom fisheries in the region as far as the DSCC is aware.

3.2.2.2 Identify and close areas where VMEs are known or likely to occur unless bottom fisheries are managed to prevent SAIs

The results of the above-mentioned IEO research surveys were presented in April 2011 at an event in Madrid hosted by the Spanish Ministry of the Environment and Rural and Marine Affairs (MARM). The IEO proposed that nine large areas of the high seas along the Patagonian Shelf and slope be designated as VMEs and closed to bottom trawling. Seven of the areas cover most of the slope between the depths of 300 and 1,000 meters (the maximum depth of the research) while the remaining two cover areas along the shelf at depths shallower than 300 meters. These areas are located between 42 and 48 degrees south latitude, an area where a fleet of approximately 20 Spanish bottom trawlers were operating, fishing primarily for hake and squid.

In July 2011, these areas were closed to this bottom trawl fleet for a period of six months, essentially restricting bottom trawl fishing by Spanish vessels in the area to depths shallower than 300-400 meters. The closures are established through a special temporary permit, renewable every six months, to fish in the region issued by the government of Spain, pursuant to EC regulation 734/2008.[140] The permits, including the area closures, have been regularly renewed since then and continue to remain in effect as of April 2016.[141]

No other flag State has closed any areas where VMEs are known or likely to occur, as far as the DSCC is aware.

3.2.2.3 Move-on rule/cease fishing in areas where VMEs are encountered

A move-on rule is required in the 2008 EU framework regulation,[142] but no encounters have been reported as far as the DSCC is aware. One-hundred percent observer coverage is required on Spanish vessels bottom fishing in the area, but the observer reports have not been made public as far as the DSCC is aware.

3.2.2.4 Ensuring the long-term sustainability of deep-sea fish stocks, including bycatch species

The high seas bottom fisheries in the region are not subject to quotas or other catch restrictions, as far as the DSCC is aware. Given the relatively shallow depths at which the Spanish fishery operates, the catch and bycatch of deep-sea species may not be a major issue of concern.

OTHER NON-RFMO REGIONS

In addition to the Southwest Atlantic, there are a number of other ocean regions where there are no RFMOs in place to manage bottom fisheries on the high seas and where there are no multilateral negotiations underway to establish RFMOs to do so. These include the following high seas areas: the central eastern and central western Atlantic between the equator and the southern boundaries of the NEAFC and NAFO Convention Areas; portions of the central eastern and central western north Pacific which lie between the boundaries of the SPRFMO and the NPFC Convention Areas; and northern portions of the Indian Ocean north of the boundary of the SIOFA Convention Area. There is no reported bottom fishing in these high seas areas as far as the DSCC is aware, but these areas may well be poorly monitored for bottom fishing activity; with any such activity unlikely to be detected or reported.

3.2.3 CONCLUSION

The main conclusions in regard to areas where there is no regional fisheries management organization or arrangement with the competence to regulate bottom fisheries are as follows:

- The European Union and Spain have largely implemented the UNGA resolutions in this area though an updated review of the implementation of the EU's Council Regulation (EC) No 734/2008 should be conducted, including an evaluation of the scientific information collected from the observer program that has been in place in the bottom fishery in the Southwest Atlantic for the past 6 years and the effectiveness of, and compliance with, the regulations.
- UNGA resolution 61/105, in paragraphs 86 & 87, "[c]alls upon flag States to either adopt and implement measures in accordance with paragraph 83 of the present resolution, mutatis mutandis, or cease to authorize fishing vessels flying their flag to conduct bottom fisheries in areas beyond national jurisdiction where there is no regional fisheries management organization or arrangement with the competence to regulate such fisheries or interim measures in accordance with paragraph 85 of the present resolution, until measures are taken in accordance with paragraph 83 or 85 of the present resolution" and "[f]urther calls upon States to make publicly available through the Food and Agriculture Organization of the United Nations a list of those vessels flying their flag authorized to conduct bottom fisheries in areas beyond national jurisdiction, and the measures they have adopted pursuant to paragraph 86 of the present resolution". Only the EU and Spain have done so as far as the DSCC is aware.
- The DSCC recommends that the UNGA call for the immediate halt to bottom fishing in such regions, including but not limited to the high seas of the Southwest Atlantic, by any vessels flying the flag of any country that has not conducted an impact assessment with respect to such fishing, made the impact assessment and the management measures established by the flag State publicly available, and has clearly demonstrated that the fisheries are being managed to prevent significant adverse impacts on VMEs and ensure the long-term sustainability of deep-sea fish stocks.

"…if the impacts of these regional studies are generalized, we can extrapolate that fishing, and in particular deep-water trawling, has caused severe, widespread, long-term destruction of these environments globally."

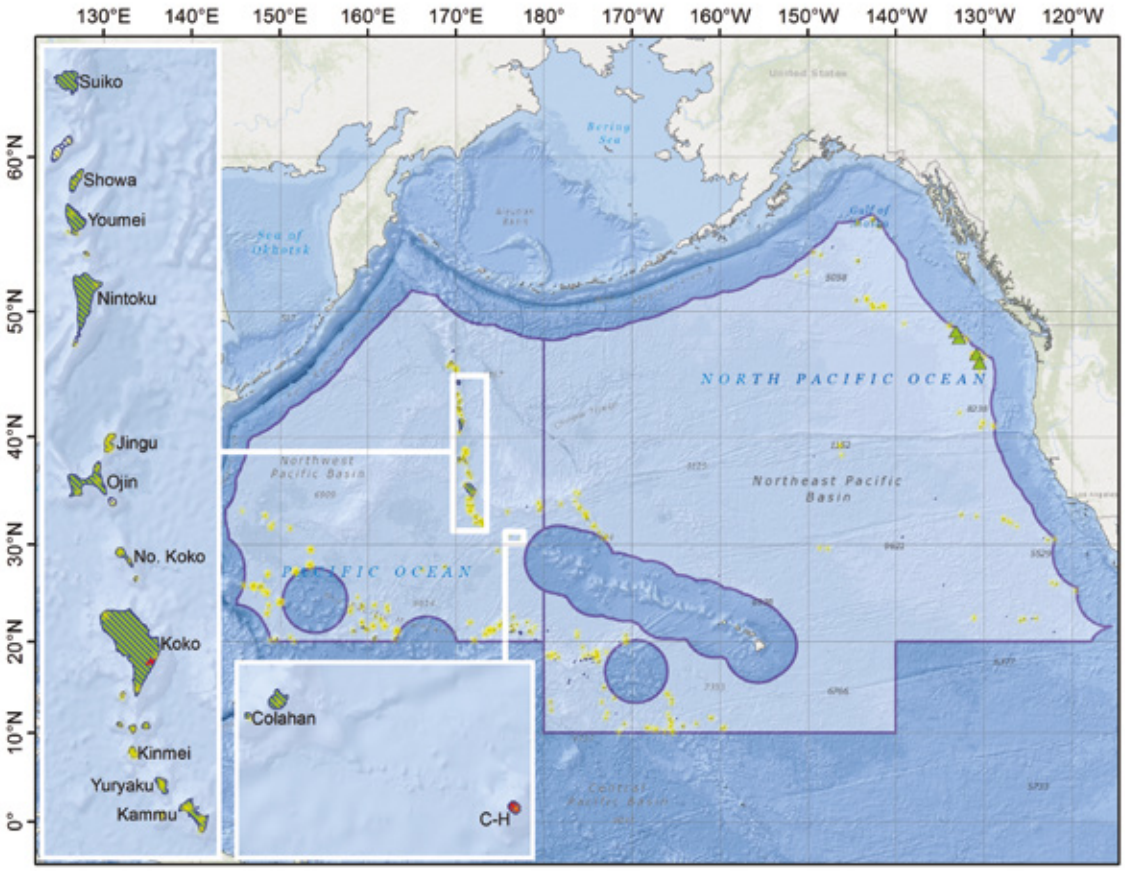
Global Marine Assessment/World Ocean Assessment (UNGA 2015).
Chapter 51: Biological communities on seamounts and other submarine features potentially threatened by disturbance (p. 15)

[136] Ibid, p. 65, Table 4.
[137] Ibid, p. 64
[138] European Union. (2008). *Council Regulation (EC) No 734/2008 of 15 July 2008 on the protection of vulnerable marine ecosystems in the high seas from the adverse impacts of bottom fishing gears* (OJ L 201/8, 30 July 2008), para 2.
[139] Instituto Español de Oceanografía. (2011). *Informe sobre Ecosistemas Marinos Vulnerables en aguas internacionales del Atlántico Sudoccidental y de las posibles interacciones las actividades pesqueras*. Madrid: Proyecto ATLANTIS, Programa Pesquerías Lejanas, Instituto Español de Oceanografía.
[140] EU, above note 138, art. 3.
[141] C. Margarita Mancebo, Jefa de Area de Relaciones Pesqueras Internacionales, S.G. de Acuerdos y Organizaciones Regionales de Pesca, Secretaria de Pesca, Spain. Personal communication, 27 April, 2016.
[142] EU, above note 138, art. 7.

4.0 NORTH PACIFIC

FIGURE 11

NPFC



SOURCE: MARINE CONSERVATION INSTITUTE 2016

NPFC	% "Fishable" Area	% "Fishable" Seamounts
Areas closed to all bottom fishing	0.5%	0.3%
Areas where bottom fishing is permitted	38.9%	12.1%
TOTAL	49,823	398
	km_2	seamounts

Negotiations to establish a regional RFMO – the North Pacific Fisheries Commission (NPFC) – to regulate high seas bottom fisheries of the North Pacific began in 2006 and concluded with the adoption of the Convention on the Conservation and Management of High Seas Fisheries Resources in the North Pacific Ocean in February 2012. The Convention entered into force in July 2015, and the first meeting of the NPFC took place in September 2015. The Convention Area covers the entire expanse of the areas beyond national jurisdiction of the North Pacific Ocean.

An interim Secretariat and Scientific Working Group were established in 2006 to facilitate the negotiation of the new RFMO treaty and the establishment of interim measures for the management of bottom fisheries pursuant to paragraph 85 of UNGA resolution 61/105.

The interim measures for the management of bottom fisheries are still in operation as of the end of 2015. Binding regulations for the management of bottom fisheries in the NPFC area to preplace the interim measures have not yet been adopted, though this is likely to be on the agenda of the meeting of the NPFC in 2016.

Most of the bottom fishing on the high seas in the region currently takes place in the northwest Pacific along the Emperor Seamount chain, and there is a small amount of bottom longline fishing on seamounts on the high seas of the northeast Pacific just outside the 200 mile EEZs of the US and Canada.

4.1 DESCRIPTION OF HIGH SEAS BOTTOM FISHERIES

4.1.1 Main High Seas Bottom Fishing Nations

Japan, South Korea, Russian Federation, Canada. Historically, vessels from Chinese Taipei have also bottom fished in the region but none have been reported fishing in recent years.

4.1.2 Number of high seas bottom fishing vessels operating in region in 2014/2015 (or latest year for which information is available)

In 2014 a total of 11 vessels were reported by Japan to be engaged in bottom fishing on the high seas: Japan (6 bottom trawl vessels and 1 gillnet vessel); South Korea (2 bottom trawl vessels); Russian Federation (1 longline vessel); and Canada (1 bottom trap or bottom longline vessel).

4.1.3 Main high seas bottom fisheries

The main bottom fisheries are the bottom trawl fisheries by Japanese and South Korean vessels targeting North Pacific armourhead and splendid alfonsino along the Emperor Seamount chain and the Northern Hawaiian Ridge in the northwest Pacific. Seamounts in the region where bottom fishing occurs include Suiko, Showa, Youmei, Nintoku, Jingu, Ojin, Northern Koko, Koko, Kinmei, Yuryaku, Kammu, Colahan, and C-H. Bycatch species include mirror dory, rockfishes and butterfish. There are also limited bottom gillnet, longline, trap and pot fisheries for splendid alfonsino, oreos, mirror dory, deep-sea red crabs, deep-sea sharks, scorpionfishes, rockfishes, skilfish and other species in the northwest Pacific.

In the high seas of the northeast Pacific, a limited bottom longline and/or pot fishery by Canadian vessels targeting sablefish takes place on several seamounts (Eickelberg Seamounts, Warwick Seamount, Cobb Seamounts, and Brown Bear Seamounts) adjacent to the US and Canadian EEZs.[143]

4.1.4 Catch (including catch per main target species)

For 2014, the total reported catch in the North Pacific was 5,399 tonnes. Of this, the northwest Pacific seamount fishery accounted for 5,387 tonnes. Japan reported a catch of 4,844 tonnes consisting primarily of alfonsino (3,172 tonnes) and pelagic armourhead (1,334 tonnes) with the remainder mirror dory, butter fish, rock fish and crabs. Less than 100 tonnes was caught by the gillnet vessels – the rest was taken by the bottom trawl vessels. South Korea reported a catch of 543 tonnes of pelagic armourhead and alfonsino.

In the northeast Pacific, Canada reported a catch of 12 tonnes of sablefish.

4.1.5 Vessels Authorized to fish in 2015/2016 (or latest year for which information is available)

As of January 2016, Japan has authorized 7 vessels (6 trawlers and 1 gillnetter), South Korea has authorized 9 vessels (7 bottom trawlers and 2 longline vessels), and the Russian Federation has authorized 31 vessels (16 bottom trawlers, 13 bottom longline, and 2 bottom gillnet vessels). Canada apparently authorizes some 4 vessels, but this information is not published on the authorized vessel list on the NPFC website.[144]

4.1.6. Changes in numbers of vessels active in bottom fisheries, volume of catch since 2004/6 – 2014 if known

In 2006, FAO indicated that 15 vessels were reportedly deep-sea bottom fishing on the high seas in the North Pacific – eight of them were trawlers and the remainder a mix of gillnet, pot and bottom longline vessels, including five vessels flagged to Belize. The total catch was approximately 10,000 tonnes. In 2014, 11 vessels engaged in bottom fisheries with a total reported catch of 5,399 tonnes. However, the reported catch from the seamount fisheries in the northwest Pacific has varied between approximately 6,000 and 27,000 tonnes per year over the past decade.

The high variation in the annual catch is related to the large fluctuations in the numbers of juvenile pelagic armourhead (the most important commercial species) that periodically "recruit" in large numbers into the spawning stock – i.e. show up on the seamounts – each year, a phenomenon known as "episodic recruitment". In 2010 and in 2012 the total catch of pelagic armourhead in the northwest Pacific was 20,554 tonnes and 25,355 tonnes respectively. Regardless of this fluctuation, the catch in recent years has been low by comparison with those in the early years of the fishery. In the five years between 1969 and 1973 (excluding 1971), the combined catch of alfonsino and pelagic armourhead taken by Soviet Union fleets on the seamounts of the Southern Emperor and Northern Hawaiian chain averaged almost 150,000 tonnes per year.[145] In the northeastern Pacific, the catch has been extremely low, varying between approximately 10 and 20 tonnes per year since 2006.

[143] North Pacific Fisheries Commission (NPFC). (n.d.). "Fisheries Overview." Retrieved 31 January 2016 from http://nwpbfo.nomaki.jp/About_Fisheries.html.
[144] NPFC. (n.d.). "Authorised Vessel List." Retrieved 31 January 2016 from http://nwpbfo.nomaki.jp/VesselList.html.
[145] Shotton, R. (2016). *Global review of alfonsino (Beryx spp.), their fisheries, biology and management* (FAO Fisheries and Aquaculture Circular No. 1084). Rome: FAO, pp. 31–32.

4.2. IMPLEMENTATION OF MEASURES TO PROTECT VULNERABLE MARINE ECOSYSTEMS FROM SIGNIFICANT ADVERSE IMPACTS AND ENSURE THE LONG-TERM SUSTAINABILITY OF DEEP-SEA FISH STOCKS – PARAGRAPHS 83 TO 87 OF UN GA RESOLUTION 61/105; PARAGRAPHS 113, 117 AND 119 TO 124 OF UNGA RESOLUTION 64/72; AND PARAGRAPHS 121, 126, 129, 130 AND 132 TO 134 OF UNGA RESOLUTION 66/68

Interim Measures to implement UNGA 61/105 were adopted by Japan, South Korea, Russian Federation and United States in February 2007 for the northwest Pacific, and revised in October 2007, October 2008, and again in February 2009 to bring them into line with the FAO Guidelines.

The Interim Measures require bottom fisheries in the area where VMEs are known or likely to occur, based on the best scientific information, to cease by 31 December 2008, unless conservation and management measures have been established to prevent SAIs on VMEs.

The boundary of the historic fishing footprint was initially agreed to in 2007. The footprint of bottom fishing in the northwest Pacific was identified, as of October 2008, as following 'fished' seamounts: Suiko, [Showa], Youmei, Nintoku, Jingu, Ojin, Northern Koko, Koko, Kinmei, Yuryaku, Kammu, Colahan, and C-H.[146] These seamounts constitute approximately 12% of the of the seamounts at fishable depths in the North Pacific (Figure 11). Since 2009, all areas outside of this footprint have been considered "new" areas, and any country wishing to authorize bottom fishing outside of the footprint is subject to an exploratory fisheries protocol for "new" bottom fisheries. The exploratory fishing protocol also applies to vessels wishing to use fishing gear not previously used in existing fishing areas. The protocol includes a requirement to conduct a prior environmental impact assessment consistent with the FAO Guidelines. However, so far no applications for exploratory fishing have been reported either by the NPFC or the Interim Secretariat that preceded the establishment of the NPFC.

In March 2011, interim measures were adopted for the high seas bottom fisheries in the northeast Pacific by Japan, South Korea, Russian Federation, US, Canada and China (with Taiwan/Chinese Taipei). Although not as detailed as those adopted for the northwest Pacific, they incorporate the key elements of UNGA resolution 61/105 and 64/72, including that no bottom fishing should occur without a prior impact assessment. A major exception is the absence of an agreed move-on rule for vessels encountering VMEs, which is explicitly mandated by the UNGA resolutions.[147]

4.2.1 Impact Assessments

Japan, Russia, South Korea and the US submitted impact assessment reports of varying detail to the interim Science Working Group in 2008 and are available on the NFPC website.[148] By far the most comprehensive assessment reports were produced by Japan, the nation with the largest reported number of vessels engaged in high seas bottom fishing in the region, and the US.

Although the US does not conduct high seas bottom fishing, and has closed adjacent seamounts along the Hawaiian seamount chain within its zone to bottom trawling since 1986, it also submitted an impact assessment report in 2008.[149] The US had allowed bottom fishing on the northwest Hawaiian seamount chain within the US EEZ in the1980s but discontinued the fishery as a result of the depletion of the stocks, which have yet to recover. The US indicated concern in its assessment report that straddling deep-sea fish stocks within the US EEZ continue to be depleted as a result of the overfishing of these stocks on the high seas.

The Japanese impact assessment report concluded that the Emperor Seamount could form a unique ecosystem, given its distance from other seamount and continental shelf areas. The report includes a review of remote operated vessel (ROV) surveys conducted in 2006 and drop camera surveys in 2008 in a number of seamount areas along the Emperor Seamount chain. However, the analysis of the surveys, and other relevant information to determine whether VMEs were present and whether SAIs would occur, was only conducted for four types of corals – Alcyonacea, Gorgonacea, Antipatharia and Scleractinia, despite the fact that other VME indicator species are known to exist and have been observed on seamounts in the area.

Japan reported that the surveys found evidence of the presence of the four orders of corals "as individuals" in most areas surveyed, but only found aggregations "which may constitute ecosystems" in two areas, both of which, Japan asserted, are areas inaccessible to bottom trawl vessels.[150] However, the assessment also stated that there were numerous limitations and uncertainties in the data and surveys used to review potential bottom fishing impacts. These included: 1) the area covered by ROV and drop cameras was only a very small fraction of the area subject to fishing; 2) some of the deep sea life found was difficult to identify on video; and 3) due to the lack of good scientific information, it is not clear whether some of the species observed constitute VMEs.

The US concluded that, while the efforts of Japan to remotely view the seamount summit benthos from drop-camera photography and ROV video observations were informative, further surveys are required. An independent review of the images produced by Japan concluded that a number of the areas were likely to contain octocoral gardens, and that the surveys done to date do not support the conclusion that there are no VMEs on other seamounts in the Emperor chain.[151]

The impact assessment report from Japan also reviewed the criteria in the FAO Guidelines for determining whether SAIs would occur and concluded that it is difficult to assess whether bottom fishing would cause such impacts in relation to the fragility of ecosystems formed by corals, due to lack of knowledge on the structure and function of coral ecosystems and a lack of information comparing the spatial extent of potential impacts relative to the availability of the

habitat type affected. The report also found that there is insufficient information to assess the ability of ecosystems to recover from harm from bottom fisheries, the rates of such recovery, the extent to which ecosystem functions may be altered by the impact of bottom fishing, and the timing and duration of the impacts relative to the period in which different species need the habitat during one or more life-history stages. The US impact assessment report came to similar conclusions.

Finally, Japan's assessment report concluded that extensive "coral drag fisheries" for precious corals on the Emperor and northern Hawaiian Seamount chains by Japanese and Taiwanese vessels from the 1960s until the 1980s has probably resulted in significant reductions in the occurrence of precious corals on seamounts in the region. Japan also provided evidence that two vessels from Chinese Taipei had been bottom drag fishing for precious corals on seamounts in the North Pacific as recently as the mid-2000s.

South Korea and the Russian Federation came to the same conclusions as Japan in their assessment reports, which were largely based on the information, analysis and scientific assessment provided by Japan. With regard to the bottom gillnet, longline and pot fisheries, which target a range of species, the Russian Federation impact assessment concluded, in each case, that "[i]nadequate catch statistics for this fishery does not make it possible to accurately conduct stock assessment, evaluate the sustainability of the fishery, and assess SAI on VMEs".[152]

Since the impact assessments were submitted to the Scientific Working Group in late 2008 no further revisions of the assessments have been made, nor have the cumulative impact assessments, called for in paragraphs 129(a) and 129(c) of UNGA resolution 66/68, been undertaken. Cumulative impact assessments are important given the widespread damage likely to have already been caused to coral VME species as a result of the precious coral drag "fishery" in previous decades. Nonetheless, Japan has continued to conduct drop camera surveys and video surveys, presenting new information to the meetings of the Interim Science Working Group in 2012 and 2014. The Russian Federation also presented information from several drop camera surveys in 2012, and both Japan and South Korea have presented detailed information on the bycatch of corals in commercial bottom trawl operations on the basis of their observer programs. In the latter case, South Korean commercial trawl vessels carried Russian scientific observers as part of a joint South Korean/ Russian observer program, a very positive example of a cooperative research effort.

In spite of the uncertainties identified in the impact assessments, Japan introduced several measures for bottom trawl and gillnet fisheries, including 100% observer coverage on trawl vessels and gillnet vessels beginning in April 2009, a prohibition of trawl and gillnet fishing below 1500 meters (which is below the depth at which bottom fishing currently takes place), and a move-on rule (discussed below). It also limited the number of trawlers authorized to fish on the seamounts to seven vessels. The Russian Federation agreed to deploy 100% observer coverage on bottom trawl vessels, and South Korea committed to deploy 100% observer coverage on all bottom trawl vessels by the end of 2009. However, regarding areas where fishing currently takes place, Japan, South Korea and the Russian Federation only agreed to voluntarily close one small area on one seamount (Koko Seamount) to protect VMEs (discussed in the following section), although they have agreed to a full closure of another seamount (Callahan) as a fish stock recovery measure.

