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Advancing marine biodiversity protection through regional fisheries management: a review of high seas bottom fisheries closures

Glen Wright (IDDRI), Jeff Ardron (IASS), Kristina Gjerde (IUCN), Julien Rochette (IDDRI)

DESTRUCTIVE FISHING ACTIVITIES IN AREAS BEYOND NATIONAL JURISDICTION

Fishing is one of the greatest threats to marine biodiversity in areas beyond national jurisdiction (the "high seas"). Bottom fishing in particular causes significant impacts to deep-sea ecosystems by damaging or destroying long-lived species, reducing the complexity of the seabed and decreasing species diversity and faunal biomass. Bottom trawling is generally considered to be the most destructive method as it involves dragging heavy fishing gear across the seabed.

SLOW DEVELOPMENT OF HIGH SEAS BOTTOM FISHERIES CLOSURES

In 2006, the United Nations General Assembly called on Regional Fisheries Management Organisations (RFMOs) to take specific actions to regulate high seas bottom fisheries, including to close areas of the high seas to bottom fishing activities where there is likely to be significant adverse impacts to vulnerable marine ecosystems (VMEs). Reviews have found that progress has been slow, and this update on the current status of closures suggests that RFMO biodiversity conservation efforts continue to advance slowly.

STRENGTHENING THE ROLE OF REGIONAL FISHERIES MANAGEMENT ORGANISATIONS IN BIODIVERSITY CONSERVATION

Analysis of high seas bottom fisheries closures highlights that existing powers are not being fully utilised and that best practice is not always followed. RFMOs will need to fully utilise their powers before authorising high seas bottom fishing to proceed, including adopting measures to prevent significant adverse impacts on VMEs and implementing high seas bottom fisheries closures. A possible new international agreement on the conservation and sustainable use of marine biodiversity in areas beyond national jurisdiction could facilitate these improvements, for example by providing common overarching principles and objectives.

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LIST OF ABBREVIATIONS

ABNJ	Areas beyond national jurisdiction
BBNJ	Working Group Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction
BPA	Benthic Protected Area
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CEM	NAFO Conservation and Enforcement Measures
CM	Conservation Measure
CMM	Conservation and Management Measure
COML	Census of Marine Life
COP	Conference of the Parties
DSCC	Deep Sea Conservation Coalition
EC	European Commission
EU	European Union
FAO	United Nations Food and Agriculture Organization
HSBFC	High seas bottom fishery closure
ICES	International Council for the Exploration of the Sea
IEO	Instituto Español de Oceanografía
IOFC	Indian Ocean Fishery Commission
IOTC	Indian Ocean Tuna Commission
ISA	International Seabed Authority
IUCN	International Union for the Conservation of Nature
mm	Millimetre
MAR	Mid-Atlantic Ridge
MOU	Memorandum of understanding
MPA	Marine Protected Area
NAFO	North Atlantic Fisheries Organisation
NOAA	United States National Oceanic and Atmospheric Administration
NEAFC	North East Atlantic Fisheries Commission
NPFC	North Pacific Fisheries Commission
NPOC	North Pacific Ocean Convention
NZ	New Zealand
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic (Oslo-Paris Convention)
PECMAS	NEAFC Permanent Committee on Management and Science
NEAFC	Permanent Committee on Management and Science
RFB	Regional Fishery Body
RFMO	Regional Fisheries Management Organisation
SAI	Significant adverse impact
SC	Scientific Council/Committee
SEAFO	South East Atlantic Fisheries Organisation
SIODFA	Southern Indian Ocean Deepsea Fishers Association
SIOFA	South Indian Ocean Fisheries Agreement
SPREP	South Pacific Regional Environment Programme
SPRFMO	South Pacific Regional Fisheries Management Organisation
SRA	Stock rebuilding area
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UN DOALOS	United Nations Division for Ocean Affairs and Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
UNGA	United Nations General Assembly
VME	Vulnerable marine ecosystem
WG-EMM	CCAMLR Working Group on Ecosystem Monitoring and Management
WGEAFM	NAFO Working Group on Ecosystem Approach to Fisheries Management
WGFMS	NAFO Working Group of Fisheries Managers and Scientists

1. INTRODUCTION

Ocean regions that do not fall under the jurisdiction of any State, areas beyond national jurisdiction (ABNJ or the "high seas"),[1] represent almost half of the planet's surface and a significant portion of its biodiversity. The high seas are increasingly under threat from human activities, including seabed mining, navigation and fishing. The international community has called on Regional Fisheries Management Organisations to take a number of actions to protect vulnerable marine ecosystems (VMEs) in these areas, including closing areas to bottom fishing (high seas bottom fisheries closures; HSBFCs).

The aims of this paper are twofold: firstly, to review the efforts made by RFMOs to implement HSBFCs and suggest options for improving the protection of VMEs within this framework; and secondly, to provide a brief overview of options for addressing fisheries in any new international agreement on high seas biodiversity, currently under discussion.

Section 2 outlines the global context, including an overview of bottom fishing and its impacts, while Section 3 details the context and process for HSBFCs. Section 4 provides an assessment of RFMO performance in the Atlantic, Pacific, Southern and Indian oceans. Section 4 considers the role RFMOs in biodiversity conservation in light of their performance in relation to HSBFCs, and highlights some pathways for strengthening their role. Section 6 concludes by summarising the issues at stake and the possible ways forward.

2. CONTEXT

2.1. Increasing exploitation of the high seas

The high seas were once thought to be relatively devoid of life, and maritime activities were mostly confined to coastal waters. There has long been speculation regarding mineral resources,[2] but their distance from shore limited exploitation. However, scientific and technological advancements, coupled with an ever-expanding global appetite for resources, have increased interest in these areas.

The exploitation of the mineral resources of the deep seabed, considered imminent 35 years ago, is now back on the agenda.[3] Additionally, bioprospecting in ABNJ is on the increase (Leary 2011), and climate mitigation activities, such as ocean fertilisation, have been tested (Boyd 2013; Williamson *et al.* 2012; Lukacs 2012). Each of these new activities brings unique threats to the marine environment and challenges existing legal and regulatory frameworks (e.g. Rayfuse, Lawrence & Gjerde 2008).

Existing activities are also intensifying: international maritime traffic has grown exponentially over recent decades (UNCTAD 2013) and fishing activities have further expanded into the high seas as demand has increased and fisheries have collapsed (Merrie *et al.* 2014; Bensch *et al.* 2009).[4]

1. ABNJ include both the Area and the high seas. According to Article 1.1(1) of UNCLOS, the Area is the *"seabed and ocean floor and subsoil thereof beyond the limits of national jurisdiction"*. Article 86 defines the high seas as *"all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State (…)"*.

2. There has long been speculation of deep sea petroleum and minerals, though these were often unrealistic. See, e.g. J. L.Mero's *Mineral Resources of the Sea* (1965).

3. The ISA has entered into 26 contracts for the exploration of minerals in the Area: http://www.isa.org.jm/en/scientific/exploration/contractors.

4. Mainly to target highly migratory fish stocks such as tunas, and deep-sea fish stocks.

2.2. Bottom fishing

Bottom fishing in particular causes significant impacts on deep-sea ecosystems (Pusceddu *et al.* 2014), damaging or destroying long-lived species, reducing the complexity of the seabed, and decreasing species diversity and faunal biomass (Althaus *et al.* 2009; Reed, John *et al.* 2005; Watling & Norse 1998). Bottom trawling is generally considered to be the most destructive method as it involves dragging heavy fishing gear across the seabed, but harm can result from all bottom-contact fishing methods (FAO 2008; ICES 2007).

The ability of deep-sea ecosystems to recover from these impacts is limited due to the age and slow growth rates of deep-sea bottom species (Norse *et al.* 2012). Some corals grow at a rate of 0.004 to 0.035 millimetres per year, and 4,550 year old coral bycatch has been documented (Roark *et al.* 2009; Hall-Spencer *et al.* 2002). The impacts are therefore long lasting or irreversible (Althaus *et al.* 2009); full recovery may take decades, even centuries (Waller *et al.* 2007). Serious impacts have now been widely reported in all oceans (Rogers & Gianni 2010).