In 2013, Canada submitted an impact assessment report of its bottom trap and longline activities in the northeast Pacific.[153] In the northeast Pacific, Canadian vessels bottom fish on four seamount areas – Eickelberg Seamounts, Warwick Seamount, Cobb Seamounts, and Brown Bear Seamounts.[154] Canada reported that a joint DFO/NOAA team undertook a joint ROV/AUV survey of one of the seamounts where Canadian vessels bottom fish – the Cobb Seamount – in July 2012. The two objectives of the survey were to document the occurrence, location, abundance and size of the flora, fauna and habitats in order to characterize the benthic community structure; and to document and describe

[146] NPFC. (2007, 2008). New mechanisms for protection of vulnerable marine ecosystems and sustainable management of high seas bottom fisheries in the Northwestern Pacific Ocean (Interim Measures), Annex 2: Science-based standards and criteria for identification of VMEs and assessment of significant adverse impacts on VMEs and marine species, para. 4(1). Retrieved from http://nwpbfo.nomaki.jp/IM-Annex2.pdf.

[147] NPFC. (2011). *Interim measures for protection of vulnerable marine ecosystems in the Northeastern Pacific Ocean* (Northeastern Interim Measures). Retrieved from http://nwpbfo.nomaki.jp/IM-maintext_east.pdf.

[148] NPFC. (n.d.). *Reports on VMEs and assessment of impacts caused by bottom fishing activities*. Retrieved 13 April 2016 from http://nwpbfo.nomaki.jp/Interim-measures_Assessment.html.

[149] NOAA Fisheries. (2008, December). *Reports on identification of VMEs and assessment of impacts caused by bottom fishing activities on VMEs and marine species*. Retrieved from http://nwpbfo.nomaki.jp/USA-Report.pdf.

[150] Fisheries Agency of Japan. (2009, December). *Report on identification of vulnerable marine ecosystems in the Emperor Seamount and Northern Hawaiian Ridge in the Northwest Pacific Ocean and assessment of impacts caused by bottom fishing activities on such vulnerable marine ecosystems or marine species as well as conservation and management measures to prevent significant adverse impacts (bottom trawl)*, p. 9. Retrieved from http://nwpbfo.nomaki.jp/JPN-Report-BottomTrawl.pdf.

[151] Rogers, A.D & M. Gianni. (2010) *The implementation of UNGA Resolutions 61/105 and 64/72 in the management of deep-sea fisheries on the high seas*. A report from the International Programme on the State of the Ocean. London: DSCC and IPSO, p. 60.

[152] NPFC. (n.d). *Report on identification of VMEs and assessment of impacts caused by trap and longline fishing activities on VMEs and marine species (Russian Federation)*. Retrieved from http://nwpbfo.nomaki.jp/RUS-Report.pdf.

[153] Canada (2013, March). *Report on identification of VMEs and assessment of impacts caused by trap and longline fishing activities on VMEs and marine species*. Retrieved from http://nwpbfo.nomaki.jp/Canada-Report.pdf.

[154] Ibid, p. 4.

[155] Ibid, p. 11.

evidence of fishing gear impacts.[155]

Canada has prohibited the use of mobile fishing gear – e.g. bottom trawls – on the seamounts, but noted that traps can also impact biogenic structures such as sponges and corals through crushing or entanglement. Crushing and scouring effects can result during deployment of the gear and during retrieval if traps are dragged across the bottom during retrieval or during periods of strong currents.[156]

Although Canada indicated that a preliminary analysis of the results of the survey has been conducted, the final report of the survey is not yet complete. Canada also indicated that it would conduct drop camera surveys on seamounts within its EEZ in 2015 and use the information obtained to develop predictions on the distributions of VME indicators taxa on all of the key seamounts within the EEZ and in the Northeast region of the NPFC. However, to date, Canada has not submitted an impact assessment to the NPFC consistent with the UNGA resolutions and FAO Guidelines to demonstrate that it's authorized high seas bottom fisheries are managed to prevent SAIs on VMEs.

Canada requires all vessels to have 100% at-sea monitoring, provided using either independent observers or electronic monitoring, which include gear sensors, video cameras, and a global positioning system; it is uncommon for observers to be placed on vessels fishing in the NPFC area given the ability to use electronic monitoring.[157]

4.2.2 Identify and close areas where VMEs are known or likely to occur unless bottom fisheries are managed to prevent SAIs

VMEs are likely to occur, or to have occurred, on many if not all of the seamounts on the high seas in the northwest Pacific. Nonetheless, Japan, South Korea and the Russian Federation have agreed to close only a small area of one seamount, the Koko Seamount, where the coral *Corallium* spp. was found during bottom camera surveys. South Korea and Japan additionally agreed to close to bottom fishing one other seamount (one of two seamounts proposed for closure by the US; the other remains open) as a measure to rebuild depleted populations of straddling stocks that occur both within and outside the US EEZ in the northwest Pacific. While this closure is primarily intended as a fishery conservation measure, it would also have the effect of temporarily protecting any VMEs from the impact of bottom fishing by Japanese and South Korean vessels on this seamount. Overall, in the total area of the high seas of the northwest Pacific where bottom fishing currently takes place, the three fishing nations have agreed to only one area closure identified through drop camera surveys and other methods as containing or likely to contain VMEs.

Japan prohibited trawl and gillnet fishing below 1,500 meters and established a "tentative" prohibition of trawl and gillnet fishing above 45 degrees north latitude. It is notable that these regions are not currently of interest to the fishing industry. South Korea has prohibited its vessels from bottom fishing in all areas not currently fished, and also prohibited bottom fishing north of 40 degrees north latitude.

However, there continues to be considerable discussion and disagreement amongst the countries concerned over what constitutes a VME in the North Pacific (e.g. how much coral visible in a drop camera picture constitutes a VME), whether the term VME is understood by all countries to have the same meaning, and whether the species considered VME indicator species used by the NPFC should remain restricted to the four orders of corals, or be expanded to include other non-coral taxa such as sponges and hydrocorals, as has been proposed by the US and been done in other RFMO regions.

4.2.3 Move-on rule/cease fishing in areas where VMEs are encountered

The Interim Measures for the bottom fisheries in the northwest Pacific stipulate that vessels must cease fishing and move "a sufficient distance, which will be no less than 5 nautical miles, so that additional encounters with VMEs are unlikely". However, the rule only applies to encounters with the four orders of coldwater corals and only the vessel that "encounters" the VME is required to move away from the site. The flag State of the vessel is required to report the encounter to the Secretariat, which in turn will report the location of the encounter to other countries so that "appropriate measures can be adopted in respect of the relevant site".[158] An encounter threshold of 50 kg of coral bycatch per tow or set observed in the fishing gear has been adopted, at least by Japan and South Korea, as the amount that would trigger the move-on rule.[159] However, there have been no reports of encounters with VMEs as of August 2015.

The efficacy of the move-on rule has been repeatedly debated since 2010 by the Interim Scientific Working Group. The US National Marine Fisheries Service (NMFS) met and published a report on the subject in 2012 in response to a mandate from the negotiations to develop recommendations for establishing an encounter protocol on VMEs in the NPFC area.[160] The report noted that there was a general lack of data on catch rates of corals and other VME taxa brought up by fishing (trawl) gear in the NPFC area. Nonetheless, they concluded, that catch rates of corals would vary and be influenced by catch efficiency, physical characteristics of the fishing gear, and the density of VME/coral species encountered, and that, in practice, the amount of coral brought up by the fishing gear could be very low or none at all because the fishing gear might retain only very small amounts of the corals even if the encounters on the seafloor were substantial. Thus the quantities of VMEs/corals brought up during fishing (including by trawl gear) could provide misleading information on actual encounter rates.[161] These conclusions are similar to those published by Auster *et al*.[162] and the findings of the 2010 meeting of the joint ICES/NAFO Working Group on Deep-Sea Ecology (WGDEC).[163] In addition, the NMFS report concluded that the distribution, relative abundance, species composition and physical characteristics of these VME groups will vary due to local influences of ocean environmental

features such as geography, bathymetry, depth, seafloor structures and geology and temperature, and encounter protocols would need to be developed that may be different for at least four separate geographical zones in the NPFC area.[164] The report also recommended that hydrocorals and sponges be considered VME indicator species, in addition to the four orders of corals agreed as part of the Interim Measures.[165]

At the first meeting of the Small Scientific Working Group on Vulnerable Marine Ecosystems of NPFC in August 2014, the US scientists reiterated these findings, including the difficulty in estimating damage to corals on the seabed – i.e. the amount of coral damaged that would not be brought up in the fishing gear. Japan's scientists reported fishing and research vessel data over the previous few years indicated low encounter rates of corals in the existing fishing areas over the tops of specific seamounts, but in some cases higher coral encounter rates in some of the adjacent non-fished areas that were surveyed by research vessels. Catch rates of indicator species, both in commercial trawls and research beam trawls, were so low that any threshold level for triggering the move on requirement would be difficult to discern.[166]

4.2.4 Ensuring the long-term sustainability of deep-sea fish stocks, including bycatch species

Target stocks/species: The status of splendid alfonsin and North Pacific armourhead, the two main target species in the bottom trawl fisheries in the northwest Pacific, is not well known. There are no reliable biomass estimates for these two species. However, major declines in the catch per unit effort (CPUE) in the fisheries for both species – from approximately 50–60 tonnes/per hour of trawling at the respective peaks of the fisheries in the 1970s and 1980s, to far less than 1 tonne/per hour of trawling over the past several years – suggests that both stocks/species have been heavily overexploited and depleted over the past 30–40 years of fishing. Both armourhead and alfonsin appear to be straddling stocks that form one population that extends into the US EEZ off Hawaii, and the portions of the populations that occur within the US EEZ have not recovered despite the closure of fisheries for these species on seamounts inside the US zone since 1986.

Japan, South Korea and the Russian Federation have agreed to reduce fishing mortality by approximately 20–25% on both stocks, primarily through a seasonal closure of bottom fisheries in November and December, but have not presented evidence as to whether the seasonal closure has achieved the desired reduction in fishing mortality. In its impact assessment report in 2008, the US indicated that stocks of the main target species, armourhead and alfonsino, were at risk of significant adverse impacts given 1) the tendency of these species to form schools, presumably even at low abundance; 2) the efficiency with which modern trawlers can electronically detect, then target and capture these schools; 3) the continued pursuit of this fishery even after the crash of the historic fishery in 1977, despite low annual catches during most years; 4) the steeply increasing trend in fishing effort of the Japan trawl fleet from 1,825 nominal trawling hours in 1990 to 10,107 nominal hours in 2007; 5) the notion that the next recruitment pulse of armourhead can be safely "fished up" at sustainable levels; and 6) the high trawl selectivity for juvenile stage alfonsino.[167] In regard to target species in other bottom fisheries, the US concluded that insufficient information is available to detect trends in the fisheries.[168]

North Pacific armourhead constitutes approximately 60% of the overall reported catch of deep-sea species in the North Pacific since 2004. Stock assessments to date have relied primarily on a "depletion analysis". But this type of analysis is based on CPUE, which does not provide scientific information upon which to establish sustainable catch limits prior to the commencement of the fishing season. Rather, it provides an after-the-fact estimate of the size or biomass of the stock at the beginning of the season, the extent of juvenile recruitment to the adult stock prior to and during fishing operations, and the extent to which the stock has been depleted after the fishing has occurred (i.e. when the CPUE returns to levels recorded prior to the arrival of the new year class or new recruits to the adult/spawning stock biomass which aggregates on the seamounts).

A workshop to review the information on stock assessments for North Pacific pelagic armourhead was held in August 2014. Among the key findings it was highlighted that there are still considerable gaps in the

[156] Ibid, p. 8.

[157] NPFC. (2015). Canada's annual report for 2015 to the North Pacific Fisheries Commission (SWG13/WP5/Ca), paras. 3.1 & 3.2.

[158] NPFC New Mechanisms, above note 146, para. 4(F).

[159] NPFC. (2015). *VME and sustainable management of high seas bottom fisheries in the North Pacific Ocean questionnaire (prepared by the Interim Secretariat), 13th Scientific Working Group Meeting Tokyo, Japan, 28–29 August 2015 (SWG13/WP9)*.

[160] Low, L-L. (coordinator). (2012). *National Marine Fisheries Service Workgroup Report on encounter protocol on vulnerable marine ecosystems in the North Pacific Fisheries Commission Area* (AFSC Processed Rep. 2012-02). Seattle, WA: Alaska Fisheries Science Centre, National Oceanic and Atmsopheric Adminstration.

[161] Ibid, p. 7.

[162] Auster, P. J., Gjerde, K., Heupel, E., Watling, L., Grehan, A., & Rogers, A. D. (2011). Definition and detection of vulnerable marine ecosystems on the high seas: problems with the "move-on" rule. *ICES Journal of Marine Science 68*(2), 254–264. doi: 10.1093/icesjms/fsq074.

[163] ICES WGDEC 2010, above note 36.

[164] Low, above note 160, p. 7.

[165] Ibid, p. 6.

[166] NPFC. (2014). Meeting report, *First Small Working Group on Vulnerable Marine Ecosystems (VMEs) for the NPFC, Tokyo, 4–5, August 2014*, para. 6(2).

[167] Low, above note 160, pp. 33–34.

[168] Ibid, p. 18.

data and research, and that the quality, completeness and longer time sequences of the data on the fisheries and biological knowledge of the stocks need to be improved before advanced stock assessment models could be applied.[169] Beyond the scientific uncertainties there are also differences of opinion amongst Contracting Parties as to how TACs should be established based on the episodic nature of recruitment to the fishable stock biomass.

Very little to no information has been made available on the status of the stocks of the other commercial species (such as oreos, mirror dory and rockfishes) in the deep-sea bottom fisheries in the northeast Pacific, and very little information is available on the status of the stocks of the high seas fisheries on seamounts in the northeast Pacific.

In regard to bycatch species, current estimates of the amount and status of most of the bycatch species impacted in the bottom fisheries is unknown. The impact assessments of the three countries fishing in the northwest Pacific indicated that some two dozen or more species or species groups are taken as bycatch in all bottom fisheries combined, apparently including both species of commercial value and those of non-commercial value. In an appendix to the impact assessment report provided by Japan relating to bycatch species, some 40–50 species or species groups were recorded caught in 56 tows by a trawl research vessel in 1993 in five of the seamount areas which are currently open to bottom fishing.[170] The catch figures for the most recent years indicate that reported catch of "other", non-specified, species reaches 2,000–3,000 tonnes per year in years when the catch of armourhead is relatively low.[171]

4.2.5 Other/gear restrictions

Canada prohibits bottom trawling on the high seas; only vessels using longline hook and longline trap gear are authorized to fish in the NPFC Convention Area.

4.3 CONCLUSION

The adoption of the Convention and the creation of the NPFC is a very positive development as was the adoption comprehensive interim measures consistent with the FAO Guidelines in 2008. The NPFC countries were amongst the few flag states that conducted impact assessments consistent with the criteria established in FAO Guidelines. A number of measures, including limiting the depth at which trawling can take place to less than 1,500 meters depth, and requiring bottom gillnets to be placed at least 10 meters off the seabed, have been taken to reduce potential impact on VMEs. The historical "footprint" of the fishery has also been established to restrict bottom fishing to seamounts that have previously been fished. However, the measures in place are still interim in nature and there are additional challenges to overcome in order to effectively implement the provisions of the UNGA resolutions, including:

- A portion of only one seamount has so far been closed to protect VMEs, and one other seamount has been closed as a fish stock conservation management measure; together these closures constitute less than 1% of seamount areas at fishable depths in the NPFC region, a small percentage compared to other ocean regions.
- However, the bottom fisheries footprint, or existing fishing area, is relatively small compared to a number of other regions, consisting of approximately 12% of the seamounts at fishable depths in the overall area of the NPFC.
- Most seamounts are likely to contain VMEs, or to have contained VMEs prior to the beginning of deep-sea trawling in the region in the 1960s and 1970s, including the bottom trawl or bottom drag 'fisheries' for precious deepwater corals.
- Cumulative impacts on VMEs, in particular stony corals, prior to the adoption of the UNGA resolutions are likely to have been widespread; impacts should be assessed and management measures established accordingly, including allowing for the regeneration of previously impacted VME areas.
- There are considerable unresolved uncertainties in the impact assessments related to the presence of VMEs, impacts on VMEs, and the impact of trawling, and there is virtually no information on the impacts of bottom gillnets.
- Some surveys of seamounts have been done (primarily by Japan) but a systematic survey of the seamounts that are open to fishing to assess cumulative impacts, including from past bottom trawl fishing activities, should be done to improve management.
- Definition of VME indicators species is restricted to four orders of coral only; a broader application of the criteria in the FAO Guidelines to identify VMEs and VME indicator species should be done by the NPFC (as has been done by most other RFMOs).
- Stock assessments are lacking for target species, and the main target species is being systematically depleted.
- There is very little to no information on catch, status and impacts on bycatch species.

[169] NPFC. (2014). *Meeting report, First Scientific Small Working Group on North Pacific Armorhead for the NPFC, Tokyo, 6–7 August 2014* (NPFC Doc. SWG/13/Ref3), para. 4.

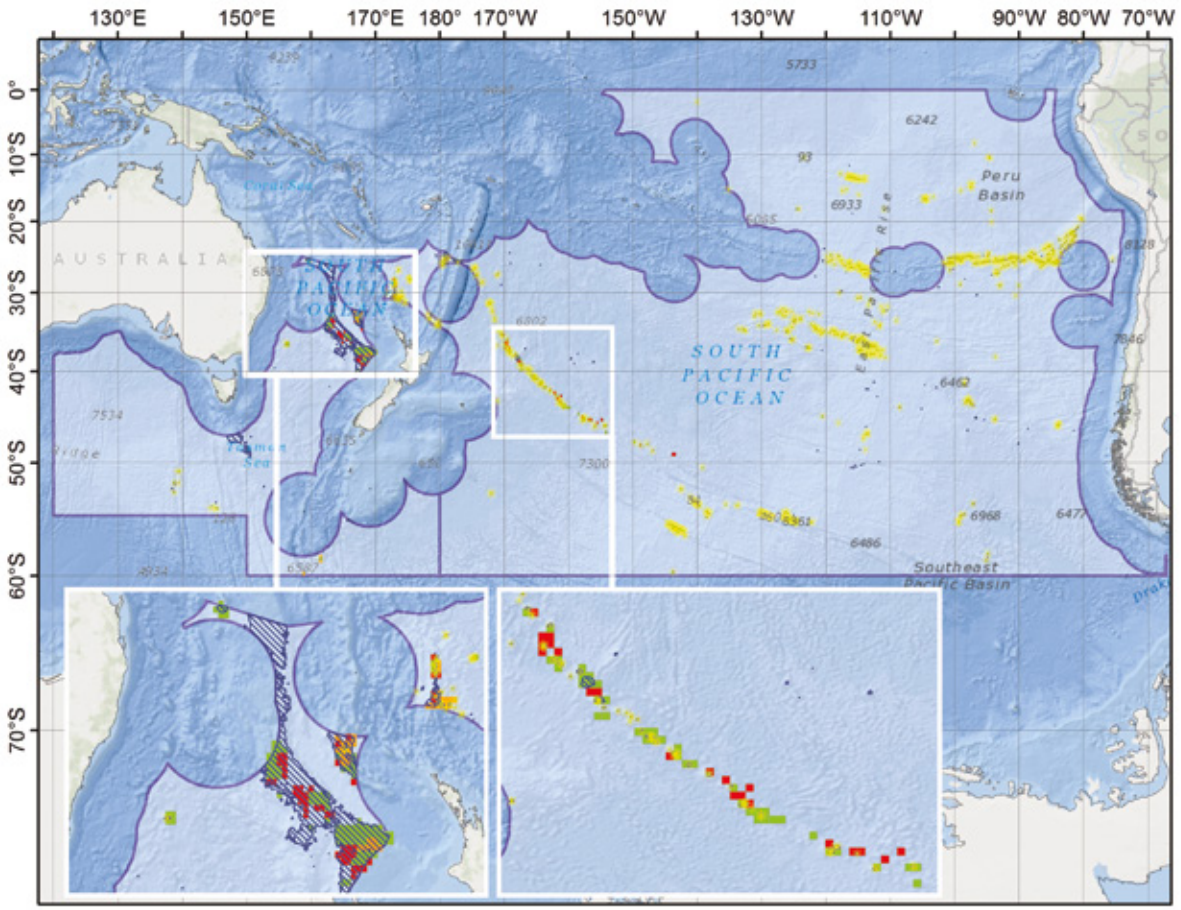
[170] Fisheries Agency of Japan, above note 150, pp. 2 & 6, citing Appendix A.

[171] Ibid, Appendix B.

5.0 SOUTH PACIFIC

FIGURE 12

SPRFMO



SOURCE: MARINE CONSERVATION INSTITUTE 2016

SPRFMO*	% "Fishable" Area	% "Fishable" Seamounts
Areas closed to all bottom fishing	0.0%	0.0%
Areas closed to bottom trawl by New Zealand	15.6%	3.3%
Areas closed to bottom fishing by Australia	0.0%	0.0%
Areas where bottom fishing is permitted by New Zealand	7.5%	3.1%
Areas where bottom fishing is permitted by Australia	14.9%	3.1%
Areas where prior impact assessment required before bottom fishing can occur for New Zealand vessels	76.9%	93.6%
Areas where prior impact assessment required before bottom fishing can occur for Australian vessels	85.1%	96.9%
TOTAL	371,117	880
	km^2	seamounts

Seamounts <1500m deep
1500m Isobath
VME/Bottom fishery closure
Existing bottom fishery
Regulatory Area

* Note that the estimates of the percentages of areas at fishable depths open, closed and within the New Zealand footprint by Penny et al are somewhat different and imply a larger area of the seabed open to bottom fishing than is indicated in Figure 12. (See Table 7 in SPRFMO Section 5.2.2)

The bottom fisheries on the high seas of the South Pacific are governed by the South Pacific Regional Fisheries Management Organisation (SPRFMO). Negotiations to establish SPRFMO began in 2006 and were finalized in 2009 with the adoption of the SPRFMO Convention, which entered into force in August 2012.

Contracting Parties are Australia, Republic of Chile, Cook Islands, Republic of Ecuador, Denmark (in respect of the Faroe Islands), New Zealand, Chinese Taipei, People's Republic of China, Republic of Cuba, EU, South Korea, Russian Federation, Peru, and the Republic of Vanuatu. Co-operating Non-Contracting Parties (CNCPs) are Colombia, France (in respect of its Territories), Republic of Liberia, Republic of Panama, and the US.

5.1 DESCRIPTION OF THE HIGH SEAS BOTTOM FISHERIES

5.1.1 Main High Seas Bottom Fishing Nations

New Zealand and Australia.

5.1.2 Number of high seas bottom fishing vessels operating in region in 2014/2015 (or latest year for which information is available)

New Zealand: 10 vessels actively bottom fished in the area in 2014 – 6 bottom trawlers and 4 longline vessels.[172]
Australia: 4 vessels actively bottom fished in the area in 2014 – 2 bottom trawlers and 2 non-trawlers.[173]

5.1.3 Main high seas bottom fisheries

Orange roughy is the main target species in the high seas bottom trawl fishery in the SPRFMO Convention Area. Other commercial species caught include oreos, cardinalfish and alfonsino. There are also bottom longline and mid-water trawl fisheries for alfonsino, and bottom longline fisheries for Antarctic butterfish (blue-eye trevalla, bluenose, bluenose sea bass), warehou, wreckfish (bass), kingfish and morwong.