2.3. International regulation of fisheries in ABNJ

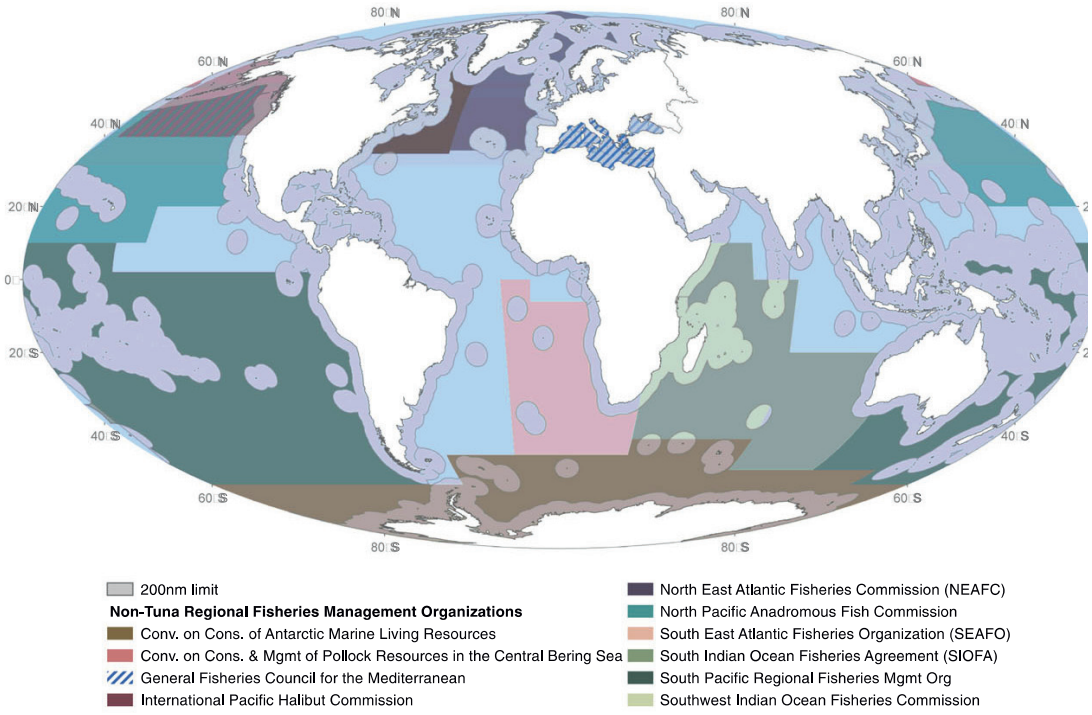
The management of fisheries has long been the subject of intensive debate, though in recent years deep-sea fisheries in ABNJ has been a particular focus at the United Nations General Assembly (UNGA) and other forums.[5] The Johannesburg Plan of Implementation (2002) set out a range of actions in relation to fisheries,[6] while the Rio+20 *"Future We Want"* document (2012) calls on States to *"enhance action to manage bycatch, discards and other adverse ecosystem impacts from fisheries, including by eliminating destructive fishing practices"* and to *"enhance actions to protect vulnerable marine ecosystems from significant adverse impacts"*.[7]

In 2004, the United Nations General Assembly (UNGA) called for urgent action and to consider on a case-by-case basis the interim prohibition of destructive fishing practices in ABNJ until appropriate conservation and management measures had been adopted.[8] In 2006, the UNGA adopted a more detailed resolution to ensure the long-term sustainability of deep-sea fish stocks that required specific measures to protect VMEs from the serious adverse impacts (SAIs) of bottom fisheries in ABNJ.[9] This Resolution 61/105 (2006) specifically calls for:

- **Impact assessments**: *"To assess, on the basis of the best available scientific information, whether individual bottom fishing activities would have significant adverse impacts on vulnerable marine ecosystems, and to ensure that if it is assessed that these activities would have significant adverse impacts, they are managed to prevent such impacts, or not authorized to proceed"*;[10]
- **Management of fisheries to prevent SAIs to VMEs**: *"To identify vulnerable marine ecosystems and determine whether bottom fishing activities would cause significant adverse impacts to such ecosystems and the long-term sustainability of deep sea fish stocks, inter alia, by improving scientific research and data collection and sharing, and through new and exploratory fisheries"*;[11]
- **'Move-on' rules**: *"To require members of the regional fisheries management organizations or arrangements to require vessels flying their flag to cease bottom fishing activities in areas where, in the course of fishing operations, vulnerable marine ecosystems are encountered, and to report the encounter so that appropriate measures can be adopted in respect of the relevant site"*;[12] and
- **High seas bottom fisheries closures (HSBFCs)**: *"In respect of areas where vulnerable marine ecosystems (…) are known to occur or are likely to occur based on the best available scientific information, to close such areas to bottom fishing and ensure that such activities do not proceed unless conservation and management measures have been established to prevent significant adverse impacts on vulnerable marine ecosystems"*.[13]

5. For example, the issue has also been raised at meetings of the Conference of the Parties to the Convention on Biological Diversity (CBD), beginning in 2004 at CBD COP-7. In 2010, COP-10 adopted Decision X/29 that called on States and RFMOs to comply with the relevant international instruments (paragraph 54).
6. Plan of Implementation of the World Summit on Sustainable Development, A/CONF.199/20, Chapter 1, Resolution 2, Johannesburg, September 2002.
7. UN. The future we want, Pub. L. No. A/CONF.216/L.1 (2012).
8. UN. 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 A/RES/59/25 (2004).
9. UN. 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, A/RES/61/105 (2006).
10. Section 83(a).
11. Section 83(b).
12. Section 83(d).
13. Section 83(c).

Map 1. Geographical Coverage of Non-Tuna RFMOs*



Source: Ban *et al.* 2014.
*Not showing the North Pacific Fisheries Commission (NPFC).

States participating in ongoing negotiations to establish a regional fisheries management organisation (RFMOs) or other competent governance arrangement were called upon to expedite the negotiations and, by 31 December 2007, adopt and implement interim measures.[14] A later deadline of 31 December 2008 for implementation of such measures by existing RFMOs was also set and States were called on to ensure that bottom fishing did not occur in ABNJ after this date, unless and until appropriate regulations were in place.[15] Following a review of progress, the UNGA adopted resolution 64/72,[16] which recalled the importance of resolution 61/105[17] and further called upon States to:[18]

> take action immediately, individually and through regional fisheries management organizations and arrangements, and consistent with the precautionary approach and ecosystem approaches, to implement the 2008 International Guidelines for the Management of Deep-sea Fisheries in the High Seas of the Food and Agriculture Organization of the United Nations in order to sustainably manage fish stocks and protect vulnerable marine ecosystems, including seamounts, hydrothermal vents and cold water corals, from destructive fishing practices, recognizing the immense importance and value of deep sea ecosystems and the biodiversity they contain.

Regional fisheries bodies (RFB),[19] and, more specifically, RFMOs, are the preferred vehicle for fisheries regulation at the regional level, and the United Nations Fish Stocks Agreement (UNFSA) imposes an obligation on contracting parties to cooperate with and through RFMOs.[20] There are a number of types of RFB, the most important

14. Section 85.
15. Section 83.
16. UN. 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, A/RES/64/72 (2009).
17. Section 114.
18. Section 113.
19. RFB refers to a mechanism through which States or entities (such as supranational organisations and unrecognised States) cooperate on the conservation, management and development of fisheries. See http://www.fao.org/fishery/topic/16800/en
20. Art. 8(3)

distinction being between those with a mandate to establish legally binding measures (RFMOs) and those that do not.[21]

In particular, the UNFSA places an obligation on States to establish RFMOs where they do not exist in relation to straddling and highly migratory fish stocks.[22] Despite this requirement, deep-sea bottom fisheries were allowed to develop without the establishment of a RFMO, in part due to the failure of the UNFSA to directly cover discrete high seas bottom fisheries (Gianni 2005). After the 2006 UNGA resolution 61/105, there was broad support in the international community to ensure that all high seas fisheries were covered by an RFMO. In part due to subsequent pressure from the UNGA regarding unregulated high seas deep-sea fishing, a number of new RFMOs have been established (Map 1) or are in the process of being established.[23]

Despite the strong calls for action, assessments conducted by civil society, the scientific community and the UNGA have highlighted that implementation gaps remain. Despite increased engagement with these issues, a number of RFMOs are not yet fully implementing the UNGA resolutions to protect high seas biodiversity in the deep ocean (DSCC 2011; Weaver *et al.* 2011; Rogers & Gianni 2010).