5.1.4 Catch (including catch per main target species)

New Zealand: Total reported catch for bottom fisheries in 2014 was 1,127 tonnes, of which 1,028 tonnes[174] were taken in bottom trawl fisheries and the remaining 99 tonnes in bottom line fisheries.[175] Of the reported trawl catch 998 tonnes was orange roughy with a small catch of black oreos (7 tonnes), and the longline catch the main species were 45 tonnes of wreckfish (Hapuku-Bass), 33 tonnes of bluenose/blue-eyed trevalla, and 11 tonnes of morwong.
Australia: Total reported catch of 204 tonnes of fish by bottom fisheries in 2014.[176] Of the 104 tonnes of reported bottom trawl catch 102 tonnes was orange roughy. Of the longline catch of 99 tonnes, 30 tonnes was morwong, 21 tonnes of bluenose/blue-eyed trevalla, and 21 of yellowtail kingfish.

5.1.5 Vessels authorized to fish in 2016 (or latest year for which information is available)

Each SPRFMO member State is required to maintain a register of fishing vessels authorized to fish in the Convention Area.[177] There is also a Commission record of all vessels authorized to fish in the Convention Area on the SPRFMO website.[178] Since the revised Conservation and Management Measures (CMM) were adopted at the January 2016 SPRFMO meeting the website now lists all vessels.[179]
New Zealand: 20 vessels have been authorized by New Zealand to engage in bottom fishing in the SPRFMO area in the 2015/2016 season: 12 trawlers, 7 longliners, and 1 multipurpose vessel.
Australia: 8 vessels have been authorized to fish in the SPRFMO area in 2016: 1 trawler, 1 multipurpose vessel, and 6 longline vessels.

5.1.6 Changes in numbers of vessels active in bottom fisheries, volume of catch since 2004/6 – 2014 if known

The New Zealand trawl effort has declined from 17 vessels in 2004 to 5 vessels in 2014. The catch has also declined from 1,697 tonnes of orange roughy in 2004 to 998 tonnes in 2014. The bycatch of black oreos peaked at 268 tonnes in 2005 and was only 7 tonnes in 2014. The NZ trawl catch of alfonsino peaked at 244 tonnes in 2010 and was zero in 2014. The longline catch effort declined from 11 vessels in 2005 to four vessels in 2014. The catch of bluenose/blue-eyed trevalla peaked at 271 tonnes in 2006 and was 33 tonnes in 2014. The other main species wreckfish (hapuku-bass) peaked at 95 tonnes in 2006 and was 45 tonnes in 2014.

Australia's trawl effort also declined from a peak 12 vessels in 2000 to 2–3 vessels in the last few years. Catch of orange roughy peaked at 3,098 tonnes in 1998 to zero in 2008 to 2010 and was 102 tonnes in 2014. Non-trawl fishing peaked in 2002 at 244 tonnes (mrwong, blue eye and ocean blue eye trevalla, and yellowtail kingfish) and has since been generally below 150 tonnes.[180]

5.2. IMPLEMENTATION OF MEASURES TO PROTECT VULNERABLE MARINE ECOSYSTEMS FROM SIGNIFICANT ADVERSE IMPACTS AND ENSURE THE LONG-TERM SUSTAINABILITY OF DEEP-SEA FISH STOCKS – PARAGRAPHS 83 TO 87 OF UN GA RESOLUTION 61/105; PARAGRAPHS 113, 117 AND 119 TO 124 OF UNGA RESOLUTION 64/72; AND PARAGRAPHS 121, 126, 129, 130 AND 132 TO 134 OF UNGA RESOLUTION 66/68

Interim measures for the management of high seas bottom fisheries in the Convention Area were first adopted in 2007, and then reviewed in 2009. These were implemented by New Zealand (whose vessels had been fishing in the area for the previous two decades) through high seas fishing permits that came into effect in 2010.[181] Australia similarly implemented a variety of management measures for the SPRFMO Area during this period.[182]
The SPRFMO Convention entered into force on 24 August 2012 and the first meeting of the SPRFMO Commission took place in January 2013. Since the entry into force of the Convention, there have been three meetings of the Scientific Committee and four Commission meetings. CMM 2.03 for the regulation of bottom fishing was adopted at the second meeting of the Commission in 2014, to replace the interim measures for bottom fisheries

adopted in 2007 and 2009. At the fourth Commission meeting in 2016, the measure was slightly amended to become CMM 4.03.[183]

The term 'bottom fishing' is defined in CMM 4.03 as "fishing using any gear type likely to come in contact with the seafloor or benthic organisms during the normal course of operations". It therefore includes mid-water trawls that touch the bottom and bottom longlining.

CMM 4.03 largely incorporates the measures agreed on an interim basis in 2007 by establishing a historic existing fishing footprint area, a bottom fishing impact assessment, a catch limitation, a move-on rule in some areas within the footprint,[184] and provisions for fishing outside the footprint on the basis of a prior impact assessment.[185] It is due to be reviewed in 2017.

New Zealand, Australia and Chile have agreed to work together intersessionally in an *ad hoc* working party to recommend revisions to be presented to the 2017 fourth Scientific Committee. The Workplan calls for the Scientific Committee to "[d]evelop a scientifically robust spatial management approach for bottom fisheries in order to appropriately protect VMEs while enabling viable fisheries to operate".[186] However, as discussed below, a spatial management approach is only appropriate if there is adequate information, the precautionary approach is taken into account, VMEs are protected, and the sustainability of target and bycatch stocks are assured. The Workplan is also contrary to UNGA resolution 64/72, as is explained below.

At the third Scientific Committee meeting, in 2015, the High Seas Fisheries Group (HSFG) from New Zealand called for the removal of the move-on rule in favor of spatial management. New Zealand representatives argued that the move-on rule was difficult to monitor. However, DSCC observers stressed that the provisions of the UNGA resolutions and the FAO Guidelines need to be implemented, and expressed concern that that the SPRFMO measures still required some amendments in order to be consistent with these international commitments. See below recommendations for bringing CMM 4.03 into alignment. The move-on rule has affected only six tows in total from 2008 to 2013, or an average of 3.3% of tows in the area subject to the rule per year. Only about half the footprint open to NZ trawling is subject to the move-on rule.

With respect to the establishment of the fishing footprint,[187] New Zealand stated in 2015 that estimates of the 'fished area' generated using any mapping resolution other than actual trawl tracks substantially exaggerated the areas within footprints that have actually been impacted. The Scientific Committee recommended that the smallest practical spatial scale should be used for defining footprints and for spatial management purposes.[188]

Following a "preliminary" impact assessment submitted by Spain/EU with regard to permitting bottom gillnet fishing by Spanish vessels in the SPRFMO area, SPRFMO Contracting Parties adopted an interim measure in 2009 to prohibit the use of bottom gillnets in the SPRFMO area.[189] Following this, CMM 1.02, prohibiting the use of large-scale pelagic driftnets and all deep-water gillnets in the Convention Area, was adopted in 2013.[190]

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[172] New Zealand Ministry for Primary Industries. (2015, August). *New Zealand national report on fishing and research activities in the SPRFMO Convention Area during 2014* (SPRFMO Doc. SC-03-22), p. 1 [New Zealand National Report].

[173] Hansen, S. & Hobsbawn, P. (2015, September). *Australian national report on 2014 fishing activities to the SPRFMO's Scientific Committee* (SPRFMO Doc. SC-03-20_rev1). Canberra: Australian Government, Department of Agriculture and Water Resources, p. 1 [Australian National Report].

[174] New Zealand National Report, above note 172, p. 3, Table 3.

[175] Ibid, p. 6, Table 7.

[176] Australian National Report, above note 173, p. 2.

[177] South Pacific Regional Fisheries Management Organisation (SPRFMO). (2014). *CMM 2.02: Standards for the collection, reporting, verification and exchange of data*, para 7.

[178] SPRFMO. (n.d.). *Commission record of vessels authorized to fish in the Convention Area*. Retrieved 15 April 2016 from https://www.sprfmo.int/data/record-of-vessels/.

[179] SPRFMO. (2016). *CMM 4.05: Conservation and management measure for the establishment of the Commission Record of Vessels authorised to fish in the Convention Area*, retrieved from https://www.sprfmo.int/assets/Fisheries/Conservation-and-Management-Measures/CMM-4.05-Record-of-Vessels-2016-4Mar2016.pdf. See also SPRFMO Record of Vessels retrieved 18 March 2016 from https://www.sprfmo.org/Web/Vessels/VesselSearchView.aspx.

[180] Ward, P., Hobsbawn, P. & Noriega, R. (2013, October). *Australian national report on 2012 fishing activities to the SPRFMO's Scientific Committee* (SPRFMO Doc. SC-01-08). Canberra: Australian Government, Department of Agriculture, Fisheries and Forestry, [Australian National Report

[181] New Zealand, Ministry of Fisheries. (2008, December). *Bottom fishery impact assessment: Bottom fishing activities by New Zealand vessels fishing in the high seas in the SPRFMO Area during 2008 and 2009*, p. 1, retrieved from http://www.sprfmo.int/assets/Meetings/Meetings-before-2013/Scientific-Working-Group/SWG-06-2008/a-Miscellaneous-Documents/New-Zealand-Bottom-Fishery-Impact-Assessment-v1.3-2009-05-13.pdf.

[182] Williams, A., SPRFMO, & Council for Scientific and Industrial Research (CSIRO). (2011, July). *Bottom fishery impact assessment, Australian report for the South Pacific Regional Fisheries Management Organisation (SPRFMO)* (Report No. SWG-10-DW-01a), Hobart: CSIRO, pp. 20–21, retrieved from https://www.sprfmo.int/assets/Meetings/Meetings-before-2013/Scientific-Working-Group/SWG-10-2011/SWG-10-DW-01a-Australian-BFIA-Final-Report.pdf.

[183] SPRFMO. (2016, March 16). *CMM 4.03: Conservation and management measure for the management of bottom fishing in the SPRFMO Convention Area*, retrieved from http://www.sprfmo.int/assets/Fisheries/Conservation-and-Management-Measures/CMM-4.03-Bottom-Fishing-2016-4Mar2016.pdf. Paragraph 27 was amended to reflect a review in 2017 instead of 2016.

[184] There is an exception for New Zealand's division of areas into areas open to bottom fishing, areas closed to bottom fishing and areas where the move-on rule applies. Ibid, para. 8(h).

[185] Ibid, para. 8.

[186] SPRFMO. (2016). *Scientific Committee workplan for 2016* (SPRFMO COMM-04 (2016)), Annex D, retrieved from https://www.sprfmo.int/meetings/commission-meetings/4/ [2016 SC Workplan].

[187] SPRFMO. (2009). *Collated comments by participants on the New Zealand Bottom Fishery Impact Assessment* (SPRFMO Doc. SP-07-SWG-DW-02), retrieved from http://www.southpacificrfmo.org/assets/7th-Meeting-May-2009-Lima/ DW-Subgroup-VII /SP -07-SWG-DW-02-Collated-comments-on-NZ-bottom-fishing-impactassessesment.pdf.

[188] At present the most practical spatial scale is 6-minute blocks; and for defining the extent of fishery impacts on VMEs the longest time period of historic effort information that is available for each fishery should be used provided that the quality (accuracy and completeness) of the positional data is adequate. SPRFMO. (2015). *Report of the 3rd Scientific Committee meeting, 28 September – 3 October 2015, Port Vila, Vanuatu*, p. 12 [2015 SC Meeting].

[189] *Final Act of the international consultations on the establishment of the proposed South Pacific Regional Fisheries Management Organisation*, Annex III, Interim measure for deepwater gillnets in the Convention Area, 14 November, 2009, retrieved from http://www.sprfmo.int/assets/Basic-Documents/Convention-and-Final-Act/2272942-v1-SPRFMOSignedFinalAct.pdf.

[190] SPRFMO. (2013). CMM 1.02: *Conservation and management measure for gillnets in the SPRFMO Conservation Area*, retrieved from https://www.sprfmo.int/assets/Fisheries/Conservation-and-Management-Measures/CMM-1.02-Gillnetting-2013-4Mar2016.pdf.

5.2.1 Impact assessments

Australia, New Zealand and Spain/EU submitted benthic impact assessments to the SPRFMO Scientific Committee in 2007 and 2008. These are available on the SPRFMO website.[191] The reports by New Zealand and Australia contained detailed information on the nature of their bottom fisheries, the impacts of bottom fishing on VMEs on the high seas, and the regulations both countries have established pursuant to the UNGA resolutions and the interim measures adopted in 2007. However, neither report complies with the FAO Guidelines when measured against the criteria for impact assessments contained in paragraph 47, nor, by extension, do they comply with UNGA resolutions 61/105 or 64/72, as there is no assessment of the potential impacts on VMEs in areas where bottom fisheries are authorized to occur. Also both assessments were completed before the SPRFMO benthic impact assessment standard was finalized and adopted.

These impact assessments were all submitted prior to the adoption of UNGA resolution 66/68 in 2011. None of them contain any analysis of the cumulative impacts that would be called for in this resolution.

SPRFMO provided a draft 'Revised Draft Bottom Fishery Impact Assessment Standard' (BFIAS) in 2009,[192] on which the Australian Impact Assessment was later based.[193] The draft however, failed to make it clear that fishing should not be allowed in areas where VMEs are known or likely to occur unless SAIs on VMEs can be prevented; nor did it establish adequate threshold quantities of VME indicator species for the move-on rule or explicitly require an assessment of the impact on non-target and most bycatch fish species, including 'low productivity', rare or endemic species. New Zealand stated that it intended to review its impact assessment in 2010, when it planned to review its implementation of the interim measures more fully;[194] this has not yet been done. Cumulative impacts are still not being assessed.

The Australian Impact Assessment, carried out in 2011, concluded that the overall risk of SAIs on VMEs by Australian vessels fishing with bottom trawls and bottom-set-auto-longlines "is low".[195] However, this assessment relied solely on estimates of the scale of impacts and not an assessment of whether individual bottom fishing activities would cause significant adverse impacts on VMEs, or whether bottom fisheries authorized by Australia can be managed to prevent significant adverse impacts on VMEs, as explicitly called for in paragraph 83 of UNGA resolution 61/105, and in subsequent UNGA resolutions.

Neither the New Zealand or Australian assessments have been updated, nor has a joint assessment been developed to look at the combined and cumulative impact of bottom fishing by both Australian and New Zealand vessels, as well as by other vessels that engaged in bottom fishing in previous years.

5.2.2 Identify and close areas where VMEs are known or likely to occur unless bottom fisheries are managed to prevent SAIs

In general, the establishment of the fisheries footprint in CMM 4.03 has resulted in the temporary closure to bottom fishing of many areas of the high seas in the South Pacific where VMEs are known or likely to occur, including the seamount and ridge system areas in the high seas off the coasts of Chile, Peru and Ecuador. However, it is clear that many of the features located outside of the footprint are deeper than 2,000 meters and thus not accessible to bottom fishing.

The method established to delineate the area of the footprint has been the subject of much debate. This is primarily because it allowed for 20 minute longitude by 20 minute latitude grid blocks of ocean space surrounding any area where any trawling had occurred between 2002 and 2006 (including even a single trawl tow) to be included in the 'footprint'. According to New Zealand, the result was "exponentially increasing exaggeration of the mapped footprint in comparison with actual seabed impact area of individual trawl tracks".[196] In reality, this means that vast areas of the seabed of the South Pacific that are not likely to have ever been previously impacted by bottom trawl fishing were incorporated into country footprints. The footprint of New Zealand's high seas bottom trawl fishery, for example, includes 218 such

[191] Retrieved from http://www.sprfmo.int/cmms/benthic-impact-assessments/.

[192] SPRFMO. (2008). *Revised draft bottom fishery impact assessment standard, 8th International Meeting, Science Working Group* (SPRFMO Doc. SP-08-SWG-DW-01), retrieved from https://www.sprfmo.int/assets/Meetings/Meetings-before-2013/Scientific-Working-Group/SWG-08-2009/SP-08-SWG-DW-01-Revised-draft-SPRFMO-Bottom-Fishing-Impact-Assessment-Standard.doc.pdf.

[193] Williams et al, above note 182.

[194] New Zealand Ministry of Fisheries, above note 181, p. 14.

[195] Williams et al, above note 182, p. viii.

[196] New Zealand Ministry of Fisheries, above note 181, p. 22.

[197] Ibid, p. 18–21.

[198] Ibid, pp. 18–19.

[199] Ibid, p. 19.

[200] SPRFMO Collated Comments, above note 187, p. 2.

[201] O'Driscoll, R. L. & Clark, M. R. (2005). Quantifying the relative intensity of fishing on New Zealand seamounts. *New Zealand Journal of Marine and Freshwater Research*, 39, 839–850.

[202] Penney, A., Clark, M., Dunn, M., Ballara, S., & Consalvey, M. (2007). *A descriptive analysis of New Zealand bottom trawl catch & effort in the proposed Convention Area of the South Pacific Regional Fisheries Management Organisation* (Doc. SPRFMO-IV-SWG-05), p. 8.

[203] New Zealand Ministry of Fisheries, above note 181, pp. 73–74.

[204] Ibid, p. 28, Table 7.

[205] Parker, S. J., Penney, A. J., & Clark, M. R. (2009). Detection criteria for managing trawl impacts on vulnerable marine ecosystems in high seas fisheries of the South Pacific Ocean. *Marine Ecology Progress Series*, 397, 309–317 at p. 310. doi: 10.3354/meps08115.

[206] Penny, A. J., Parker, S. J., & Brown, J. H. (2009). Protection measures implemented by New Zealand for vulnerable marine ecosystems in the South Pacific Ocean. *Marine Ecology Progress Series*, 397, 341–354 at p. 349, Table 3.

[207] New Zealand Ministry of Fisheries, above note 181, p. 29.

blocks, each approximately 800–1,200 km2 in size, depending on the latitude.[197]

New Zealand's management regime involves a mixture of open, closed and 'move-on' blocks.[198] New Zealand closed a substantial portion of its footprint to bottom fishing, including some areas where VMEs are known or likely to occur, by closing all previously "lightly trawled" areas within its footprint and approximately 15% of the "moderately" and "heavily" trawled areas within its footprint. The effect of these measures has been to eliminate bottom trawling in 41% of the total 217,463 km2 that fall within the New Zealand bottom trawl footprint surface area; a further 30% (the moderately trawled areas) of the area was made subject to a move-on rule, and the remaining 29% (the heavily trawled areas) left open to bottom trawling with no constraints.[199]

In its 2009 comments on the New Zealand approach to managing bottom fisheries, the US expressed serious concerns that the 20 minute blocks allow the incorporation of large swaths of "new" areas that would not otherwise have been included in the SPRFMO bottom fishing footprint if a smaller block area was used. It also asserted that the size of the 20 minute blocks allows bottom fishing in "new" or previously unfished areas, even in "heavily trawled blocks". The US expressed additional concerns regarding the lack of information on the specific impacts of fishing gear types on the seabed, and on the impacts of bottom fishing on target species other than orange roughy, as well as on bycatch species.[200]

New Zealand replied that it is not actually feasible for vessels to accurately trawl exactly the same track as trawled previously, notwithstanding the substantial improvements in navigational equipment over the past decade. In a paper prepared by New Zealand government officials, Penney *et al* cite analysis conducted by O'Driscoll & Clark (2005)[201] which shows that vessels do not repeat their trawl tracks when fishing seamount features typically targeted in the deep-water trawl fisheries, and that although there are some directional preferences on certain seamounts related to the topography of the seamount concerned, in other instances vessels may conduct radial trawls on seamounts from almost any direction.[202] Thus even on heavily trawled seamounts, areas of the seamount which have not been previously fished may still be vulnerable to the impact of continued bottom fishing. New Zealand also reported that most of the bottom trawling over the past several years has taken place in the heavily trawled blocks (where no restrictions are in place) given industry reluctance to operate in areas where a move-on rule is in place, but that within the heavily trawled blocks there were reports that new, previously unfished, features were being fished.[203]

It was also pointed out by New Zealand that the areas where their vessels are authorized to bottom fish represent only 0.13% of the entire SPRFMO Area.[204] However, it is important to note that Parker *et al* estimate that the footprint areas where New Zealand vessels are authorized to fish actually comprise approximately 16% of the SPRFMO area seabed shallower than 2,000 meters, and thus accessible to fishing.[205] Moreover, in 2009, Penny *et al* in provided a more precise breakdown of the size of New Zealand's bottom fisheries footprint, and the areas open to bottom trawl fishing within the footprint, in relation to the overall area of seabed at various depths located within the SPRFMO Convention Area, which is presented in Table 7.[206]

To summarize these findings, New Zealand vessels are prohibited from bottom trawling anywhere within the SPRFMO area at depths shallower than 200 meters; they are permitted to bottom trawl fish in over half – 54.6% – of the entire seabed area in the SPRFMO area at depths between 200 and 800 meters, an area equal to approximately 23,533 km2, and so on. These figures may have altered slightly as a result of changes to the open and closed footprint blocks reported by New Zealand in its report to SPRFMO in 2015.

New Zealand reports that of the 42 large seamounts within its overall footprint, 11 fall within the now closed areas and the remaining 31 are located within the areas where bottom fishing is permitted.[207] The 59% of the footprint that remains open includes large areas that had not been fished prior to 2007 as a result of the large size of the blocks of ocean space that are included in

Table 7. New Zealand's bottom fisheries footprint and areas open to bottom trawl within SPRFMO Convention Area

Depth range (m)	SPRFMO area (km2)	Bottom trawl footprint % of seabed in SPRFMO area				Footprint Total %	Approximate size of seabed where bottom trawl fishing permitted (km2)
		Closed	Open (Move-on rule)	Open (no Move-on rule)	Open Total		
0–200	552	100	0	0	0	100	0
200–800	43,101	35.5	40.0	14.6	54.6	90	23,533
800–2,000	497,305	9.0	4.9	8.2	13.1	22.0	65,147
> 2,000	53,309,911	0.1	0	0	0	0.1	0
Total	53,850,868	0.2	0.1	0.1	0.2	0.4	88,680

Source: Penney *et al*, at note 206. Additional information is provided in the far right column here based on the calculations and information from the table and text from Penney *et al*.

the footprint. Indeed, New Zealand reported in 2009 that fishing vessels were finding – and bottom trawl fishing on – previously unfished features (e.g. seamounts, hills, knolls, rises) within areas of the footprint classified as having been "heavily" fished in the past, and that "much of the successful fishing effort was targeted at these new areas" within the footprint.[208]

In the heavily fished areas open to bottom fishing, New Zealand does not apply a move-on rule or any other conservation measures to protect VMEs. The rationale New Zealand used to allow fishing in the 'heavily fished' areas with no measures to protect VMEs is provided in the 2009 Impact Assessment report "given the existing evidence about the substantial impact of bottom trawling, it is likely that most pre-existing VMEs in these areas have already been significantly impacted."[209] the assumption appears to have been that the risk of impacts on VMEs was likely to be low because few VMEs would occur in these 'heavily fished' areas because they would not have survived the impact of bottom trawl fishing occurring in the past. However, far from being confined to fishing in areas already 'heavily' impacted by bottom trawling in the past, New Zealand vessels apparently have been fishing primarily on seamounts and in other areas within the 'footprint' where bottom trawling had not previously taken place. None of the fisheries in these areas have been assessed for potential significant adverse impacts on VMEs as far as the DSCC is aware.

In a 2013 review of the Australian and New Zealand footprints in the SPRFMO area, Penny provided estimates of the extent unfished areas located within the footprint, noting that "estimates of the 'fished area' generated using any mapping resolution other than actual trawl tracks substantially exaggerate the areas within the footprints that have been impacted, with inclusion of substantial unfished areas within these 'fished footprint' maps". He concluded that some 95% to 96% of a footprint mapped using 20-minute degree blocks, as SPRFMO has done, would not have been previously fished.[210] He went on to state that predictive habitat modelling studies indicated that there would be a "high probability of occurrence of vulnerable scleractinian corals and octocorals in unfished areas contained within the 'fished footprint'" and that under UNGA resolutions, the expectation would be that VMEs occurring within 'previously fished' areas will be protected from significant adverse impacts, necessitating measures to protect these VMEs "irrespective of whether they occur within or outside 'previously fished areas'".[211]

New Zealand reports that VMEs are likely to occur in most high seas areas of the South Pacific where bottom fishing occurs (e.g. seamounts, rises, ridge systems). Despite this, the government has chosen to close only a portion of its footprint to bottom fishing. To implement the UNGA resolutions and SPRFMO interim measures, the New Zealand government engaged in consultations with the high seas fishing industry, environmental non-governmental organizations and government departments concerned with environmental conservation, and attempted to strike a balance between competing objectives: on the one hand the protection of all features known or likely to support VMEs from any SAIs from bottom fishing operations, and, on the other hand, to allow New Zealand deepwater fishing vessels to continue to bottom fish on the high seas. Thus, rather than closing all areas where VMEs are known or likely to occur unless fisheries are assessed for their impacts and can be managed to prevent SAIs on VMEs (as is called for in the UNGA resolutions), New Zealand has chosen to attempt to provide "adequate and representative protection" from trawling impacts by closing approximately 40% of its bottom fisheries 'footprint' and allow New Zealand vessels to continue to bottom fish in the remaining areas with limited (a move-on rule in some areas) or no measures in place to prevent SAIs on VMEs.[212]

New Zealand announced a few changes to the areas within its bottom trawl footprint in 2015: two blocks (nos. 1 and 2) previously open to bottom trawl fishing (subject to a move-on rule) have been closed, and one block within the footprint but previously closed to bottom trawl fishing (block #18) has been opened.[213] New Zealand stated that it closed the two blocks because of the substantial bycatch of many species indicative of the presence of VMEs, this included bycatch of black corals and gorgonian corals, and sponges. It is not clear whether the move-on rule was ever triggered by trawling in these blocks, but New Zealand requires the reporting of any amount of bycatch of VME indicator species, not only amounts exceeding the level that triggers the move-on rule.[214] New Zealand also intends to carry out exploratory bottom longlining[215] for toothfish in the SPRFMO area close to the boundary of the CCAMLR area in the mid-Pacific Ocean.

New Zealand has made some progress in predicting the distribution of VMEs within the SPRFMO area. Information on the distribution of VMEs in the SPRFMO area is very sparse however,[216] and thus predicting where VMEs are likely to occur relies on predictive models, which have been shown to result in inaccuracies in the South Pacific to date. There have been difficulties in creating such models, but new models are being developed at a smaller, New Zealand region-scale and "absences" from historical databases are included as well as "presence".[217] DSCC has expressed concern that the Scientific Committee has taken into account cost considerations in its deliberations.[218]

Australia implemented an interim fishing footprint which restricted fishing by Australian vessels to the area covered by its collective (all gear combined) distribution of fishing activity for the period of 2002–2006 using the same formula that New Zealand used to delineate its footprint.[219] In 2009 there were seven Australian high seas permits allowing bottom fishing in the SPRFMO area.

Chile has notified a footprint based on past fishing, prior to the SPRFMO coming into force, but has not fished in the area since then.

5.2.3 Move-on rule/cease fishing in areas where VMEs are encountered

A move-on rule has been adopted by New Zealand, but the rule is only applicable to areas deemed to have been 'moderately' fished corresponding to approximately 50% of the high seas areas where New Zealand vessels are currently permitted to bottom trawl fish. Bottom fishing in the 'heavily fished' blocks of the New Zealand footprint is exempt from the rule.

In its National Report to the SPRFMO Scientific Committee in 2015, New Zealand reported that the move-on rule was only triggered six times between 2008 and 2013, representing an average of 3.3% of tows per year in the areas where the move-on rule applies.[220] This rate of triggering move-on events is less than the predicted rate of about 8%,[221] probably due to catch rates of VME taxa in the SPRFMO Convention Area being lower than in areas inside the New Zealand EEZ. The move-on-rule was triggered by the bycatch of VME indicator species which either exceeded one or more of the weight thresholds of individual VME taxa, or exceeded the maximum permitted count (3) of indicator taxa that make up the biodiversity component of the process for determining evidence of an encounter with a VME.[222]

New Zealand did not state where the encounters occurred, or whether the areas within 5 nm of the encounter were subsequently closed to bottom fishing by all vessels or whether only the vessel that had exceeded the threshold and triggered the move-on rule was required to move 5 nm away for a specified period of time. However, in a review of move-on rules for the first meeting of the SPRFMO Scientific Committee in 2013, Hansen *et al* stated that under the New Zealand move-on rule, an area is closed within a 5 nm radius of the start of hauling the gear (the end of the trawl) only for the vessel that triggered the rule and only for the duration of the remainder of fishing trip by the vessel. On the other hand, under the Australian move-on rule, a 5 nm closure applies to the entire length of the trawl tow or line set and the area is closed to all vessels fishing under the Australian flag for the remaining duration of the annual fishing permits.[223]

In the midwater trawl fishery for bentho-pelagic species, the move-on-rule has never been triggered, but there have been relatively few tows; in fact New Zealand vessels conducted no midwater trawling for bentho-pelagic species in 2014.[224] This type of fishing is now considered to be included within the SPRFMO definition of bottom fishing whereas previously New Zealand had allowed it to undertake fishing by this method in closed areas. However, New Zealand does not apply the move-on rule to the 'heavily fished blocks', so no triggers from VMEs have ever been reported in these areas.

In its 2015 National Report, Australia indicated that the move-on rule had not been triggered in 2014.[225] The VME threshold limits, which trigger Australian move-on protocols, are 50 kg of corals or sponges for trawlers and 10 kg of corals or sponges per 1,000 hooks for longliners. Australia's threshold levels are far higher for bottom trawlers than those established by New Zealand for its fleets. New Zealand thresholds use a mixture of number of species (VME biodiversity indicators) and weight (Porifera 50 kg, Scleratinia 30kg, Antipatharia, Alcynacea and Gorgonacea 1kg, and Hydrozoa 6 kg). Catching more than three species groups or any weight threshold triggers a VME move-on.

SPRFMO has yet to adopt uniform regulations on the threshold levels that would constitute an "encounter" with a VME. CMM 2.03 provides that, until the Scientific Committee has developed advice on SPRFMO threshold levels pursuant to paragraph 5(c) of this CMM, Members are to establish their own threshold levels for encounters with VMEs for vessels flying their flag, taking into account paragraph 68 of the FAO Guidelines.[226] The Scientific Committee's Workplan is to continue with the collection of relevant data and the development of models to predict VME indicator taxa,[227] but progress has been slow.

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[208] Ibid, p. 73.

[209] New Zealand Ministry of Fisheries, above note 181, p. 47

[210] Penny, A. (2013). *Spatial analysis of Australian and New Zealand historical bottom trawl fishing effort in the Convention Area of the SPRFMO* (SPRFMO Doc. SC-01-20), p. 1.

[211] Ibid.

[212] Penny et al, above note 206, p. 346.

[213] New Zealand Ministry for Primary Industries. (2015). *New Zealand notification of amendments to the status of blocks within its bottom fishing footprint* (SPRFMO Doc. SC-03-DW-03), pp. 1–2.

[214] Ibid, p. 2.

[215] New Zealand Ministry for Primary Industries. (2015). *Proposal for exploratory bottom longlining for toothfish by New Zealand vessels outside the bottom lining footprint during 2016 and 2017: Description of proposed activities and impact assessment* (SPRFMO Doc. SC-03-DW-01_rev2).

[216] 2015 SC Meeting, above note 188, p. 14.

[217] Ibid, p. 15.

[218] Ibid.

[219] Williams et al, above note 182, p. viii.

[220] New Zealand National Report, above note 172, p. 19.

[221] Penney, A. J. (2014). *Review of the biodiversity component of the New Zealand Vulnerable Marine Ecosystem Evidence Process* (New Zealand Aquatic Environment and Biodiversity Report No. 135 & SPRFMO Doc. SC-02DW-01). Wellington: New Zealand Ministry for Primary Industries, p. 1.

[222] New Zealand National Report, above note 172, p. 19.

[223] Hansen, S., Ward, P., & Penney, A. (2013, October). *Identification of vulnerable benthic taxa in the western SPRFMO Convention Area and review of move-on rules for different gear types* (SPRFMO Doc. SC-01-09). Canberra: Australian Bureau of Agricultural and Resource Economics and Sciences, p. 9.

[224] New Zealand National Report, above note 172, p. 19.

[225] Australian National Report, above note 173, p.1

[226] SPRFMO. (2014, May 4). *CMM 2.03: Conservation and management measure for the management of bottom fishing in the SPRFMO Convention Area*, para. 8(f).

[227] 2016 SC Workplan, above note 186.

5.2.4 Ensuring the long-term sustainability of deep-sea fish stocks, including bycatch species

New Zealand and Australia have been slow in providing SPRFMO with bycatch information, particularly for non-commercial species including VME Taxa. Some information was provided to the second Scientific Committee meeting by New Zealand in a review by Penney (2014).[228] This report focuses on 23 major taxa (e.g. families and orders) rather than individual species. The bycatch of deepwater sharks, for example, has not been reported in any detail. According to Penney, individual catches of cold water corals have reached up to 15 tonnes. No equivalent report has been provided by Australia.

CMM 2.03 provided that Contracting Parties should undertake stock assessments of principal deep-sea fishery resources targeted, and, to the extent possible, taken as bycatch and caught incidentally in these fisheries, including straddling resources.[229] This has not been done.[230] Furthermore, although the Scientific Committee was requested to undertake these stock assessments by 2015, this was not done either. Instead, the Workplan for the 2016 Scientific Committee proposes the development of estimates of initial biomass, productivity, and stock status for relevant orange roughy sub-stocks.[231]

At the third Scientific Committee meeting (2015), New Zealand said that low-information stock assessment methods for orange roughy could be applied in the SPRFMO area. Despite the absence of a stock assessment, the Scientific Committee found that the stock assessment areas for orange roughy to the west of New Zealand remain appropriate and need not be changed.[232] At the third Scientific Committee meeting, no paper or analysis was presented to define other species of concern for deepwater species.[233]

New Zealand: Total reported catch for bottom trawl fisheries in 2014 was 1028 tonnes.[234] Orange roughy has comprised 79% of the total bottom trawl catch since 2002; other species reported include oreos (5%), cardinalfish (4%) and alfonsino (4%).[235] There was a substantial increase in the reported catch of alfonsino and cardinalfish in 2010 and 2011, but these declined in 2012 and 2013 and neither was reported caught in 2014.[236] Alfonsino is frequently targeted using mid-water trawls (included in the SPRFMO definition of bottom fishing) close to the seabed. In 2013, the total catch by mid-water trawl vessels targeting alfonsino amounted to 145 tonnes, of which 122 tonnes were alfonsino. However, New Zealand reported conducting no such trawling in 2014.[237] Blue-eyed trevalla/ Bluenose and wreckfish/hapuku-bass make up around 76–95% of the catch from bottom line fishing, which amounted to 99 tonnes in 2014.[238]

Twenty-two different species were declared or reported as bottom trawl target species in the bottom trawl fisheries between 2002 and 2006, with the top four species groups (orange roughy, alfonsino, cardinalfish and oreos) constituting 98% of the targeted species.[239] In 2014, orange roughy continued to be the main bottom trawl target species, and some oreos were also caught.[240] Another 115 species were reported taken as bycatch in the New Zealand high seas bottom trawl fisheries from 2002 to 2006.[241] New Zealand's bottom line fisheries in the SPRFMO area have primarily targeted blue-eyed trevalla/ bluenose and wreckfish/hapuku, with a total of 59 species or species groups reported to have been caught in the fisheries between 2002 and 2006.[242] As with the bottom trawl fisheries, stock assessments for the bottom line fisheries target species have not been done, nor have the impacts of the fishing on the bycatch species, including low productivity species been conducted, as far as the

[228] Penney, above note 222.
[229] SPRFMO CMM 2.03, above note 228, para. 5(b).
[230] A fine-scale spatially disaggregated CPUE analysis has been applied to areas to the east of New Zealand, on the Louisville Ridge. "Estimated median stock for these four stocks ranged from 0.23 of K to 0.44 of K with relatively wide confidence limits. Attempts to model stocks on the Lorde Howe Rise and Northwest Challenger Plateau have not been completely successful and biomass estimates were very poorly constrained". 2015 SC Meeting, above note 185, p. 7. There are preliminary estimates of initial biomass, productivity and stock status for four of the six orange roughy sub-stocks. There are concerns over the confidence that can be placed in the CPUE modelling generally. The SC noted the scarce data that was available for stock assessment. Biomass indices in the SPRFMO area are almost entirely restricted to CPUE low information modelling and thus subject to large variables in outcome. Ibid.
[231] 2016 SC Workplan, above note 186.
[232] 2015 SC Meeting, above note 188, p. 7.
[233] Ibid, p. 17.
[234] New Zealand National Report, above note 172, p. 3, Table 3.
[235] Ibid, p. 3.
[236] Ibid.
[237] Ibid.
[238] Ibid, p. 6.
[239] New Zealand Ministry of Fisheries, above note 181, p. 10.
[240] New Zealand National Report, above note 172, 3. No alfonsino or cardinalfish were reported in 2014.
[241] New Zealand Ministry of Fisheries, above note 181, p. 10.
[242] Ibid, p. 11.
[243] Australian National Report, above note 173, p. 2.
[244] Ibid.
[245] Ibid.
[246] Ibid.
[247] Ibid, p. 7.
[248] 2015 SC Meeting, above note 188, p. 11.
[249] Ibid.
[250] UNGA resolution 64/72, above note 8, para. 120. See also paragraph 119(a) which calls on States and RFMOs to ensure that vessels do not engage in bottom fishing until assessments have been carried out.
[251] 2015 SC Meeting, above note 188Error! Bookmark not defined., p. 13.
[252] New Zealand Ministry of Fisheries, above note 181, p. 76.
[253] New Zealand National Report, above note 172, p. 3, Table 3

DSCC is aware. It is not clear to what extent there is an overlap between the 137 species reported caught in the bottom trawl fisheries and the 59 species, or species groups, reported caught in the bottom line fisheries.

Australia: Australia's reported a total catch of 204 tonnes of fish caught in the SPRFMO Area in 2014.[243] Orange roughy comprised 97% of the 2014 trawl catch.[244] Orange roughy, blue-eye trevalla, jackass morwong (tarakihi) and yellowtail kingfish were again among the top five species caught by weight.[245] Australia's vessels did not target alfonsino in 2014. [246]

In 2011 Australia assessed the sustainability of the harvest of key commercial species in the SPRFMO area by Australian vessels. Catch and effort data were the main sources that could be used, but Australia noted that such assessments may not provide reliable indices of abundance.[247]

5.2.5 Other/gear restrictions

SPRFMO has adopted a ban on bottom gillnet fishing. The 2014 and 2015 Scientific Committees recommended that the Commission implement a spatial management approach for bottom fisheries in order to protect VMEs from SAIs, "while enabling viable fisheries to operate".[248]

The second meeting of the Scientific Committee recommended that spatial management should use open and closed areas, thus rendering the move-one rule unnecessary.[249] DSCC has repeatedly reminded SPRFMO that spatial management is *not* a substitute for the move-on rule. Further investigation must be carried out to identify VMEs. Spatial management could be used as a tool to improve on the current conservation measurements in place, and to bring these measures more in line with the UNGA resolutions and FAO Guidelines, but this is not the approach being taken. The proposed Workplan is directly contrary to UNGA resolution 64/72, which calls on States to not authorize bottom fishing activities until the specified measures have been adopted and implemented.[250]

For example, the statement by the Scientific Committee in 2015 that "[t]he question of which areas to open and close to fishing would be best re-examined when considering the spatial management approach and the trade-off between environmental protection of VMEs and access by fisheries"[251] raises the question: what scientific criteria does the Committee have in mind to determine the trade-off of environmental protection of VMEs and access by fisheries? There is no such "trade-off" to prevent SAIs on VMEs envisaged in the UNGA resolutions nor in the FAO Guidelines.

The spatial management approach is clearly spelled out in the UNGA resolutions and the FAO Guidelines:

1. Closing areas where VMEs are known or likely to occur on the basis of the best scientific information available unless bottom fisheries in such areas can be (and are) managed to prevent significant adverse impacts (SAIs) on VMEs; and
2. Only permitting bottom fishing to take place in an area after conducting a prior impact assessment to determine whether SAIs would occur and any mitigation measures needed, including closures, within the area to ensure that SAIs on VMEs would be prevented.

As a complement to these two key requirements, a move-on rule is needed to cover those cases where encounters with VMEs occur in spite of the efforts of States and RFMOs to close areas where VMEs are likely to occur and to conduct impact assessments. However, as the DSCC has noted in previous submissions, a move-on rule, to be effective, must be rigorous and should only be used as a complement to, not as a substitute for, area closures and impact assessments.

Area of seabed impacted by New Zealand bottom trawl fleet

New Zealand has provided estimates of the size of an area of seabed impacted per bottom trawl tow by New Zealand bottom trawl vessels operating in the SPRFMO Area. In its impact assessment report in 2009, New Zealand stated that the maximum area impacted by a single tow based on the average length of tows in the period 2002-2006 and a maximum spread of 200 meters between the doors or otter boards. However, in the same assessment New Zealand states that the "optimum spread" of the trawl doors would be 120-150 meters but that based on the impact of the footrope alone, or based on the shorter tows observed in 2007, the impact would be "about one-tenth" of the 2002-2006 figure.[252]

Based on the above information, and using the information in New Zealand's National Report to SPRFMO in 2015 on the number of tows made by bottom trawl vessels in the SPRFMO area between 2002-2014,[253] an estimate of the range of the area of cumulative impact of the seabed by bottom trawling by New Zealand vessels in the SPRFMO area would be as follows:

Table 8. Estimated size of cumulative area of seabed impact by New Zealand bottom trawl fleet in the SPRFMO area: 2002–2014

2002–2006	Number of tows	Area of seabed impact km_2	Average number vessels/year
0.2 km_2 per tow	11,145	2,229	14.5
2.0 km_2 per tow	"	22,290	"
2007–2014			
0.2 km_2 per tow	5,310	1,062	6
2.0 km_2 per tow	"	10,620	"
Total cumulative impact		3,291 – 32,910 km_2	

Based on the an estimate of the spread of the trawl doors as 135 meters (the mid-range between 120–150 meters given as the optimum spread of the doors above) and an average tow length of 10.8 km, Gianni and Bos estimated that the cumulative impact on the seabed of the New Zealand bottom trawl fleet in the SPRFMO area between 2002-2006 as approximately 16,000 km^2 over the five year period, equivalent to an average of 1.46 km^2 per tow. They noted that the New Zealand Ministry of the Environment reported that 68 vessels operating in depths greater than 200 meter in the New Zealand EEZ conducted 38,648 trawls with a cumulative impact of 85,222 km^2, equivalent to an average of approximately 2.2 km^2 per tow. They surmised that the lower average figure for the area of seabed impacted per tow outside of the New Zealand EEZ may have been due to more of the fishing targeting seamounts in international waters where tows are likely to be shorter than in continental slope areas.[254] Regarding the spread of the doors and associated the Australian Antarctic Division estimated that the width or sweep of the gear – the distance from door to door including bridle, ground chain and the footrope of the net – in the deepwater bottom trawl fisheries off Heard and McDonald Islands was approximately 120 meters wide.[255] More recently, Penny and Guinotte estimated that the actual swept area of the seabed by bottom trawling in the SPRFMO area between 1996-2006 amounted to some 12,000 km^2.

No doubt that however the estimates are calculated, many of the tows conducted by New Zealand vessels on the high seas would cover areas previously towed. Nonetheless in its 2009 impact assessment report to SPRFMO, New Zealand reported that in 2007 "much of the successful fishing effort was targeted at these new [previously unfished] areas" within the New Zealand footprint; thus one may assume that much of the cumulative impact of the bottom trawl fleet was spread to new, potentially quite large, areas of the seabed, including seamounts, or portions thereof, that had not been previously impacted by bottom trawl fishing.

Interestingly, New Zealand recognized the potential adverse impact of bottom trawling in its impact assessment submitted to CCAMLR in 2008 for the bottom longline fisheries in the Southern Ocean, stating that "a deliberate decision was made by New Zealand not to use trawl fishing methods for toothfish in the exploratory fisheries. The reason for this was to avoid potential significant adverse impacts on the marine environment".[256]

5.3 CONCLUSION

The Contracting Parties of SPRFMO, through its interim measures, were amongst the first to adopt multilateral measures consistent with the provisions of resolution 61/105. However, the implementation of these measures by the countries concerned was inconsistent with UNGA resolution 61/105 and the FAO Guidelines as the States concerned did not require assessing the impact of bottom fisheries in areas where they are permitted to occur nor apply the move-on rule to heavily fished areas. The current regulation, CMM 4.03, continues to reflect these shortcomings and inconsistencies with the UNGA resolutions. The objective of CMM 4.03 to promote (rather than ensure) the sustainable management of bottom fisheries, including target fish stocks as well as non-target species taken as bycatch, is inadequate in expression and currently in implementation. As stated in previous sections, this is a key objective established in the UNGA resolutions and the practical actions States are committed to take to meet this objective are spelled out in considerable detail in UNGA resolution 64/72 paragraph 119(d) (such as stock assessments and rebuilding plans). These in turn reflect fundamental and detailed obligations under international law for the management of fisheries established in Articles 5 & 6 of the UN Fish Stocks Agreement (UNFSA).[257]

Specific areas of concern that need to be addressed to bring the work of the Scientific Committee and the regulations adopted by SPRFMO into compliance with the UNGA resolutions include:

- Any areas open to bottom fishing should only be open after an impact assessment has been done and determined that bottom fishing will be managed to prevent SAIs on VMEs in the area covered by the assessment, and conservation measures, including a move-on rule, should apply to all areas open to bottom fishing; this is not currently the case.

- The bottom fishing footprint should be redrawn to correspond to areas where bottom fishing has previously occurred during the 2002–2006 reference period and eliminate, to the maximum extent practicable, the large areas within the current footprint where bottom fishing has not previously occurred.

- A SPRFMO-wide move-on rule in the SPRFMO area should be established and consistently applied to vessels from all flag States fishing in the region, apply to all areas where vessels are permitted to bottom fish, and require the immediate temporary closure of an area for all vessels where a VME encounter occurs. The closure should remain in effect indefinitely unless a subsequent scientific assessment of the area by the Scientific determines that either VMEs do not occur in the area or SAIs will not occur as a result of reopening the area to one or more methods of bottom fishing.