2.4. A new international agreement on high seas biodiversity

Aside from the fisheries-specific discussions and resolutions, the international community has initiated a process to consider negotiating an international agreement for the conservation and sustainable use of marine biodiversity in ABNJ (Druel *et al.*, 2013), possibly an implementing agreement to the United Nations Convention on the Law of the Sea (UNCLOS). Discussions are currently taking place under the auspices of the *Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction* (BBNJ Working Group)[24] and a decision on whether to open formal negotiations will be taken by the end of the 69th session of the UNGA, i.e. by September 2015.[25]

As early as 2008, the International Union for the Conservation of Nature (IUCN) noted that *"whether the agreement should cover fisheries activities will be a major point of dispute"* (Gjerde *et al.* 2008). This issue was indeed raised early on by States[26] and observers,[27] and has been a recurring feature of BBNJ Working Group meetings. A number of fishing States have argued strongly that there is no place for fisheries in a new agreement as this is already covered by the UNFSA and RFMO regulations, and that these arrangements provide sufficient protection of marine biodiversity in ABNJ. Conversely, many States argue that as fish form part of the biodiversity of the high seas, and as fishing impacts on biodiversity are arguably greater than any other human activity, fisheries management should be implicated by any agreement on high seas biodiversity.

Though the "package deal" agreed in 2011 does not explicitly mention fisheries,[28] there nonetheless remains a link with fisheries through the protection of biodiversity, the implementation of marine protected areas (MPAs) and environmental impact assessment (EIA) processes. Given this

21. Some RFMOs focus on the management of particular highly migratory species, most notably tuna, while others manage all fish stocks in a particular fishery. RFMOs usually comprise coastal States from the region, as well as countries with interests in the fisheries concerned, such as distant-fishing nations.
22. Art. 8(5).
23. In the Southern Indian Ocean, the South Pacific and the North Pacific for instance.
24. The BBNJ Working Group was created in 2004 by UNGA resolution 59/24.
25. The Rio+20 outcomes document states: "before the end of the sixty-ninth session of the General Assembly we commit to address, on an urgent basis, the issue of the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction, *including by taking a decision on the development of an international instrument under the United Nations Convention on the Law of the Sea*" (UN. The future we want, A/CONF.216/L.1 (2012 Document A/61/65, §162). For an overview of the negotiations to date, see Druel et. al. (2013).
26. E.g. the first meeting of the BBNJ Working Group (2006) addressed fisheries issues, including IUU fishing and destructive fishing practices. Many delegations identified these two issues as "the greatest threats to marine biodiversity beyond areas of national jurisdiction" (Document A/61/65, Report dated 9 March 2006 of the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction, §33).
27. E.g. in 2008, Greenpeace made a proposal for a draft "High seas Implementing Agreement for the Conservation and Management of the Marine Environment in areas beyond national jurisdiction", proposing several fisheries-related measures (Greenpeace 2008).
28. Document A/66/119, Letter dated 30 June 2011 from the Co-Chairs of the Ad Hoc Open-ended Informal Working Group to the President of the General Assembly, § I. 1. (a) and (b). The Package Deal approach can be summed up as "nothing is agreed until everything is agreed"; i.e. all issues considered during a given negotiation are linked and a compromise or an outcome must be found for all of them. This approach stems from the original UNCLOS negotiations.

link, the extent to which fisheries will be covered in a new agreement, and how the agreement will interact with RFMOs mandates, has again been a source of much debate and disagreement at the two most recent BBNJ meetings (Wright *et al.*, 2014).