- The failure of CMM 2.03 and CMM 4.03 to ensure the management deep-sea stocks and bycatch for sustainability is a significant failure of the SPRFMO management regime. The Scientific Committee has not yet undertaken a stock assessment for orange roughy stocks or any other stocks targeted or taken as bycatch, despite having been tasked to so.

- The Scientific Committee should carry out stock assessments of all target species, and assessments of the impacts on at least "low-productivity" species taken as bycatch, as is called for in the FAO Guidelines.

- The Scientific Committee needs to be tasked specifically with providing advice and recommendations on minimizing impacts on by-catch species and preventing significant adverse impacts on low-productivity fish species. The assertion that, due to limited resources, the Scientific Committee should begin by concentrating on target species, and address the bycatch species at a later date[258] is not an acceptable basis for continuing to fish in disregard of UNGA resolution 64/72, paragraph 119(d).[259] Moreover, Article 5(f) of the UN Fish Stocks Agreement requires States to "minimize…catch of non-target species…and impacts on associated or dependent species, in particular endangered species". This is a longstanding obligation under international law. If this is not done, flag States and RFMOs are "not to authorize bottom fishing activities until such measures have been adopted and implemented".[260]

- The advice of the Scientific Committee needs to be assessed against the commitment to take specific actions in the UNGA resolutions and the FAO Guidelines.

- The ad hoc working party of New Zealand, Australia and Chile should include observers in order to satisfy transparency requirements.

The Scientific Committee should not only carry out stock assessments of all target species, and assessments of the impacts on at least "low-productivity" species taken as bycatch, as is called for in the FAO Guidelines, but should make recommendations on reference points, including precautionary reference points as described in Annex II of the UNFSA,[261] management strategies or plans for fishery resources based on such reference points,[262] and analyses of conservation and management alternatives, such as the establishment of total allowable catch or total allowable fishing effort at different levels, that estimate the extent to which each alternative would achieve the objective or objectives of any management strategy or plan adopted, or under consideration, by the Commission.[263] This recommendation is in fact applicable to all RFMOs with the competence to manage deep-sea fish stocks.

[254] Gianni, M. & Bos, O.G. (2012, April). Protecting ecologically and biologically significant areas (EBSAs): Lessons learned from the implementation of UN resolutions to protect deep-sea biodiversity (Report No. C061/12). Wageningen: Wageningen UR/IMARES - Institute for Marine Resources & Ecosystem Studies, pp. 50-51.

[255] Australia (2014, June). *Demersal fishing interactions with marine benthos in the Australian EEZ of the Southern Ocean: An assessment of the vulnerability of benthic habitats to impact by demersal gears/ edited by Dirk C. Welsford, Graeme P. Ewing, Andrew J. Constable, Ty Hibberd and Robert Kilpatrick. Final Report, FRDC Project 2006/042, The Department of the Environment, Australian Antarctic Division and the Fisheries Research and Development Corporation 2014, Appendix 10, Figure A10.1, p. 179.*

[256] CCAMLR (2008). *Preliminary assessments of known and anticipated impacts of proposed bottom fishing activities on vulnerable marine ecosystems*. Collated by the Secretariat. CCAMLR-XXVII/26. 24 September 2008.

[257] *United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks*, 4 August 1995, 2167 UNTS 3.

[258] SPRFMO. (2014). *Report of the 2nd Scientific Committee Meeting, Honolulu, Hawaii, USA*, 1–7 October 2014, p. 14.

[259] States and RFMOs are to "[a]dopt conservation and management measures, including monitoring, control and surveillance measures, on the basis of stock assessments and the best available scientific information, to ensure the long-term sustainability of deep sea fish stocks and non-target species, and the rebuilding of depleted stocks, consistent with the [FAO] Guidelines". UNGA resolution 64/72, above note 8, para. 119(d).

[260] Ibid, para. 120.

[261] *Convention on the Conservation and Management of High Seas Fishery Resources in the South Pacific Ocean*, 14 November 2009, art. 10.2(b)(i).

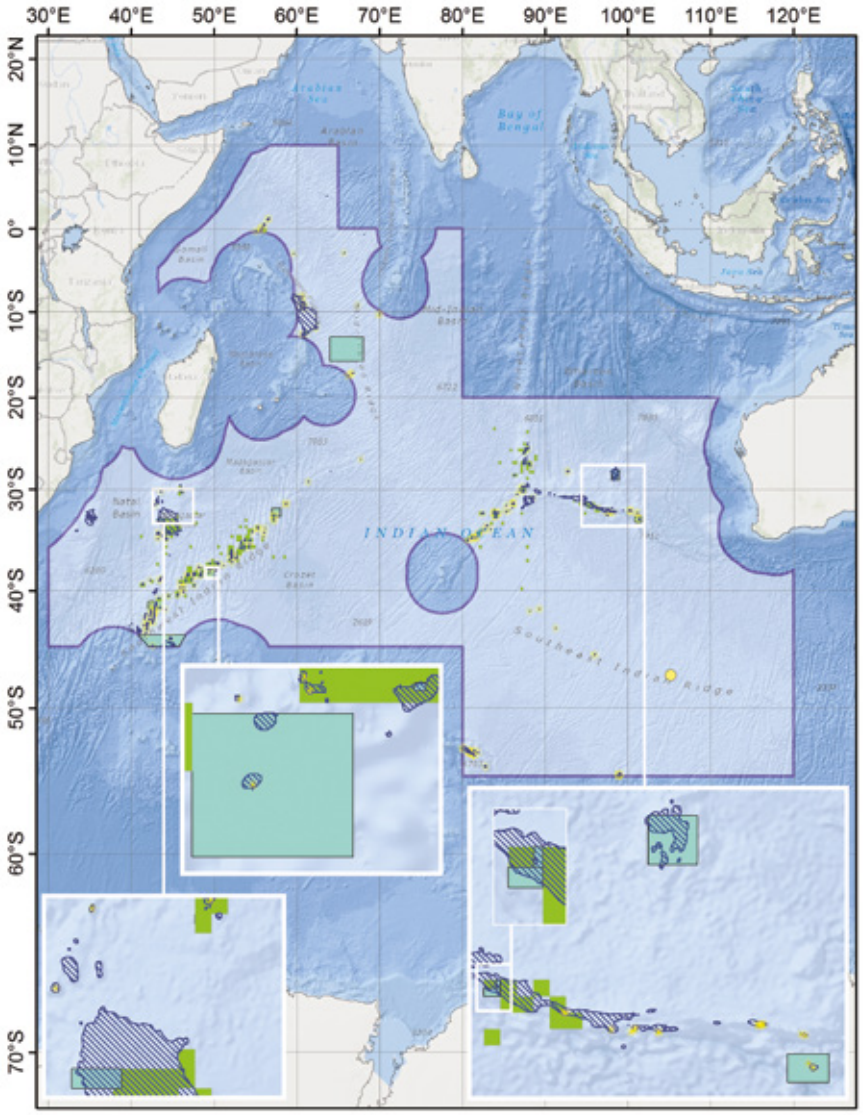
[262] Ibid, art. 10.2(b)(ii).

[263] Ibid, art. 10.2(b)(iii).

6.0 INDIAN OCEAN

FIGURE 13

SIOFA



SIOFA	% "Fishable" Area	% "Fishable" Seamounts
Areas closed to all bottom fishing	0.0%	0.0%
Areas voluntarily closed to bottom fishing by SIODFA* vessels	6.9%	6.3%
Areas where bottom fishing is permitted by Australia	19.8%	36.0%
TOTAL	205,260 km2	253 seamounts

* South Indian Ocean Deepwater Fishers' Association

Seamounts <1500m deep
1500m Isobath
Voluntary bottom fishery closure
Regulatory Area

SOURCE: MARINE CONSERVATION INSTITUTE 2016

Non-tuna high seas fishing in the Southern Indian Ocean is managed by the Southern Indian Ocean Fisheries Agreement (SIOFA). The area covered includes the high seas between eastern Africa and Western Australia. It is bordered by CCAMLR to the south, SPRFMO to the east and SEAFO to the west. The SIOFA Convention entered into force in June 2012. Since then it has held three meetings: the first in Melbourne, Australia in October 2013, the second in Mauritius in March 2015 and the third in La Réunion in July 2016. An Extraordinary Meeting of the Parties was held in October 2015 in Belgium. The first meeting of the SIOFA Scientific Committee was held in Fremantle, Australia in March 2016.

The Contracting Parties are Australia, the Cook Islands, the EU, France, Japan, South Korea, Mauritius, and Seychelles.

6.1 DESCRIPTION OF HIGH SEAS BOTTOM FISHERIES

6.1.1 Main High Seas Bottom Fishing Nations

Cook Islands, Australia, Japan, EU, France (in respect of its Territories), South Korea.

6.1.2 Number of high seas bottom fishing vessels operating in region in 2014/2015 (or latest year for which information is available)

In 2014, 8 vessels were reported active in bottom fisheries; 5 trawlers, 2 longline vessels and 1 gillnet vessel.[264]

Australia reported that in 2015, only 1 Australian multipurpose trawler-longliner conducted a single trip.[265] The Cook Islands reported that 2 bottom and mid-water trawl vessels fished for a total of 562 days combined in 2015.[266] Japan reported 2 trawlers operating in 2014.[267] The EU reported 1 or 2 bottom longline or bottom gillnets vessels fishing in 2014 and 2015.[268] France (Territories) reported 2 bottom longline vessels operated in the SIOFA area in 2015.[269] South Korea reported no vessels bottom fishing in 2014 or 2015 (South Korean vessels have fished in the area in previous years).

6.1.3 Main high seas bottom fisheries

Trawl vessels from the Cook Islands and Australia predominantly target alfonsino and orange roughy. Species also caught by bottom trawling include pelagic armourhead, bluenose warehou, violet warehou, ocean blue-eye trevalla and oreo dories, cardinal fish, and hapuku wreckfish.

The longline fisheries by Japanese and South Korean vessels target Patagonian toothfish and associated species such as blue antimora. Other longline vessels catch hapuku wreckfish and ocean blue-eye trevalla, pelagic armourhead, deepwater sharks, alfonsino, rubyfish and common mora.

EU gillnet vessels predominantly fish for deepwater sharks (Squalidae) though the species composition of the sharks is uncertain. Bycatch species in the EU longline and gillnet fisheries include bluenose warehou, blackbelly rosefish, common mora, roudi escolar, violet warehou, and oreo dories.[270]

6.1.4 Catch (including catch per main target species)

Australia and the Cook Islands do not report the catch by their vessels in the SIOFA area. In the case of Australia, catch information is deemed to be "confidential" if fewer than five vessels are involved in the fishery. Japan reported a catch of 507 tonnes in 2014. The EU reported that a Spanish vessel or vessels caught 1,885 tonnes in 2015, over 90% of which consisted of deep-sea sharks.[271]

6.1.5 Vessels authorized to fish in 2016 (or latest year for which information is available)

This information is not available from all countries; Australia reports that six Australian-flagged vessels hold permits to fish in the SIOFA Area.[272]

6.1.6 Changes in numbers of vessels active in bottom fisheries, volume of catch since 2004/6 – 2014 if known

The Cook Islands has had two to four flagged vessels per year operating in the SIOFA Area since 2006, but only two have operated each year since 2012. Australia reported that the total number of active vessels in the trawl fishery declined from three in 2005, to two in 2006, and down to one per year in the period between 2007 and 2015. The total effort for the Australian trawl fishery fluctuates from year to year, but has largely declined from 325 and 329 trawl hours in 2005 and 2007 respectively; to 106 trawl hours in 2014 (effort data for 2015 was not available as of March 2016).

A combination of 1 or 2 commercial and exploratory trawl vessels from Japan have trawled in the SIOFA area since 2009, with a reported catch ranging from 500–1,500 tonnes per year. France (Territories) reported that 1 or 2 vessels bottom longline fish for Patagonian toothfish, antimora, marcuroids and rays in the SIOFA Area on their way to or from the Southern Ocean, spending a total of 15 to 40 days per year, with an average catch ranging between 40–85 tonnes per year over the past six years.

The EU reported that 1 or 2 bottom gillnet and longline vessels have operated in the region per year since 2007. The primary target species for the EU since 2008 has been deep-sea sharks, with catches of all species combined since 2006 ranging between 150 tonnes to slightly less than 2,000 tonnes per year. Between 2009 and 2013, 2 to 4 South Korean bottom fishing vessels operated in the SIOFA Area each year. In 2013, three South Korean bottom longline vessels fished in the area and caught 153 tonnes of Patagonia toothfish and 2 tonnes of bycatch, which included skates and sharks. In 2013, 1 South Korean bottom trawler fished in the Agreement Area and caught 733 tonnes of alfonsino and 20 tonnes of bycatch, including cardinal fish.[273]

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[264] Southern Indian Ocean Fisheries Agreement (SIOFA). (2016, March). *Report of the first meeting of the Southern Indian Ocean Fisheries Agreement (SIOFA) Scientific Committee*, Annex I, Overview of SIOFA fisheries [SIOFA 2016 SC].

[265] SIOFA. (2016, March). *Australia's National Report on 2015 fishing activities to the Southern Indian Ocean Fisheries Agreement's Scientific Committee* (SIOFA Scientific Committee Doc. SC-01-05 (01)), p. 1 [SIOFA Australia Report 2016].

[266] SIOFA. (2016, March). *National Report – Cook Islands* (SIOFA Scientific Committee Doc. SC-01-05 (04)), Tables 1 & 2.

[267] SIOFA. (2016, March). *National Report – Japan* (SIOFA Scientific Committee Doc. SC-01-05 (05)), Table 1.

[268] SIOFA. (2016, March). *National Report – European Union_Rev 1* (SIOFA Scientific Committee Doc. SC-01-05 (03)), Table 1 [SIOFA EU Report 2016].

[269] SIOFA. (2016, March). *National Report – France (Territories)* (SIOFA Scientific Committee Doc. SC-01-05 (07)), Table 1.

[270] SIOFA 2016 SC, above note 266, Annex I, Overview of SIOFA fisheries.

[271] SIOFA EU Report 2016, above note 270, Table 2.

[272] SIOFA Australia Report 2016, above note 26756, p. 1.

[273] SIOFA. (2013, March). *National Report – South Korea* (SIOFA Scientific Committee Doc. SC-01-05 (05)), Tables 1 & 2.

6.2 IMPLEMENTATION OF MEASURES TO PROTECT VULNERABLE MARINE ECOSYSTEMS FROM SIGNIFICANT ADVERSE IMPACTS AND ENSURE THE LONG-TERM SUSTAINABILITY OF DEEP-SEA FISH STOCKS – PARAGRAPHS 83 TO 87 OF UN GA RESOLUTION 61/105; PARAGRAPHS 113, 117 AND 119 TO 124 OF UNGA RESOLUTION 64/72; AND PARAGRAPHS 121, 126, 129, 130 AND 132 TO 134 OF UNGA RESOLUTION 66/68

The deadline for the implementation of UNGA resolution 61/105 for the bottom fisheries on the high seas in the in the Indian Ocean region was 31 December 2007. However, the States whose vessels engaged in bottom fishing in the region did not adopt interim measures prior to the entry into force of SIOFA and SIOFA has only adopted a set of regulations for the management of bottom fisheries – CMM 2016/01 – in July 2016.[274] Several companies operating deep-sea trawlers formed the Southern Indian Ocean Deepsea Fishers Association (SIODFA) ten years ago and voluntarily agreed to refrain from fishing in 12 deep-sea areas within the SIOFA Area.[275] These closed areas cover approximately 6% of the seamounts and 7% of the seabed shallower than 1,500 meters depth on the high seas in the region (Figure 13 above).

The measures contained in CMM 2016/01 adopted in July 2016 require, inter alia, that Contracting Parties:

- submit impact assessments to the Scientific Committee by 2018;
- submit relevant data on historical fishing in the area by 2018;
- 100% observer coverage for bottom trawl vessels and 20% observer coverage for other bottom fishing vessels.

The Scientific Committee of SIOFA is required to provide advice and recommendations to Meetings of the Parties in support of the above requirements and other elements of the regulation:

- by 2017 in regard to a Bottom Fishing Impact Assessment Standard to be used by Contracting Parties in submitting their impact assessments (by 2018);
- maps of where VMEs are known or likely to occur;
- protocols for future area closures;
- guidelines for electronic observer programs;
- by 2019 on the status of target fish stocks and "to the extent possible" bycatch species;
- criteria for evidence of an encounter with a VME and what to do if a VME is encountered; and
- by 2020 a bottom fishing footprint for the SIOFA area and a bottom fishing impact assessment.

In the meantime, CMM 2016/01 establishes "interim bottom fishing measures" that, inter alia,

- require limits on vessels' bottom fishing effort and/or catch to average annual levels "in active years over a representative period";
- constraints on the spatial distribution of bottom fishing effort (excluding bottom line or trap fishing) to "recently fished areas";
- a general requirement to ensure bottom fishing will not have significant adverse impacts on VMEs;
- a move-on rule (though leaving thresholds to define encounters up to each flag State);
- data collection requirements;
- provisions ensuring that no vessels are authorized to fish in any areas that future Meeting of the Parties decide to close to fishing; and
- a requirement that the CMM be reviewed no later than 2019.

[274] SIOFA. (2016, July). *Report of the Third Meeting of the Parties to the Third Meeting of the Parties to the Southern Indian Ocean Fisheries Agreement* (SIOFA), La Reunion, 3 to 8 July, Annex L – CMM 2016/01 on the management of bottom fishing in the SIOFA Area.
[275] http://www.siodfa.org/
[276] Williams, A., Althaus, F., Fuller, M., Klaer, N., & Barker, B. (2011, October). *Bottom fishery impact assessment, Australian report for the Southern Indian Ocean Fisheries Agreement (SIOFA)*, Hobart: CSIRO. Retrieved from http://www.afma.gov.au/wp-content/uploads/2014/02/bottom_fishery_impact_assessment_siofa.pdf.
[277] Ibid, p. 1.
[278] Ibid, p. 3.
[279] Ibid, p. x.
[280] Gianni, above note 7, p.20.
[281] Williams et al, above note 280, p.x.

6.2.1 Impact assessments

No impact assessment has been conducted or made public by any flag State whose vessels bottom fish in the SIOFA region, with the exception of Australia.[276] Australia published a "Bottom fishery impact assessment" in 2011 for its bottom fisheries on the high seas in the Indian Ocean, stating that it followed the format of the Benthic Fisheries Impact Assessment Standard adopted by SPRFMO in 2009. However, because of a lack of data on the distribution of seabed biodiversity, Australia instead used seabed topographical features, in particular seamounts, as "surrogates" or indicators of VMEs,[277] as well as "bathomes" – areas defined as "ecologically meaningful depth ranges within fishable depths".[278]

Australia indicated that, despite the potential for bottom trawling and auto longlining to "severely" impact VME fauna at "fine ('site') scales, and for impacts to persist and accumulate through time," the risk of significant adverse impacts from the bottom fisheries by Australian vessels was considered low. A number of reasons were given for this conclusion, including that the "current" fishing activity by Australian vessels is low; there are few areas of "high" fishing intensity; the fishery is restricted to a historical footprint area; the limited spatial extent of fishing effort in relation to the bathomes most likely to support VMEs; and the fact that mitigation measures have been established in the fishery, including establishing the footprint and a move-on rule.[279]

However, the conclusion that SAIs are not likely to occur is debatable. First, there are questions about what constitutes a "fine site scale" and whether, given the potential for "severe" impacts by bottom trawling and auto longlining, the species impacted by bottom fishing where it occurs are or may be rare, endangered or endemic or meet the criteria for being VMEs. Secondly, there are concerns that the mitigation measures Australia has established for its flagged vessels may still allow for serious cumulative impacts and do not take into account past cumulative impacts from deepwater bottom fishing in the SIOFA area over the course of the previous several decades. Australia's fisheries footprint constitutes 44.99% of the entire seabed area of the SIOFA Area at depths between 701 and 1,000 meters, and 24.08% of the entire seabed area in the SIOFA Area at depths between 1,001 and 1,500 meters (see Table 8 below). "Freezing" the footprint therefore still allows bottom fishing to potentially impact VMEs across large areas of the SIOFA Area. In addition, the move-on rule that Australia has adopted establishes high threshold values (e.g. 50 kg corals) and therefore is not likely to be effective as a conservation measure.

Australia indeed recognizes that cumulative impacts, both over time and by all fleets combined, may be a problem. Deep-sea bottom fishing, primarily bottom trawl fishing, has taken place in the Southern Indian Ocean since at least the 1970s.[280] In its report, Australia indicated that assessing cumulative impacts on VMEs and stock assessments are both very difficult – in part because sufficient information is not forthcoming from other Contracting Parties to effectively conduct either type of assessment. Finally, Australia admits that there is a "high degree of uncertainty about many of the key elements relevant to assessing and managing impact and risk to VMEs".[281]

Despite these concerns, it is important to recognize that Australia has performed this analysis and made a detailed report of its bottom fisheries publicly available. This both fulfills a key provision of the UNGA resolutions regarding transparency (consistently highlighted in resolutions 61/105, 64/72 and 66/88), and provides an opportunity for all nations with an interest in the conservation of marine biodiversity in areas beyond national jurisdiction in the Indian Ocean, as well as scientists and civil society organizations, to critique and engage the Australian government in a debate over whether the measures adopted by Australia are sufficient to implement the commitments to action endorsed by the international community as a whole. No other flag State that has authorized bottom fishing in the SIOFA Area has attempted an impact assessment, or, if they have, has not made the assessment public as far as the DSCC is aware. This is a serious shortcoming of both the SIOFA RFMO and of the individual flag States whose vessels operate in the region.

Table 9. The overlap of the Australian footprint (20' grid, 1999–2009) in the SIOFA Area with the five ecologically meaningful bathomes and their size in relation to the areas in each bathome for the SIOFA Area

Bathome	Name	Footprint area (km^2)*	SIOFA Area (km^2)*	Overlap of footprint with total bathome in SIOFA Area (%)
0–200 m	Continental shelf	272	37,402	0.73
201–700 m	Shallow upper continental slope	2,773	32,101	8.64
701–1000 m	Deep upper continental slope	11,307	25,133	44.99
1001–1500 m	Shallow mid-continental slope	26,677	110,781	24.08
1501–2000 m	Deep mid-continental slope	33,795	260,633	12.97
>2000 m	(Unfished depths)**	151,074	26,414,597	0.57

* All areas given are 'plane areas' i.e. they do not account for underlying topography ** coarse resolution (20' grid) mapping results in the footprint overlapping some areas of unfishable depths

Source: Williams *et al*, (2011) at note 280, p. 10, Table 3.1.2.1.

6.2.2 Identify and close areas where VMEs are known or likely to occur unless bottom fisheries are managed to prevent SAIs

VMEs associated with seamounts and ridge systems are likely to occur throughout the high seas areas of the Southern Indian Ocean, including in areas where deep-sea bottom fishing currently occurs.[282] However, no areas have yet been closed to bottom fishing to protect VMEs in the region, although, as indicated in the previous section, Australian vessels are restricted to fishing within the historic bottom fisheries footprint. Also, as already mentioned, the industry association SIODFA has adopted a set of voluntary closures that are observed by the vessels owned by its member companies. At the first meeting of the SIOFA Scientific Committee in March 2016 it was recommended that the Meeting of Parties in June 2016 agree to formally close 11 of the areas that SIODFA members have already closed on a voluntary basis,[283] but CMM 2016/01 adopted in July 2018 does not require that there areas be closed but only recommends that all Contracting Parties note the advice from the Scientific Committee.