3. HIGH SEAS BOTTOM FISHERIES CLOSURES: CONTEXT AND PROCESS

The value and effectiveness of 'no-take' marine reserves is well-evidenced by the literature on MPAs, and studies have confirmed these benefits specifically in relation to HSBFCs (Roberts *et al.* 2005; Sumaila *et al.* 2007; White & Costello 2014; Edgar *et al.* 2014). HSBFCs are the only proven method for avoiding SAIs to VMEs (DSCC 2011).[29]

Nonetheless, mere declaration of closed areas does not guarantee protection (Agardy *et al.* 2011). Closures need to be ecologically coherent (Hiddink *et al.* 2006) and potential distributional effects must be considered (Dinmore *et al.* 2003). Strong monitoring and enforcement will also be required, along with additional and complementary conservation and management measures. Edgar *et al.* studied 87 MPAs and found the most effective to be "no take" areas that are well enforced, longstanding, large and geographically isolated[30] (Edgar *et al.* 2014). These considerations can be applied equally to HSBFCs and should be borne in mind when assessing the actions of RFMOs.

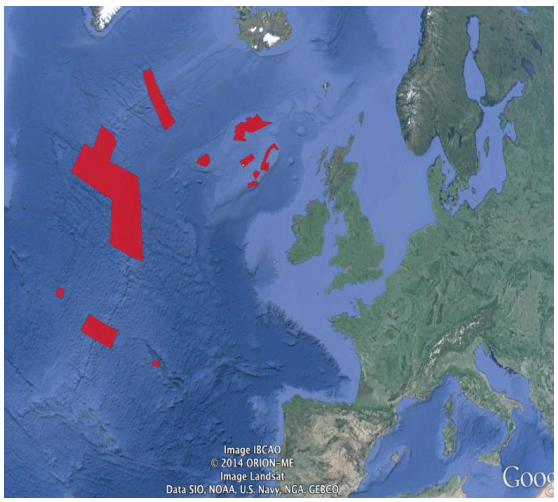
HSBFCs are particularly important because other measures are being under-utilised and may in any case be ineffective. For example, 'move-on' measures require a vessel to cease fishing when a potential VME is detected,[31] but there is a risk that such encounters will be underreported. The European Union (EU) recently expressed its concern that no parties to the North East Atlantic Fisheries Commission (NEAFC) have reported encounters with VMEs under its move-on rule,[32] stating that it is *"not sufficient to have measures in NEAFC legislation - they also have to be effective and consistent with the relevant UNGA Resolutions*".[33] Even if the bycatch weight thresholds were strict, and such measures were widely used, their effectiveness is questionable given the fragility of the ecosystems in question: irreversible damage may already have occurred, and the vessels simply "move on" to another potentially vulnerable area.

In terms of identifying and establishing HSBFCs, the UN Food and Agriculture Organization (FAO) has published guidelines that expand on key terms such as *"Vulnerable Marine Ecosystem"* and *"Serious Adverse Impact"*.[34] Vulnerability concerns the *"likelihood that a population, community, or habitat will experience substantial alteration from short-term or chronic disturbance, and the likelihood that it would recover and in what time frame"*.[35] Ecosystem characteristics are central to VME identification and the FAO Guidelines call for consideration of: uniqueness or rarity; functional significance; fragility; life-history traits of component species that make recovery difficult; and structural complexity.[36] The guidelines provide some examples of species groupings and geological features[37] which may indicate the presence of VMEs.[38] Noting the general nature of the criteria in the FAO Guidelines, and the variety of interpretations, Ardron *et al.* (2014) have elaborated a systematic process for identifying VMEs.

SAIs are those that compromise ecosystem structure or function in a manner that: impairs the ability of affected populations to replace themselves; degrades the long-term natural productivity of habitats; or causes significant loss of species richness, habitat or community types.[39] The guidelines list six factors to be taken into consideration when assessing whether an interaction with a VME is a SAI: intensity or severity of the impact; spatial extent of the impact; the sensitivity/vulnerability of the ecosystem; the recovery ability and recovery rate of the ecosystem; the extent to which ecosystem functions may be altered by the impact; and the timing and duration of the impact.[40]