6.2.3 Move-on rule/cease fishing in areas where VMEs are encountered

Australia has unilaterally implemented move-on rules for its flagged vessels. The VME threshold limits which trigger Australia's move-on rule are 50 kg of corals or sponges per tow for trawlers, and 10 kg of corals or sponges per 1,000 hooks or 1,200 meter section of line (whichever is shorter) for longliners. Australia reports that these threshold limits have not been reached, and thus the move-on rule was not triggered in either 2014 or 2015.[284]

SIOFA in July 2016 adopted a move-on rule as part of CMM 2016/01 requiring vessels to cease bottom fishing activities for bottom or mid water trawling, or fishing with any other type of towed net, 2 nautical miles either side of a trawl track extended by two nautical miles at each end. For longline and trap activities – an encounter with a VME requires the closure of an area with a radius of one nautical mile from the midpoint of the line segment. For all other bottom fishing gear types a closure with a radius of one nautical mile from the midpoint of the operation is required. The thresholds are set by individual fishing countries, pending thresholds to be adopted by SIOFA. It is not clear whether the SIOFA measures only requires the vessel that encountered the VMME to move out of the area or whether all vessels would be required to stay out of an area where an encounter occurred.

6.2.4 Ensuring the long-term sustainability of deep-sea fish stocks, including bycatch species

No stock assessments have been conducted for the main target species in the deep-sea fisheries in the SIODFA Area. Most species caught in the bottom fisheries are low productivity species, in particular deepwater sharks. Some 123 sharks, 63 batoids and 18 chimaeras occur in the deep-sea in the Indian Ocean, representing about 17% of all known chondrichthyan species. This includes six species of kitefin sharks, of which *Dalatias licha* is widespread and frequently caught in the deep-sea fisheries. The differences between the species found in the eastern and western Indian Ocean indicate a high degree of regional endemism of deep-sea chondrichthyan species in the Indian Ocean.[285]

In its proposal to ban the use of bottom gillnets tabled at the March 2016 meeting of the Scientific Committee, Australia stated as a reason for proposing the ban that deepwater gillnets pose a risk to deepwater shark populations which are characterized by slow growth, high longevity, late maturity and low fecundity making them vulnerable to overexploitation and localized depletion; and that there is little fisheries and biological data available on deepwater sharks occurring in the SIOFA Area (e.g. relative abundance, critical habitats, reproduction, age structure and growth rates).[286] A Spanish gillnet fishery targeting deep-sea sharks has been in operation in the region for a number of years. According to the report of the European Union to the first meeting of the Scientific Committee, Spanish vessels involved may have stopped using gillnets recently but it would appear that Spanish vessels using bottom longline gear are also targeting deep-sea sharks. The EU indicates that, since 2008, 85–95% of its reported catch consisted of deep-sea sharks, regardless of whether Spanish vessels were bottom fishing with longlines or gillnets in any given year, although the report does state that this information is provisional and under review.[287]

In the July 2016 meeting of SIOFA a proposal to ban bottom gillnet fishing was not adopted: instead, SIOFA adopted a 'recommendation' to do so which is not binding on Contracting Parties. The objection was based on lack of scientific evidence of harm in spite of a requirement under Article 4(c) of the SIOFA Convention which requires the application of the precautionary approach.

[282] Butler A.J., J.A. Koslow, P.V.R. Snelgrove, & S.K. Juniper. (2001). *Review of the benthic biodiversity of the deep sea. CSIRO Marine Research, Australia*.
[283] SIOFA 2016 SC, above note 266, Annex M, List of benthic protected areas proposed for closure to all fishing.
[284] SIOFA Australia Report 2016, above note 267Error! Bookmark not defined., p. 1.
[285] FAO. (2015). *Report of the Regional Workshop on the Identification of Deep-sea Cartilaginous Fishes of the Indian Ocean, Albion, Mauritius, 10–13 June 2014* (FAO Fisheries and Aquaculture Report No. 1091), Rome: FAO,paras. 31 and 32. Retrieved from http://www.fao.org/3/a-i4241e.pdf.
[286] Delegation of Australia. (2016, March). *Large-scale pelagic driftnets and deepwater gillnets in the SIOFA Convention Area: Background information and recommendations* (SIOFA Scientific Committee Doc. SC-01-10 (02)), p. 9.
[287] SIOFA EU Report 2016, above note 259. See the information for vessels, gear types and catch on Tables 1 & 2 and in Annex I.

6.2.5 Other

On the broader issue of managing bottom fisheries consistent with the UNGA resolutions, the countries fishing in the SIOFA Area, and/or which are Parties to the Agreement, took some ten years to establish multilateral measures for the management of bottom fisheries, as previously noted.

6.3 CONCLUSION

Progress on implementing the UNGA resolutions in the Southern Indian Ocean has been woeful and slow. While the regulation CMM 2016/01 adopted at the third Commission meeting in July 2016 contains a number of helpful elements, it still falls far short of measures required to effectively implement the UNGA resolutions. Amongst the shortcomings are the following:

- The regulation will "freeze the footprint" but, like SPRFMO, the footprint for the SIOFA area will be drawn on the basis of 20 minute latitude by 20 minute longitude blocks, which equals approximately 1,000 km^2 each +/- 200 km^2. As has occurred in the South Pacific region, this would likely result in large areas of previously unfished seamounts and ridge systems being incorporated into the fishing footprint because of the large size of the blocks.
- Regarding impact assessments, a Contracting Party would only be prohibited from bottom fishing in the SIOFA Area if it has not submitted an impact assessment by 2018.
- The measure does not specify actions to be taken under the move-on rule following cessation of the fishing activity in question, other than to report the action taken, pending advice and recommendations of the Scientific Committee in 2019.
- Regarding the management of deep-sea fish stocks, the measure does not require stock assessments for target species (including in regard non-target species) until 2019 and only requires assessments of the status bycatch species "to the extent possible".

It is a clear breach of paragraphs 86 and 120 of resolutions 61/105 and 64/72 respectively that bottom fishing activities have been repeatedly authorized by a number of States in the region before measures in accordance with paragraphs 83 and 85 of resolution 61/105, and paragraph 119 of resolution 64/72, were adopted and implemented. The SIOFA experience has shown that failure to implement the UNGA resolutions is regarded as being without consequence.

" It should no longer be acceptable for States, whether individually or through RFMOs, to exercise a right to fish on the high seas without ensuring the conservation of marine biological diversity in areas beyond national jurisdiction, sustainable exploitation of fish stocks, minimal impact on bycatch species, and the preservation and protection of the marine environment as called for in the UNGA resolutions and required under international law. "

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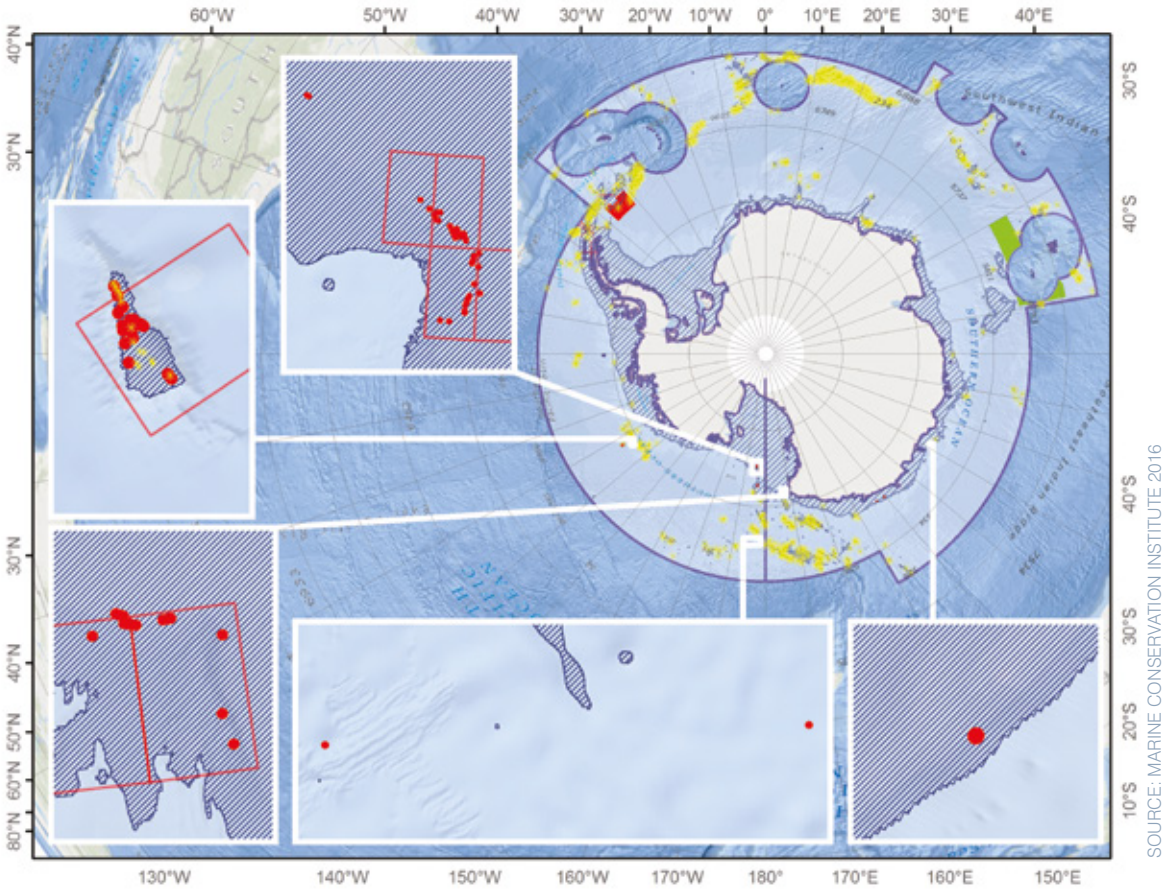
7.0 SOUTHERN OCEAN

FIGURE 14

CCAMLR



SOURCE: MARINE CONSERVATION INSTITUTE 2016

CCAMLR	% "Fishable" Area	% "Fishable" Seamounts
Areas closed to bottom trawling	100.0%	100.0%
Areas closed to all bottom fishing	0.7%	2.4%
Areas where bottom fishing is permitted	99.3%	97.6%
TOTAL	5,302,522	1,047
	km_2	seamounts

The regulation of bottom fishing south of the Antarctic Convergence is managed by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), which was established by international convention in 1982 with the objective of conserving Antarctic marine life. Twenty-four states and the EU are currently Members of CCAMLR, which is supported by a Secretariat based in Hobart, Australia.

7.1 DESCRIPTION OF HIGH SEAS BOTTOM FISHERIES

7.1.1 Main high seas bottom fishing nations

Australia, Chile, France, Japan, South Korea, New Zealand, Norway, Russia, South Africa, Spain, United Kingdom, and Ukraine.

7.1.2 Number of high seas bottom fishing vessels operating in region in 2014/2015 (or latest year for which information is available)

The Vessels Authorized to Fish in 2015/16 list includes 17 vessels. All of these are authorized to conduct bottom fishing on the basis of an impact assessment in accordance with CCAMLR Conservation Measure 22-06, paragraph 6(i).[288] The largest high seas fishery is in the Ross Sea (88.1) where 14 vessels fished in 2015.

7.1.3 Main high seas bottom fisheries

Bottom fishing is permitted by CCAMLR in the high seas areas of the Convention Area using bottom-set longlines. These are primarily used to target toothfish (mainly Antarctic toothfish ***Disccostichus mawsoni***, and some Patagonian toothfish ***Dissostichus eleginoides***). Pots (traps) are also occasionally used.

7.1.4 Catch including catch per main target species)

Reported catches for the last two seasons were 3661 tonnes and 3801 tonnes of toothfish on the high seas in the season 2013/2014 and 2014/2015 respectfully, while another 11,338 tonnes and 8317 tonnes were reported caught within EEZs in the CCAMLR areas over the same seasons. These figures do not include the estimated IUU catch per year of around 1,500 tonnes. Similar levels of catch have been approved for the 2015/2016 season.

7.1.5. Vessels authorized to fish in 2016 (or latest year for which information is available)

CCAMLR publishes an annual list of vessels licensed to bottom longline fish for toothfish in high seas portions of the CCAMLR Area (CCAMLR areas 48.6, 58.4.1-3, 88.1-2). The Ross Sea (88.1) had largest number with 20 vessels notified from nine member countries.

7.1.6. Changes in numbers of vessels active in bottom fisheries, volume of catch since 2004/6 – 2014 if known

The main areas of the high seas where vessels have bottom fished include the Ross Sea (88.1), the Amundsen Sea (88.2). Reported catches in 2004-05 were 4576 tonnes of toothfish in high seas areas this is a bit more that catches reported in the last two years. The main change has been a decline in catches in East Antarctica which has been driven by uncertainties over the sustainability of catches in this area.

7.2 IMPLEMENTATION OF MEASURES TO PROTECT VULNERABLE MARINE ECOSYSTEMS FROM SIGNIFICANT ADVERSE IMPACTS AND ENSURE THE LONG-TERM SUSTAINABILITY OF DEEP-SEA FISH STOCKS – PARAGRAPHS 83 TO 87 OF UN GA RESOLUTION 61/105; PARAGRAPHS 113, 117 AND 119 TO 124 OF UNGA RESOLUTION 64/72; AND PARAGRAPHS 121, 126, 129, 130 AND 132 TO 134 OF UNGA RESOLUTION 66/68

CCAMLR began discussing measures to address destructive fishing practices on benthic ecosystems in 2006, and had already adopted a number of measures prior to the adoption of UNGA resolution 61/105. Since 2006, the Commission has adopted additional Conservation Measures (CM) to implement the resolution.[289] These include:

- A ban on bottom trawling in high-seas areas of the Convention Area, except for conducting scientific research (CM 22-05 (2008))
- A prohibition of deep-sea gillnetting, until the Commission agrees on the basis of advice from the Scientific Committee that such a method may be used in the Convention Area. (CM 22-04 (2010))
- Prohibition of fishing for ***Dissostichus*** spp in depths shallower than 550 meters (CM 22-08 (2009))
- A requirement that impact assessments be submitted by Contracting Parties as a condition for a vessel bottom fishing on the high seas in the CCAMLR Area (CM 22-06 (2008, updated 2016)
- Assessment of proposed bottom fisheries, primarily longlining, by the Scientific Committee to determine if they would have significant adverse impacts on VMEs, and if so, to ensure that such activities are managed to prevent such impacts or are not authorized to proceed (CM 22-06 (updated 2012 & 2015))
- Use of a pro-forma template for submitting preliminary assessments of the potential for proposed bottom fishing activities to have SAIs on VMEs (CM 22-06/Annex A)
- Guidelines for the preparation and submission of notifications of encounters with VMEs (CM 22-06/Annex B)
- Closure of registered VME "Risk Areas" in subareas, divisions, small-scale research units or management areas where bottom fishing is permitted, unless and until explicitly reopened by Commission on the basis of Scientific Committee advice (CM 22-09 (2012))
- Notification requirements for areas with evidence of VMEs, and closure of Risk Areas triggered by a bycatch of VME indicator taxa at specified thresholds (CM 22-07 (2013)).

[288] Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). (2016). List of vessel authorizations (1 December 2015–30 November 2016). Retrieved 23 May 2016 from https://www.ccamlr.org/en/compliance/licensed-vessels.

[289] CCAMLR. (2015). *Schedule of Conservation Measures in force 2015/16 Season (as amended by the Commission at the Thirty-fourth Meeting, 19 to 30 October 2015)*. Retrieved from https://www.ccamlr.org/en/system/files/e-schedule2015-16_1.pdf. The text of current and past Conservation Measures are also available on the CCAMLR website at https://www.ccamlr.org/en/conservation-and-management/conservation-measures.

To support the implementation of these measures, CCAMLR has established the following programs or procedures:

- Annually updated VME register, which lists Risk Areas closed to protect VMEs.[290]
- Research guidelines to assist with monitoring, refining and declaring VME areas.
- Glossary of terms and conceptual diagram, identifying VME habitats and taxonomic groups and conceptual relationship between the terms.[291]
- Detailed criteria to assist in identifying VMEs.
- Training programs and manuals to assist Scientific Observers on vessels to identify VME indicator units. (CCAMLR requires two scientific observers on vessel licensed to undertake bottom fishing.)
- Annually updated report of cumulative impact assessments for all bottom fishing methods, although this has not been updated since 2013.

Specific restrictions for each fishery are outlined in the associated Conservation Measures (e.g. CM 41-04, 05, 06, 07, 09, 10, 11 for the 2014-15 fishing season). The 2013 implementation of a compliance evaluation procedure also provides a mechanism for an annual review of the compliance of Members with all Conservation Measures.

7.2.1 Impact assessments

Initial discussions in 2006 on the likely impact of various types of bottom fishing year were based on an assumption that the maximum area of seabed likely to be impacted by bottom longline fishing was approximately 1,000 m^2 for each kilometer of longline set, and that seven to ten kilometers of line are typically used per set of the gear, deploying some 900–1,000 hooks per kilometer.[292] However, the CCAMLR Fish Stock Assessment Working Group concluded in 2010 that the maximum impact of bottom longlining on the seabed could be much higher (as much as 25,000 m^2 per kilometer of gear deployed, primarily in cases where the longline gear is dragged across the seabed during the haul back of the gear).[293]

CCAMLR has also acknowledged that bottom longlining gear may cause damage in encounters with potential VMEs without necessarily bringing up VME indicator species snagged on hooks and associated gear, and that it is challenging to specify the point where impacts become 'significant' either as a 'one off' event or as a cumulative impact.[294] Despite this acknowledgement, CCAMLR has continued to permit the use of bottom longlining, relying on their annual assessment and approval processes to evaluate any significant adverse impacts on VMEs, and additional advice from the Scientific Committee as it becomes available.

Measures for new (CM 21-01) and exploratory (CM 21-02) fisheries require information on known and anticipated impacts of bottom fishing gear on VMEs, including benthos and benthic communities, and CM 10-02 prohibits members from authorizing their vessels to actively undertake bottom fishing if they are not fully compliant with CM 22-06.

All Contracting Parties proposing to participate in bottom fishing are required to complete Annex 22-06/A of CM 22-06 (2012). This provides a standardized pro forma template for submitting information on their fishing plans, including a preliminary assessment of the known and anticipated impacts of bottom fishing activities on VMEs (including benthos and benthic communities), and mitigation measures to prevent impacts, no less than three months in advance of the next CCAMLR annual meeting.

The Scientific Committee is tasked with assessing potential impacts. The impact assessment involves seven steps and can be applied for any spatial scale where the fishing effort data is available:

- Step 1 - Description of fishing gear.
- Step 2 - Description of fishing activity, and estimated fishing footprint per unit effort for a typical fishing gear deployment event.
- Step 3 - Description of non-standard gear deployment scenarios, and estimation of associated frequencies and fishing footprints per unit effort.
- Step 4 - Characterization of fragility for VME taxa within each spatial footprint identified in Steps 2 and 3.
- Step 5 - Calculation of footprint index and impact index for the fishing method.
- Step 6 - Spatial summary of historical fishing effort.
- Step 7 - Calculation of spatially resolved cumulative footprint and impact.[295]

Based on advice from the Scientific Committee on whether the proposed activities would have SAIs on VMEs, the Commission approves, prohibits or restricts bottom fishing proposals within particular areas or for certain gear types, applies specific mitigation measures, and /or determines if any other relevant requirements or restrictions are required to prevent SAIs to VMEs.

Following initial patchy submissions of the preliminary assessments, CCAMLR adopted a measure in 2008 that prohibited fishing by any country that did not submit an impact assessment. The introduction of the pro forma template, and its application over several years, has generated consistency in quality and detail. However, while the quality of preliminary assessments is improving, detailed descriptions of how different gear types interact with the seafloor are still needed to better estimate footprint and impact indices.

7.2.2 Identify and close areas where VMEs are known or likely to occur unless bottom fisheries are managed to prevent SAIs

Aside from the prohibition on bottom trawling in all high seas areas, the main measure in place to prevent SAIs on VMEs is to close areas where VMEs are "encountered" during the course of fishing activity. Vessels using bottom longlining gear are required to segment their lines (either as 1,000 hook section or a 1,200 meter section of line,

whichever is shorter) and then report the number of VME-indicator units recorded on each line segment. A VME indicator unit is defined as either 1 litre or 1 kilogram of any combination of VME indicator species, as listed in the CCAMLR VME taxa class guide. Any instance of 5 or more indicator units within one segment must be reported to the Secretariat immediately so that other vessels in the fishery may be informed.

If 10 or more VME-indicator units are recorded in one-line segment, hauling must be stopped immediately. The area within 1nm of the mid-point of the line segment is declared a VME "Risk Area" and the area is immediately closed to all vessels. It remains closed until reviewed by the Scientific Committee and management measures have been taken by the Commission. No VME Risk Area has so far been reviewed. Fine-scale rectangles may also be designated under CM 22-07 in areas when frequent VME indicator notifications (5 separate notifications of between 5 and 9 indicator units) are reported. The Secretariat must then inform all vessels in the fishery that VMEs may occur within this area but these areas are not required to be closed.[296] Altogether 46 VME Risk Areas to date have been closed under CM 22-06 and another 76 areas have been notified under CM 22-07.[297]

Much of the work for the development of these bottom-fishing and VME-specific measures and supporting mechanisms was based on a scientific review undertaken in 2009,[298] and subsequent work by the Scientific Committee's Working Group on Statistics, Assessments and Modelling with respect to the methods for identifying and assessing VME taxa and communities, and its Working Group on Ecosystem Modelling to advance understanding of biology and ecology of VMEs.

In 2013, CCAMLR conducted a review of the status of knowledge on bottom fisheries within the CCAMLR area, the types of interactions of fisheries with VMEs, and the impacts arising from such interactions. It also examined how different management strategies were being applied and identified priorities for additional work, as well as possible amendments to existing Conservation Measures.[299]

The 2013 Report identified a number of areas where additional scientific information would support the Commission in refining, reviewing or adding management measures. These are currently being addressed, but have been deferred for several years due to other CCAMLR science priorities. The work includes: refining the definition of Risk Area; completing the review of existing Risk Areas; developing alternate trigger levels for a range of VME taxa, including a distinction between 'heavy' and 'light' taxa, along with options to enable taxon specific weights to be collected; consideration of whether high densities of rare taxonomic groups or unique community assemblages require additional protection; reviewing the possible impacts on VMEs from Spanish longlines, trotlines and pot methods; further assessment of benthic taxa against the seven criteria for assisting in evaluating their vulnerability; and consideration of how the footprint estimates for different gears might be used to assess whether proposed bottom fishing activities would contribute to causing SAIs on VMEs.[300]

Increasing the capacity of the Secretariat to manage, store, process and summarize data resulting from CMs 22-06 and 22-07 has also been identified as a priority.[301]

CM 22-06 and 22-07 are required to be reviewed every two years, on the basis of advice from the Scientific Committee and its specialist working groups, including determining whether the current management arrangements are sufficient for the existing fisheries to avoid causing SAIs on VMEs. In 2015, new methods were proposed for undertaking assessments of the interactions of fishing with ecological features, including VMEs.[302] These are still under discussion.