29. For this reason, many commentators go even further: a recent study modelled the environmental and economic benefits of complete closure of the high seas, advocating such a course of action (White & Costello 2014), while the Global Ocean Commission has recommended the creation of a high seas regeneration zone (Global Ocean Commission 2014).
30. E.g. by deep water or sand.
31. Indicator species and bycatch thresholds are identified to provide an indication of when a VME may be present, and a vessel is generally required to cease fishing and move a certain distance.
32. In any case, NEAFC's move on rules initially had very high bycatch weight thresholds. These were subsequently significantly lowered in accordance with scientific advice.
33. NEAFC. (2013). Report of the 32nd Annual Meeting of the North-East Atlantic Fisheries Commission 11-15 November 2013 Volume II – Annexes (Vol. II), Annex C.
34. FAO, International Guidelines for the Management of Deep-Sea Fisheries in the High Seas (2009).
35. Ibid, paragraph 14.
36. Ibid, paragraph 42.
37. E.g. cold-water corals and sponge-dominated communities, and seamounts and hydrothermal vents.
38. FAO, International Guidelines for the Management of Deep-Sea Fisheries in the High Seas (2009), Annex.
39. Ibid, paragraph 17.
40. Ibid, paragraph 18.

Map 2. Current HSBFCs in the NEAFC area



Source: Adapted from NEAFC/Google Earth. See http://www.neafc.org/page/closures or download the Google Earth KML file at http://bit.ly/1mgOSJH.

4. A REVIEW OF HIGH SEAS BOTTOM FISHERIES CLOSURES

While there is considerable scope for interpretation of the FAO Guidelines, the wording of the UNGA resolutions is clear: "*close such areas to bottom fishing and ensure that such activities do not proceed unless conservation and management measures have been established to prevent significant adverse impacts on vulnerable marine ecosystems*". It is in this context that the HSBFCs implemented to date in the Atlantic (3.1), Pacific (3.2), Southern (3.3) and Indian (3.4) oceans are considered.

4.1. Atlantic Ocean

4.1.1. North-East Atlantic

NEAFC has closed a number of fished areas around the Hatton and Rockall Banks[41] and has permanently closed large areas of the Mid-Atlantic Ridge (MAR)[42] since April 2009, expanding on previous temporary closures.[43] These closures, initially made until 2015, were recently extended until 2017.[44] The last HSBFC to be added was Edora Bank, effective January 2013 (Map 2).[45] NEAFC is actively debating additional closures, though the issue of possible new HSBFCs was postponed until after the September 2014 meeting of the Permanent Committee on Management and Science (PECMAS). Instead, NEAFCs efforts are currently focused on improving the overall framework for protection.

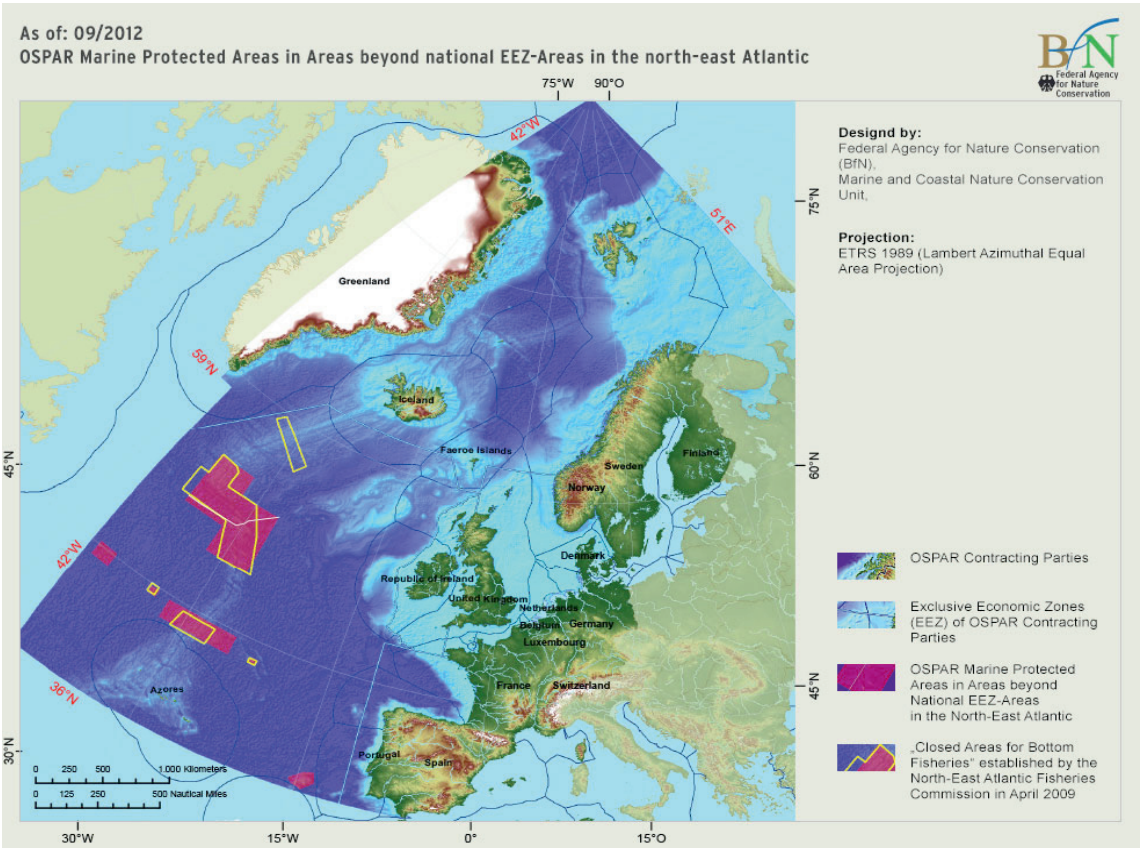
NEAFC has undertaken an exercise to assess whether its regulations are consistent with the UNGA resolutions and FAO Guidelines. This includes work by PECMAS and at the Annual Meetings, as well as a dedicated symposium with outside participation.[46] The 2012 Annual Meeting of NEAFC concluded that current measures are generally consistent with the relevant UNGA resolutions and FAO Guidelines, but that some improvements could be made. NEAFC's updated rules on the protection of VMEs were formally finalised earlier this year.[47]