Since 2008, the Secretariat has received 169 VME-indicator notifications from exploratory bottom fisheries in high seas areas; these primarily occurred in the Ross Sea region (Subarea 88.1) but interactions have also been reported in Subarea 88.2 (Amundsen Sea), Subareas 48.2 (South Orkney Islands area) and 48.6 and Division 58.4.1. Notifications are reviewed by the Scientific Committee and its Working Group on Ecosystem Monitoring and Management, and agreed instances of VMEs, VME Risk Areas and VME fine-scale rectangles are recorded in the CCAMLR VME Registry.[303]

As of October 2015, 46 areas have been closed to protect VMEs in high seas areas of the Convention Area under CM22-09. The register of VME closures lists coordinates and depths as well as taxa involved. No new VME closures have been added to the register since 2011. However, most VME closures are located in Subareas 48.1 and 48.2 (South Atlantic Ocean). These Subareas are now completely closed to bottom fishing under Conservation Measure 32-02 adopted by CCAMLR in 2012.[304]

A total of 75 VME Risk Areas have also been declared in high-seas areas, including 58 Risk Areas in Subarea 88.1; 16 Risk Areas in Subarea 88.2 and one in 58.4.1; seven VME fine-scale rectangles in Subarea 88.1; and two fine-scale rectangles in Subarea 88.2.

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[290] CCAMLR. (2014). *CCAMLR VME Registry: CCAMLR database of information on VMEs in areas beyond national jurisdiction*. Retrieved from https://www.ccamlr.org/en/data/ccamlr-vme-registry.

[291] CCAMLR. (2009). *CCAMLR VME Taxa Classification Guide 2009*. Retrieved fromhttp://www.ccamlr.org/pu/e/sc/obs/vme-guide.pdf.

[292] Sharp, B. R., Parker, S. J., & Smith, N. (2009). An impact assessment framework for bottom fishing methods in the CAMLR Convention Area. *CCAMLR Science*, 16, 195–210.

[293] CCAMLR. (2010). *Report of the Working Group on Fish Stock Assessment, Hobart, Australia, 11 to 22 October 2010* (SC-CAMLR-XXIX/04).

[294] CCAMLR. (2013) *Report on bottom fishing and vulnerable marine ecosystems*. Retrieved from https://www.ccamlr.org/en/system/files/VMEs_1.pdf [2013 Report].

[295] Ibid, para. 20.

[296] Ibid, para. 9.

[297] CCAMLR VME Registry. https://www.ccamlr.org/en/document/data/ccamlr-vme-registry (accessed 22 July 2016)

[298] CCAMLR. (2009). *Report of the Workshop on Vulnerable Marine Ecosystems, La Jolla, CA, USA, 3–7 August 2009* (SC-CAMLR-XXVIII/10). Retrieved from https://www.ccamlr.org/en/system/files/e-sc-xxviii-a10.pdf.

[299] CCAMLR 2013 Report, above note 300.

[300] Ibid, para. 63.

[301] Ibid, para. 63(xvi).

[302] CCAMLR. (2015). *Report of the Thirty-fourth meeting of the Scientific Committee, Hobart, Australia, 19–23 October 2015*, para. 5.1. Retrieved from https://www.ccamlr.org/en/system/files/e-sc-xxxiv_2.pdf.

[303] CCAMLR. (2016). *CCAMLR VME Registry*. Retrieved from https://www.ccamlr.org/en/document/data/ccamlr-vme-registry.

[304] CCAMLR. (2012). *Conservation Measure 32-02: Prohibition of directed fishing*. Retrieved from https://www.ccamlr.org/en/measure-32-02-2012.

The Secretariat prepares an updated VME Register report each year; this will soon be replaced with a web-based interface.

CCAMLR also has also published a list of VME indicator species to which the move-on rule and other VME related conservation measures apply. This list includes numerous taxa of anemones, sea pens, sea squirts, chemosynthetic species, xenophyophores and other species in addition to species and taxa of hard and soft corals and sponges.[305]

CCAMLR has acknowledged that "some VMEs may consist of rare or unique communities. Even with high detectability, the utility of using by-catch information is not likely to provide information about the extent of distributions of these taxa".[306] The development of alternative methods for detecting these communities, and advice on possible additional protection, is currently in progress.

7.2.3 Move-on rule/cease fishing in areas where VMEs are encountered

As noted above, vessels using bottom longlining gear are required to segment their lines and then report the number of VME-indicator units recorded on each line segment. The move-on rule is triggered when five or more indicator units are reported within one segment. Such instances must be reported to the Secretariat immediately so that other vessels in the fishery may be informed that this area is closed and not to fish in this area.

7.2.4 Ensuring the long-term sustainability of deep-sea fish stocks, including bycatch species

CCAMLR has established conservation and management measures, including catch limits, for fisheries for Patagonian and Antarctic toothfish – the main target species in the high seas bottom longline fisheries in the Convention Area. Catch limits are determined on the basis of regularly updated stock assessments, which are informed by tagging and scientific programs.

Because of the well-developed scientific observer program in CCAMLR, there is detailed and comprehensive reporting of bycatch, in terms of species or species group, area, weight and numbers. The majority of the bycatch by numbers and weight consist of species of skates, rays and grenadiers (*macrouridae*). In 2015, the CAMLR Scientific Committee identified some substantial differences in reporting bycatch in previous years, with some vessels only reporting the bycatch observed by the scientific observer rather than for the total catch. Overall bycatch rates could therefore be under-reported by as much as 50%.[307]

CCAMLR has established limits on the catch of these bycatch species for specific areas (Small Scale Research Units or SSRUs) within CCAMLR statistical subareas or divisions ranging from 5% of the catch limit for toothfish or 50 tonnes (whichever is greater) per area for *macrouridae,* to 16% of the catch limit for toothfish or 20 tonnes (whichever is greater) per area for all skates and rays combined. Additional provisions include a requirement that skates and rays be released alive where possible and that vessels temporarily cease fishing (for at least 5 days) within 5 nm of an area (defined as the "path" or entire length of the set of the gear) if over 1 tonne of either group of species is taken in a single haul. There are additional combined restrictions on ***macrouridae*** catch in SSRUs. The catch limit per SSRU for all other bycatch species combined is 20 tonnes.[308]

A large number of other species are also reported caught in the high seas bottom longline fisheries, including some taken in substantial quantities such as icefish (*Channichthyidae*), blue antimora (*Antimora rostrata*), rockfish (*Notothenii*d*ae*) and moray cods (*Muraenolepis spp*). Others are taken in relatively small numbers.[309] The reported bycatch rates are considered low, generally less than 5% of the catch of the target species (e.g. in Subarea 88.1). However, it is not clear the 20 tonne limit per SSRU of bycatch of all other species combined (excluding skates, rays and grenadiers) is sufficient to ensure the long-term sustainability of these non-target species.

7.2.5 Other/gear restrictions

CCAMLR has prohibited the use of bottom trawls in all high seas areas of the Convention Area since 2006 and deep-sea gill nets since 2010.

7.3 CONCLUSION

In the view of the DSCC, CCAMLR has done more to protect VMEs and manage deep-sea fish stocks for sustainability than any of the other RFMOs. However, measures for both the protection of VMEs and to ensure the sustainability of deep-sea fish stocks should be improved. These include:

- Annually update report on bottom fisheries and VMEs
- Develop alternative trigger levels for the move-on rule which a more taxa specific
- Consider the impact on rare taxonomic groups and unique community assemblages
- Better assess the footprint of Spanish style longlines, trott lines and pots
- Assess the differences of reporting rates on bycatch and whether it also extends to VME taxa
- Assess whether MPA proposals will assist in protecting VMEs.

[305] CCAMLR VME Taxa Classification Guide 2009, above note 297. See also CCAMLR 2013 Report, above note, 300.

[306] CCAMLR. (2010). *Report of the twenty-ninth meeting of the Scientific Committee, Hobart, Australia, 25–29 October 2010 (SC-CAMLR-XXIX), Annex 8: Report of the Working Group on Fish Stock Assessment, Appendix E: Report on Bottom Fisheries and Vulnerable Marine Ecosystems*, para. 38. Retrieved from https://www.ccamlr.org/en/system/files/appE_0.pdf.

[307] CCAMLR 2015 SC, above note 308, paras 2.5–2.6 & 3.162–3.163.

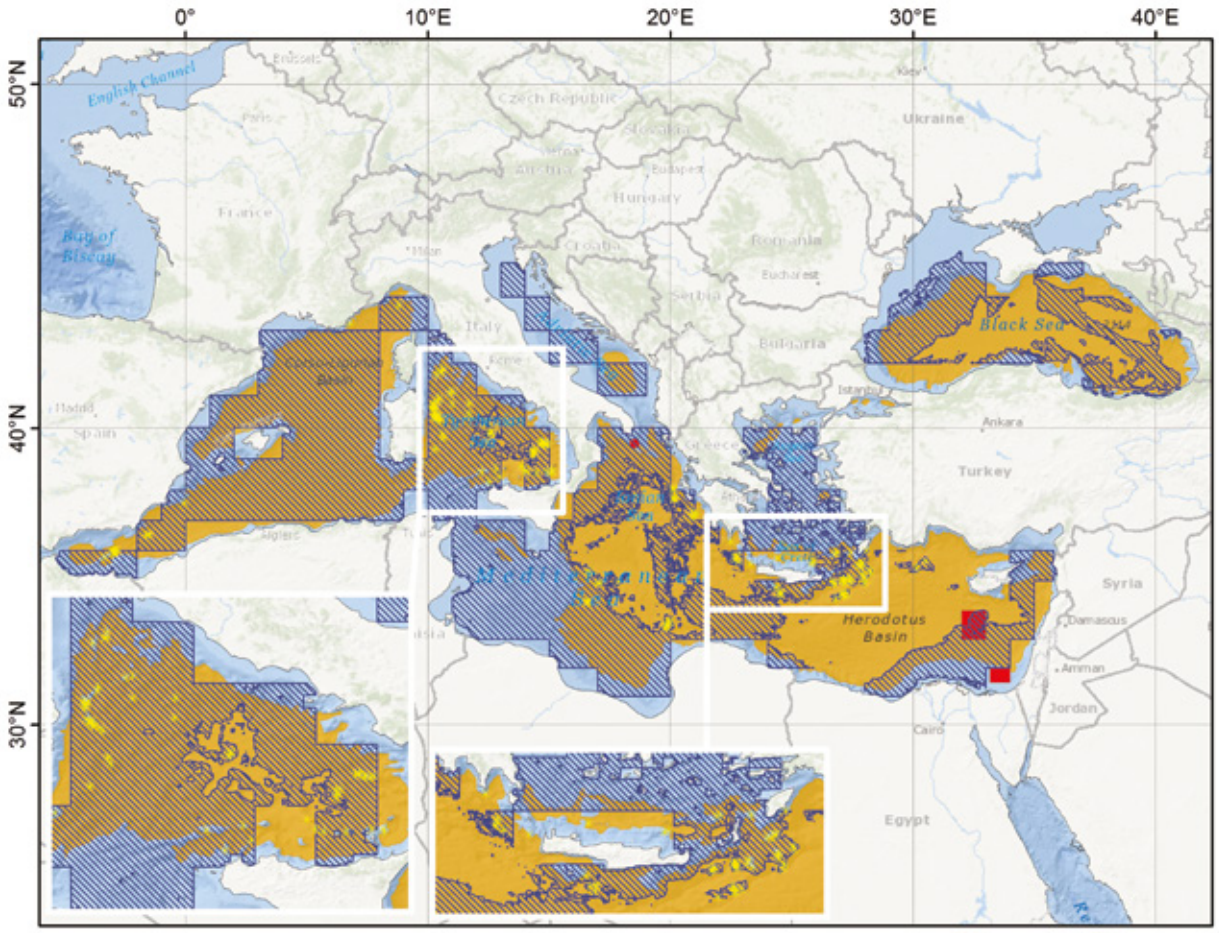
[308] CCAMLR. (2015). *Conservation Measure 33-03: Limitation of by-catch in new and exploratory fisheries in the 2015/2016 season*. Retrieved from https://www.ccamlr.org/en/measure-33-03-2015.

[309] CCAMLR. (2015). *Implementation of conservation measures in 2014/15: fishing and related activities* (CCAMLR-XXXIV/BG/02). See also: CCAMLR. (2008, 24 September). *Preliminary assessments of known and anticipated impacts of proposed bottom fishing activities on vulnerable marine ecosystems* (CCAMLR-XXVII/26), Appendix 2: Secretariat Preliminary Report on By-catch Data of Species Associated with Vulnerable Marine Ecosystems from Bottom Fishing Relevant to the Application of Conservation Measure 22-06. May 2008.

8.0 Mediterranean Sea

FIGURE 15

GFCM



SOURCE: MARINE CONSERVATION INSTITUTE 2016

GFCM	% "Fishable" Area	% "Fishable" Seamounts
Areas closed to bottom trawling (incl 3 VME areas in red)	18.1%	39.7%
Areas where bottom fishing is permitted	81.9%	60.3%
TOTAL	1,496,929 km²	136 seamounts

Seamounts <1500m deep
1500m Isobath
VME Bottom fishery closure

The bottom fisheries in the high seas portions of the Mediterranean Sea are regulated by the General Fisheries Commission for the Mediterranean.

Amongst the measures adopted to date for the protection of VMEs in the Mediterranean are GFCM/29/2005/1 adopted in 2005 which prohibits bottom trawling below 1000 meters depth; GFCM/30/2006/3 adopted in 2006 which established areas closed to fishing with towed dredges and bottom trawls around the *Lophelia pertusa* reefs at Santa Maria de Luca, cold seep ecosystems in the Nile Delta and the Eratosthemes Seamount; and GFCM/33/2009/1 adopted in 2009 restricting fishing effort in an area of the Gulf of Lions to a level no higher than in 2008 to protect spawning aggregations and deep-sea habitats.[310]

A good overview of the Mediterranean deepwater fisheries can be found in the UN FAO Worldwide Review of Bottom Fisheries in the High Seas[311] and the review of the Mediterranean deepwater fisheries, ecosystems, the status of and impacts on VMEs and the measures in place to conserve fish stocks and protect VMEs published in 2010 by the DSCC.[312] Amongst the conclusions of the 2010 DSCC report were that impact assessments had not been done for deepwater bottom fisheries, predominantly mixed species bottom trawl fisheries; many VME areas had already been impacted by bottom trawling; and ecologically important deep-sea VMEs remain vulnerable, including coral gardens formed by *Isidella elongata, Funiculina quadrangularis*, other corals and other habitat-forming groups such as crinoids and brachiopods, which customarily occur shallower than 1,000m. The report also highlighted the particular vulnerability of deep-sea shark species which were recognized at the time as endangered or critically endangered in the Mediterranean (e.g. three species of angel sharks) mainly as a result of bycatch in the deepwater trawl fisheries.

Unfortunately, the authors of the current report were unable to research or update the 2010 report other than to review the spatial extent of the prohibition on bottom trawling and the closed deepwater fishing areas in the Mediterranean as indicated in Figure 15.

“ Deep-sea ecosystem… are now and will increasingly be subjected to multiple stressors from habitat disturbance, pollutants, climate change, acidification and deoxygenation…the widespread destruction of deep-water benthic communities due to trawling has presumably reduced their ecological and evolutionary resilience as a result of reduced reproductive potential and loss of genetic diversity and ecological connectivity. ”

Global Marine Assessment/World Ocean Assessment (UNGA 2015).
Chapter 51: Biological communities on seamounts and other submarine features potentially threatened by disturbance (pp 16–17)

[310] GFCM (2016). Compendium of Decisions of the General Fisheries Commission for the Mediterranean http://www.fao.org/fileadmin/user_upload/faoweb/GFCM/Compliance/GFCM-CompendiumDecisions-en.pdf (accessed 9 July 2016)

[311] FAO (2009), above note 12, pp 69-82

[312] Rogers and Gianni (2010), above note 151, pp. 45-50

[313] UNGA Resolution 57/141, para. 56.

[314] Marine Conservation Biology Institute. (2004). *Deep-sea coral scientist statement*. Retrieved from https://mcbi.marine-conservation.org/what/dscstatement.htm.

[315] *Convention on Biological Diversity. (2004). Decisions adopted by the Conference of the Parties to the Convention on Biological Diversity at its Seventh Meeting. Decision VII/5: Marine and coastal biological diversity, Seventh Ordinary Meeting of the Conference of the Parties to the Convention on Biological Diversity, 9–20 February 2004, Kuala Lumpur, Malaysia* (UNEP/CBD/COP7/21, Annex), paras. 60–61:

“60. Concerned about the serious threats to the biological diversity, stresses the need for rapid action to address these threats on the basis of the precautionary approach and the ecosystem approach, in marine areas beyond the limits of national jurisdiction, in particular areas with seamounts, hydrothermal vents, and cold-water corals, other vulnerable ecosystems and certain other underwater features, resulting from processes and activities in such areas;

61. Calls upon the General Assembly and other relevant international and regional organizations, within their mandate, according to their rules of procedure, to urgently take the necessary short-term, medium-term and long-term measures to eliminate/avoid destructive practices, consistent with international law, on scientific basis, including the application of precaution, for example, consideration on a case by case basis, of interim prohibition of destructive practices adversely impacting the marine biological diversity associated with the areas identified in paragraph 60 above;”.

[316] UNGA Resolution 59/25, paras. 66–71.

[317] FAO. (2005). *Report of the twenty-sixth session of the Committee on Fisheries, Rome, 7–11 March 2005* (FAO Fisheries Report No. 780). Rome: FAO. 2005, paras. 83–95.

[318] UNGA. (2006). *Report of the Review Conference on the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, New York, 22–26 May 2006*. (UN Doc. A/CONF.210/2006/15), paras. 56–59.

[319] UNGA. (2006). *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, Report of the Secretary-General* (UN Doc. A/61/154, 14 July 2006), paras. 204–205.
Retrieved from http://www.un.org/depts/los/general_assembly/general_assembly_reports.htm#Reports on fisheries issues.

ANNEX 1. ACRONYMS

CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CEM	Conservation and Enforcement Measure
CPUE	catch per unit effort
DSCC	Deep Sea Conservation Coalition
EEZ	exclusive economic zone
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
HCR	harvest control rules
HSFG	High Seas Fisheries Group (SPRFMO)
ICES	International Council for the Exploration of the Sea
IEO	Instituto Español de Oceanografía (Spain)
IUCN	International Union for Conservation of Nature
IUU	illegal, unreported and unregulated
MARM	Ministry of the Environment and Rural and Marine Affairs (Spain)
MAR	Mid-Atlantic Ridge
NAFO	Northwest Atlantic Fisheries Organization
NMFS	National Marine Fisheries Service (US)
NRA	NAFO Regulatory Area
NEAFC	North-East Atlantic Fisheries Commission
nm	nautical mile
NPFC	North Pacific Fisheries Commission
PECMAS	Permanent Committee on Management and Science (NEAFC)
RFMO	regional fisheries management organization
ROV	remote operated vehicle
SAI	significant adverse impact
SEAFO	South East Atlantic Fisheries Organisation
SIODFA	Southern Indian Ocean Deepsea Fishers Association
SIOFA	South Indian Ocean Fisheries Agreement
SPRFMO	South Pacific Regional Fisheries Management Organisation
SSRU	small-scale research unit
TAC	total allowable catch
UNCLOS	United Nations Convention on the Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
UNGA	United Nations General Assembly
VME	vulnerable marine ecosystem
VMS	Vessel Monitorial System
WGDEC	NAFO/ICES Working Group on Deep-Sea Ecology
WGEFM	Working Group on Ecosystem Approach to Fisheries Management (NAFO)

ANNEX 2. HISTORY OF THE UNGA NEGOTIATIONS

The deep sea is one of the greatest reservoirs of biodiversity on Earth, home to unknown species and the cradle of life itself. Virtually every scientific expedition into the deep sea reveals previously undiscovered creatures or ecosystems. It remains the last great unexplored area of the planet and holds untold secrets. Yet as shallower and inshore stocks of fish have been depleted and fished out, the fishing industry has moved into deeper water in search of new species and fishing opportunities. The most commonly used method of deep-sea bottom fishing is bottom trawling, widely recognized to be the greatest direct threat to deep-sea species and ecosystems such as long-lived fish species and cold-water coral, sponge, and seamount ecosystems.

The first UNGA resolution to specifically address these concerns, resolution 57/141 adopted in 2002, encouraged "relevant international organizations" to "consider urgently ways to integrate and improve, on a scientific basis, the management of risks to marine biodiversity of seamounts and certain other underwater features within the framework of the Convention".[313] In 2004, following two years of further debate at the United Nations Open-ended Informal Consultative Process on Oceans and Law of the Sea (known as UNICPOLOS, or ICP), the Deep Sea Conservation Coalition (DSCC) launched its campaign for a moratorium on bottom trawling on the high seas unless or until the fisheries were managed consistent with obligations under international law. The campaign was supported by two open letters from scientists (one of which was signed by over 1,600 scientists worldwide) calling for a moratorium on bottom trawling on the high seas.[314] In February of 2004 the 7th Conference of Parties to the Convention on Biological Diversity called on the UNGA and other relevant international and regional organizations to take urgent action to protect deep-sea ecosystem from destructive practices.[315]

In response to these and other expressions of public concern, the UNGA adopted resolution 59/25 in 2004 calling on States individually or through RFMOs *"to take action urgently, and consider…the interim prohibition of destructive fishing practices, including bottom trawling that has adverse impacts on vulnerable marine ecosystems, including seamounts, hydrothermal vents and cold water corals located beyond national jurisdiction, until such time as appropriate conservation and management measures have been adopted in accordance with international law"*.[316]

Resolution 59/25 also committed the UNGA to review, in 2006, the actions taken by high seas fishing nations and RFMOs to implement this call for action. In the interim period, debate and discussions continued regarding the environmental impacts, legality and management of high seas bottom fisheries in a variety of fora, including meetings of UNICPOLOS, the FAO Committee on Fisheries in 2005,[317] and the UN Fish Stocks Agreement Review Conference in 2006.[318]

A Report of the UN Secretary-General, presented in July 2006 as a part of the UNGA review that year, concluded that "[s]ome States have undertaken, or are in the process of undertaking, extensive efforts to protect some fishery habitat areas within their national jurisdiction, in particular through the establishment of protected areas. However, this is not the case on the high seas, though deep-sea habitats in these areas are extremely vulnerable and require protection". The Secretary-General's report noted that "[m]any fisheries are not managed until they are overexploited and clearly depleted and, because of the high vulnerability of deep-sea species to exploitation and their low potential for recovery, that is of particular concern for such stocks."[319] At the same time, it was becoming clear that there were important equity issues to be considered, since these impacts were mainly the result of the activity of a relatively small number of high seas fishing nations.[320]

By that time, a number of countries were calling for various types of moratoria on bottom trawl fishing and other forms of bottom fishing on the high seas until such time as the fisheries could be managed in accordance with obligations under international law related to fisheries sustainability and the protection and preservation of the marine environment.

Intensive negotiations at the UNGA in November 2006 resulted in a compromise which was largely based on proposals put forward by those nations which allowed their vessels to bottom fish on the high seas. The UNGA concluded that, on the basis of the review, "additional actions are urgently needed"[321] and adopted resolution 61/105 calling on high seas fishing States individually and through RFMOs to take a series of specific actions to manage bottom fisheries on the high seas "as a matter of priority, but not later than 31 December 2008".[322] These measures were intended to ensure the long-term sustainability of deep-sea fish stocks and to "prevent significant adverse impacts" on "vulnerable marine ecosystems" by bottom fisheries, or else ensure that such fisheries are "not authorized to proceed".[323] The specific actions were outlined in paragraph 83 of resolution 61/105 and included:

- Conduct impact assessments to determine whether bottom fishing activities would have significant adverse impacts on VMEs or on the long-term sustainability of deep-sea fish stocks;
- Close areas of the high seas to bottom fishing where VMEs are known or likely to occur and "ensure that such activities do not proceed" unless the bottom fishing in such areas can be managed to prevent significant adverse impacts on vulnerable marine ecosystems;
- Require flag States and RMFOs to ensure that vessels flying their flag cease bottom fishing activities in areas where, in the course of fishing operations, VMEs are encountered.

At the time, RFMOs with the legal competence to manage bottom fisheries had only been established in some high seas regions, such as the Northwest, Northeast and Southeast Atlantic. In regard to regions of the high seas where RFMOs had not yet been established but were under negotiation (e.g. in the North and South Pacific and Indian Ocean), resolution 61/105 called on States involved in the negotiations to adopt and implement "interim measures" consistent with those listed in paragraph 83 by "no later than 31 December 2007". For those areas of the high seas where RFMOs neither existed nor were under negotiation at that time (e.g. the southwest Atlantic), flag States committed to unilaterally implementing the measures agreed in paragraph 83 of the resolution.[324] The UNGA agreed to review in 2009 the implementation of the actions called for in resolution 61/105.

Following the adoption of resolution 61/105 in 2006, a number of States were of the view that in order to facilitate its implementation it was necessary to establish a common agreement on the operational definition of key terms in the resolutions. In March 2007 it was therefore agreed at the 27th Session of the UN FAO Committee on Fisheries that States would negotiate, under the auspices of the FAO, an international set of guidelines for the implementation of resolution 61/105. This would, *inter alia*, establish an agreed set of operational criteria for conducting impact assessments of deep-sea fisheries, identifying VMEs, and defining "significant adverse impacts". The FAO subsequently held an Expert Consultation on deep-sea fisheries to draft the guidelines in September 2007, followed by two rounds of intergovernmental negotiations (referred to as FAO "Technical Consultations") to formally negotiate and adopt the International Guidelines for the Management of Deep Sea Fisheries in the High Seas in 2008 (FAO Guidelines).

In 2009, the UNGA reviewed the actions taken by States and RFMOs to implement the bottom fisheries provisions of UNGA resolution 61/105. Based on the review, the UNGA adopted resolution 64/72, which reaffirmed and strengthened the commitments contained in resolution 61/105, and endorsed the new FAO Guidelines.[325] In paragraph 119, resolution 64/72 further committed States individually and through RFMOs to take urgent actions, ***inter alia***, to "ensure that vessels do not engage in bottom fishing" until impact assessments have been carried out consistent with the criteria established in the FAO Guidelines, and to "ensure the long-term sustainability of deep sea fish stocks and non-target species and the rebuilding of depleted stocks". A key paragraph, paragraph 120, specifically calls on States and RFMOs "not to authorize bottom fishing activities" until the measures in paragraph 119 of resolution 64/72 and those in resolution 61/105 have been adopted and implemented. This is a crucial paragraph which has been largely ignored.

In 2011 the UNGA once again reviewed the implementation of the previous resolutions - resolutions 61/105 and 64/72. The review included a report of the Secretary General and a two-day UNGA workshop involving presentations and a debate amongst representatives of States, RFMOs, NGOs, the fishing industry and deep-sea scientists regarding the implementation of the resolutions. The UNGA concluded again that the actions taken since the adoption of previous resolutions revealed major shortcomings in their implementation, and emphasized "the need for full implementation by all States and relevant regional fisheries management organizations and arrangements of their commitments … on an urgent basis".[326] Resolution 66/68, adopted in 2011, emphasized the importance of conducting impact assessments and making them public, and called for further actions by States and RFMOs to:

- Strengthen procedures for both carrying out impact assessments to take into account individual, collective and cumulative impacts, and for making these assessments publicly available;
- Establish and improve procedures to ensure that assessments are updated when new conditions or information so require;
- Establish and improve procedures for evaluating, reviewing and revising, on a regular basis, assessments based on best available science and management measures;
- Establish mechanisms to promote and enhance compliance with the applicable measures related to the protection of VMEs in accordance with international law.[327]

" Although it is heartening that some seamounts, ridges and other sensitive marine habitats are being protected by fishing closures, Marine Protected Areas and other actions, little scientific understanding of the efficacy of actions implemented to date and few studies to assess this exist. The connectivity between these habitats remains largely unknown, as are the factors that influence colonization, species succession, resilience and variability. Comparative studies of seamount, canyon, and continental margin habitats seem to indicate that many species are shared (but see Richer de Forges et al., 2000); however, community structure differs markedly and the factors influencing such differences remain unknown (McClain et al., 2009). "

Global Marine Assessment/World Ocean Assessment (UNGA 2015).
Chapter 51: Biological communities on seamounts and other submarine features potentially threatened by disturbance (pp 16–17)

[320] Virtually all of this activity was being conducted in the early 2000s by 11 nations – Denmark/Faroe Islands, Estonia, Iceland, Japan, Latvia, Lithuania, New Zealand, Norway, Portugal, Russia and Spain. See Matthew Gianni (2004). High Seas Bottom Trawl Fisheries and their Impacts on the Biodiversity of Vulnerable Deep-Sea Ecosystems: Options for International Action. IUCN, Gland, Switzerland. P. viii. See also DSCC. (n.d). *Economics and equity… the deep sea parted* (DSCC Policy Paper). Retrieved from http://www.savethehighseas.org/publicdocs/DSCC_Economics.pdf.

[321] UNGA Resolution 61/105, paragraphs 80 - 91.

[322] Ibid, para. 83.

[323] Ibid, para. 83.

[324] Ibid, paras. 84–86.

[325] FAO Guidelines, above note 9.

[326] UNGA Resolution 66/68, para. 122.

[327] Ibid, para. 129.

ANNEX 3. DATA SOURCES USED FOR MAPPING RFMOS, VMES AND CORAL HABITAT

General Data	Data Type	Data Source	
Bathymetry	Global Bathymetry	Becker, J. J., D. T. Sandwell, W. H. F. Smith, J. Braud, B. Binder, J. Depner, D. Fabre, J. Factor, S. Ingalls, S-H. Kim, R. Ladner, K. Marks, S. Nelson, A. Pharaoh, R. Trimmer, J. Von Rosenberg, G. Wallace, P. Weatherall. (2009) Global Bathymetry and Elevation Data at 30 Arc Seconds Resolution: SRTM30_PLUS, Marine Geodesy, 32:4, 355-371.	
Seamounts	Global Seamounts	Yesson, C.; Clark, M.R.; Taylor, M.L.; Rogers, A.D. (2011) The global distribution of seamounts based on 30 arc seconds bathymetry data. Deep-Sea Res., Part 1, Oceanogr. Res. Pap. 58(4): 442-453.	
Coral Predicted Habitat	Scleractinian global predicted habitat	Davies, A and JM Guinotte. (2011) Global habitat suitability for framework-forming cold-water corals. PLoS ONE 6(4) e18483.	
Coral Predicted Habitat	Octocoral global predicted habitat	Yesson, C., Taylor, M. L., Tittensor, D. P., Davies, A. J., Guinotte, J., Baco, A., Black, J., Hall-Spencer, J.M. & Rogers, A. D. (2012) Global habitat suitability of cold-water octocorals. Journal of Biogeography. 39 (7), 1278-1292.	
RFMO Data	**Data Type**	**Data Source**	**URL**
CCAMLR	VME closures / footprint	FAO VME database	http://www.fao.org/in-action/vulnerable-marine-ecosystems/vme-database/en/
	VME closures	Conservation Measure 22-06 & 22-07 - CCAMLR VME registry and VME risk areas (potential VMEs)	Conservation Measure 22-06 & 22-07 - CCAMLR VME registry and VME risk areas (potential VMEs) (https://www.ccamlr.org/node/85695)
GFCM	VME closures	FAO VME database	http://www.fao.org/in-action/vulnerable-marine-ecosystems/vme-database/en/
NAFO	VME closures / footprint	FAO VME database	http://www.fao.org/in-action/vulnerable-marine-ecosystems/vme-database/en/
NEAFC	VME closures / footprint	FAO VME database	http://www.fao.org/in-action/vulnerable-marine-ecosystems/vme-database/en/
NPFC	VME closures / footprint	Japanese Report on VMEs and Assessment of Impacts caused by Bottom Fishing Activities, Appendix G	http://nwpbfo.nomaki.jp/Interim-measures_Assessment.html
SEAFO	VME closures	FAO VME database	http://www.fao.org/in-action/vulnerable-marine-ecosystems/vme-database/en/
		Measure on Bottom Fishing Activities and VMEs in the SEAFO CA (941KB) [CM30-15], Annex I and 2 in force Feb 2016	http://www.seafo.org/media/8933d489-854c-4c99-895e-66573c7010a4/SEAFOweb/CM/open/eng/CM30-15_pdf
SIOFA	Benthic Protection Areas	SIOFA Website	http://www.fao.org/3/a-a0726e.pdf
	Benthic Protection Areas	Two new BPAs from 2010	http://www.siodfa.org/index.php/news/article/two-new-benthic-protected-areas-come-into-existence-in-the-southern-indian
	Footprint	Australian Footprint	http://www.afma.gov.au/wp-content/uploads/2014/02/bottom_fishery_impact_assessment_siofa.pdf
SPRFMO	NZ Blocks - closures / footprint (updated)	Updated "Conditions Relating to Fishing in the SPRFMO Convention Area" document	Draft document provided by Barry Weeber (emailed for best citation)
	Update to NZ blocks in 2015	Update to NZ blocks in 2015 (closed 1&2, opened 18) - SC-03-DW-03 "New Zealand notification of amendments to the status of blocks within its bottom fishing footprint"	https://www.sprfmo.int/assets/Meetings/Meetings-2013-plus/SC-Meetings/3rd-SC-Meeting-2015/Papers/SC-03-DW-03-New-Zealand-notification-of-amendments-to-the-status-of-blocks-within-its-bottom-fishing-footprint-for-trawl.pdf
	NZ Blocks - closures / footprint	NZ Closures/Footprint - SP-07-SWG-DW-01-rev. "Bottom Fishery Impact Assessment" for 2008/2009 that NZ submitted to SPRFMO in 2009	https://www.sprfmo.int/assets/Meetings/Meetings-before-2013/Scientific-Working-Group/SWG-06-2008/a-Miscellaneous-Documents/New-Zealand-Bottom-Fishery-Impact-Assessment-v1.3-2009-05-13.pdf
	Australian footprint	SWG-10-DW-01a "Bottom Fishery Impact Assessment" Australian report for SPRFMO, prepared in July 2011	https://www.sprfmo.int/assets/Meetings/Meetings-before-2013/Scientific-Working-Group/SWG-10-2011/SWG-10-DW-01a-Australian-BFIA-Final-Report.pdf

ANNEX 4. COMPARISON OF RFMO AREA MANAGEMENT MEASURES

NEAFC	% "Fishable" Area	% "Fishable" Seamounts	NEAFC	% Predicted Coral Habitat - Octocorals	% Predicted Coral Habitat - Scleractinian sp.	1500m
Areas closed to all bottom fishing	16.7%	33.1%	Areas closed to all bottom fishing	22.6%	25.0%	
Areas where bottom fishing is permitted	37.3%	8.6%	Areas where bottom fishing is permitted	25.9%	29.9%	
Areas where prior impact assessment required before bottom fishing can occur	46.0%	58.3%	Areas where prior impact assessment required before bottom fishing can occur	51.5%	45.2%	
TOTAL	300,646 km2	139 seamounts	TOTAL	222,512 km2	189,897 km2	
NAFO	**% "Fishable" Area**	**% "Fishable" Seamounts**	**NAFO**	**% Predicted Coral Habitat - Octocorals**	**% Predicted Coral Habitat - Scleractinian sp.**	2000m
Areas closed to all bottom fishing	12.9%	57.6%	Areas closed to all bottom fishing	12.9%	10.1%	
Areas where bottom fishing is permitted	79.0%	0.0%	Areas where bottom fishing is permitted	78.9%	86.4%	
Areas where prior impact assessment required before bottom fishing can occur	8.1%	42.4%	Areas where prior impact assessment required before bottom fishing can occur	8.1%	3.5%	
TOTAL	140,368 km2	33 seamounts	TOTAL	139,431 km2	60,482 km2	
SEAFO	**% "Fishable" Area**	**% "Fishable" Seamounts**	**SEAFO**	**% Predicted Coral Habitat - Octocorals**	**% Predicted Coral Habitat - Scleractinian sp.**	20000m
Areas closed to bottom trawling	5.1%	1.8%	Areas closed to bottom trawling	4.8%	6.9%	
Areas closed to all bottom fishing including bottom trawling	16.1%	21.5%	Areas closed to all bottom fishing	16.3%	13.6%	
Areas where bottom fishing is permitted	42.9%	25.5%	Areas where bottom fishing is permitted	42.7%	44.9%	
Areas where prior impact assessment required before bottom fishing can occur	41.0%	53.0%	Areas where prior impact assessment required before bottom fishing can occur	41.0%	41.5%	
TOTAL	175,943 km2	502 seamounts	TOTAL	170,756 km2	104,992 km2	
NPFC	**% "Fishable" Area**	**% "Fishable" Seamounts**	**NPFC**	**% Predicted Coral Habitat - Octocorals**	**% Predicted Coral Habitat - Scleractinian sp.**	1500m
Areas closed to all bottom fishing	0.5%	0.3%	Areas closed to all bottom fishing	0.5%	1.0%	
Areas where bottom fishing is permitted	38.9%	12.1%	Areas where bottom fishing is permitted	38.9%	69.8%	
TOTAL	49,823 km2	398 seamounts	TOTAL	49,778 km2	7,820 km2	

Annex 4 continues on page 78

Annex 4 continued from page 77

SPRFMO	% "Fishable" Area	% "Fishable" Seamounts	SPRFMO	% Predicted Coral Habitat - Octocorals	% Predicted Coral Habitat - Scleractinian sp.	1500m
Areas closed to all bottom fishing	0.0%	0.0%	Areas closed to bottom fishing	0.0%	0.0%	
Areas closed to bottom trawl by New Zealand	15.6%	3.3%	Areas closed to bottom trawl by New Zealand	15.6%	18.7%	
Areas closed to bottom fishing by Australia	0.0%	0.0%	Areas closed to bottom fishing by Australia	0.0%	0.0%	
Areas where bottom fishing is permitted by New Zealand	7.5%	3.1%	Areas where bottom fishing is permitted by New Zealand	7.5%	7.8%	
Areas where bottom fishing is permitted by Australia	14.9%	3.1%	Areas where bottom fishing is permitted by Australia	14.9%	17.0%	
Areas where prior impact assessment required before bottom fishing can occur for New Zealand vessels	76.9%	93.6%	Areas where prior impact assessment required before bottom fishing can occur for New Zealand vessels	76.9%	73.5%	
Areas where prior impact assessment required before bottom fishing can occur for Australian vessels	85.1%	96.9%	Areas where prior impact assessment required before bottom fishing can occur for Australian vessels	85.1%	83.0%	
TOTAL	371,117 km2	880 seamounts	TOTAL	370,620 km2	289,730 km2	
SIOFA	**% "Fishable" Area**	**% "Fishable" Seamounts**	**SIOFA**	**% Predicted Coral Habitat - Octocorals**	**% Predicted Coral Habitat - Scleractinian sp.**	**1500m**
Areas closed to all bottom fishing	0.0%	0.0%	Areas closed to bottom fishing	0.0%	0.0%	
Areas voluntarily closed to bottom fishing by SIODFA vessels	6.9%	6.3%	Areas voluntarily closed to bottom fishing by SIODFA vessels	7.1%	5.8%	
Areas where bottom fishing is permitted by Australia	19.8%	36.0%	Areas where bottom fishing is permitted by Australia	20.4%	26.1%	
TOTAL	205,260 km2	253 seamounts	TOTAL	199,647 km2	139,468 km2	
CCAMLR	**% "Fishable" Area**	**% "Fishable" Seamounts**	**CCAMLR**	**% Predicted Coral Habitat - Octocorals**	**% Predicted Coral Habitat - Scleractinian sp.**	**2200m**
Areas closed to bottom trawling	100.0%	100.0%	Areas closed to bottom trawling	100.0%	100.0%	
Areas closed to all bottom fishing	0.7%	2.4%	Areas closed to all bottom fishing	1.5%	0.0%	
Areas where bottom fishing is permitted	99.3%	97.6%	Areas where bottom fishing is permitted	98.5%	100.0%	
TOTAL	5,302,522 km2	1,047 seamounts	TOTAL	1,774,402 km2	2,024 km2	
GFCM	**% "Fishable" Area**	**% "Fishable" Seamounts**	**GFCM**	**% Predicted Coral Habitat - Octocorals**	**% Predicted Coral Habitat - Scleractinian sp.**	**1500m**
Areas closed to bottom trawling (incl 3 VME areas in red)	18.1%	39.7%	Areas closed to bottom trawling	23.6%	0.0%	
Areas where bottom fishing is permitted	81.9%	60.3%	Areas where bottom fishing is permitted	76.4%	#REF!	
TOTAL	1,496,929 km2	136 seamounts	TOTAL	790,094 km2	0 km2	

FURTHER READING

Baker, C. M., Bett, B. J., Billett, D. S. M., & Rogers, A. D. (2001). An environmental perspective. In World Wildlife Fund (WWF)/IUCN (Eds), *The status of natural resources on the high-seas*. Gland: WWF/IUCN.

Bensch, A., Gianni, M., Gréboval, D., Sanders, J., & Hjort, A. (2009). *Worldwide review of bottom fisheries in the high seas* (FAO Fisheries and Aquaculture Technical Paper 522, rev.1). Rome: FAO.

Clark, M. R., Tittensor, D., Rogers, A. D., Brewin, P., Schlacher, T., Rowden, A., Stocks, K., & Consalvey, M. (2006). *Seamounts, deep-sea corals and fisheries: Vulnerability of deep-sea corals to fishing on seamounts beyond areas of national jurisdiction* (UNEP-WCMC Biodiversity series 25). Cambridge, UK: United Nations Environment Programme (UNEP)-World Conservation Monitoring Centre (WCMC).

de Fontaubert, A. C. (2001). Legal and political considerations. In WWF/IUCN (Eds.), *The status of natural resources on the high-seas*. Gland: WWF/IUCN.

FAO (2009). *International guidelines for the management of deep-sea fisheries in the High seas. Rome: FAO.*

FAO/Japan Government Cooperative Programme. (2007). *Report and documentation of the expert consultation on deep-sea fisheries in the high seas, Bangkok, Thailand, 21–23 November 2006* (FAO Fisheries Report No. 838). Rome: FAO.

Freiwald, A., Fossa, J. H., Grehan, A., Koslow, T., & Roberts, J. M. (2004). *Cold-water coral reefs: Out of sight - no longer out of mind* (UNEP-WCMC Biodiversity Series 22). Cambridge, UK: UNEP-WCMC.

Gianni, M. (2004). *High seas bottom trawl fisheries and their impacts on the biodiversity of vulnerable deep-sea ecosystems: Options for international action.* Gland: IUCN.

Gianni, M. (2009, May). *Review of the implementation of the provisions of UNGA resolution 61/105 related to the management of high seas bottom fisheries* (Submission to the UN Division for Oceans Affairs and the Law of the Sea).

Gianni, M. & Bos, O.G. (2012, April). *Protecting ecologically and biologically significant areas (EBSAs): Lessons learned from the implementation of UN resolutions to protect deep-sea biodiversity* (Report No. C061/12). Wageningen: Wageningen UR/IMARES - Institute for Marine Resources & Ecosystem Studies.

Gianni, M., Currie, D. E. J., Fuller, S., Speer, L., Ardron, J., Weeber, B., . . . Kavanagh, A. (2011, September). *Unfinished business: A review of the implementation of the provisions of United Nations General Assembly resolutions 61/105 and 64/72, related to the management of bottom fisheries in areas beyond national jurisdiction.*

Group of Experts of the Regular Process. (2016). *The first global integrated marine assessment. World ocean assessment I.* New York: United Nations. Retrieved from http://www.un.org/depts/los/global_reporting/WOA_RegProcess.htm.

Hogg, M. M., Tendal, O. S., Conway, K. W., Pomponi, S. A., Van Soest, R. W. M., Gutt, J., Krautter, M., & Roberts, J. M. (2010). *Deep-sea sponge grounds: Reservoirs of biodiversity* (UNEP-WCMC Biodiversity Series No. 32). Cambridge, UK: UNEP-WCMC.

Norse, E. A., Brooke, S., Cheung, W. W. L., Clark, M. R., Ekeland, I., Froese, R., . . . Watson, R. (2012). Sustainability of deep-sea fisheries. *Marine Policy, 36,* 307–320.

Rogers, A. D., & Gianni, M. (May 2010). *The implementation of UNGA resolutions 61/105 and 64/72 in the management of deep-sea fisheries on the high seas* (Report prepared for the DSCC). London: International Programme on the State of the Ocean.

Thiel, H., & Koslow, J. A. (Eds.). (2001) *Managing risks to biodiversity and the environment on the high sea, including tools such as marine protected areas - Scientific requirements and legal aspects - Proceedings of the Expert Workshop held at the International Academy for Nature Conservation Isle of Vilm, Germany, 27 February – 4 March 2001* (BfN-Skripten 43). Bonn: German Federal Agency for Nature Conservation Bonn. Retrieved from https://www.bfn.de/fileadmin/MDB/documents/proceed1.pdf.

Watling, L., Haedrich, R. L., Devine, J., Drazen, J., Dunn, M. R., Gianni, M., . . . Nouvian, C. (2011). *Can ecosystem-based deepsea fishing be sustained? Report of a workshop held 31 August-3 September 2010* (Darling Marine Center Special Publication 11-1). Walpole, ME: University of Maine, Darling Marine Center. Retrieved from http://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?article=1144&context=sms_facpub

Weaver, P. P. E., Benn, A., Arana, P. M., Ardron, J. A., Bailey, D. M., Baker, K., . . . Watling, L. (2011). *The impact of deep-sea fisheries and implementation of the UNGA Resolutions 61/105 and 64/72. Report of an international scientific workshop.* Southampton: National Oceanography Centre. Retrieved from http://www.savethehighseas.org/publicdocs/Lisbon_report_final_web.pdf.

Wright, G., Ardron, J., Gjerde, K., Currie, D., & Rochette, J. (2015). Advancing marine biodiversity protection through regional fisheries management: A review of bottom fisheries closures in areas beyond national jurisdiction. *Marine Policy*, *61*, 134–148.

ACKNOWLEDGEMENTS

We would like to thank the following people in particular:

Debra Austin, Jessica Battle, Fiona Curtin, Brittney Francis, Sophie Hulme, Rachael Kenningham, Chris Lauwerys, Mirella von Lindenfels, Sebastian Losada, Lance Morgan, Lisa Nutt, Sandrine Polti, Lisa Speer, Mili Patel, Susan Rolston, Hils Tranter, Monica Verbeek, Elizabeth Wilson

Maps:
Marine Conservation Institute

Design:
Communications INC
Wink Agency Ltd.

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The DSCC is registered with the Netherlands trade register under number 59473460, and holds the Dutch tax number 853509542.

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With thanks for the generous support of:

J.M. KAPLAN FUND

ADESSIUM FOUNDATION

THE OCEAN FOUNDATION

SYNCHRONICITY EARTH

and all of the DSCC member organizations