In 2008, NEAFC signed a Memorandum of Understanding (MOU) with the OSPAR Convention. The MOU noted that both bodies *"have an interest in conserving the living resources of the seas including those located in areas beyond national jurisdiction"* and that they agree to *"promote mutual cooperation to- wards the conservation and sustainable use of marine biological diversity including protection of marine ecosystems in the North-East Atlantic"*.[48] The MOU states that they will cooperate *"regarding marine spatial planning and area management"*.[49] In this context, it is interesting to note that NEAFC's HSBFCs partially overlap with the high seas MPAs established by OSPAR (Map 3). Further to the MoU, NEAFC is also involved in the *"Madeira Process"*, initiated by the OSPAR Commission in 2009, to advance cooperation on marine biodiversity protection in ABNJ (Freestone *et al.*, 2014; Johnson, 2013). The ultimate goal of that process is to elaborate a *"Collective Arrangement"* for the collaborative management of selected aspects of biodiversity protection.

The MAR closures were proposed by Norway with the aim of protecting "*representative* vulnerable ecosystems".[50] The EU noted that these measures could *"only be a first step and need to be extended urgently if NEAFC is to respond to the*

41. The northeastern cluster of HSBFCs marked on Map 2, below. See http://www.neafc.org/closures/hatton-rockall.
42. Faintly visible in the western portion of Map 2, below.
43. Similar areas had been previously been temporarily closed.
44. For an overview of current closures, see: http://www.neafc.org/closures/vme
45. See http://www.neafc.org/closures/edorabank
46. http://neafc.org/pecmas/symposium
47. http://neafc.org/system/files/Rec.19-Protection-of-VMEs.pdf
48. Memorandum of Understanding between the North-East Atlantic Fisheries Commission (NEAFC) and the OSPAR Commission available at http://www.neafc.org/basictexts
49. Ibid.
50. Royal Ministry of Fisheries and Coastal Affairs (Norway), "Proposal for Revision of Areas Closed to Bottom Fisheries in the NEAFC Regulatory Area" (2008). Emphasis added.

Map 3. NEAFC HSBFCs along the MAR (yellow) and their partial overlap with OSPAR MPAs (red)



Source: German Federal Agency for Nature Conservation. http://mare.essenberger.de/en/karte-charlie-gibbs-schutzgebiet.php

expectations of the international community and protect vulnerable marine ecosystems".[51]

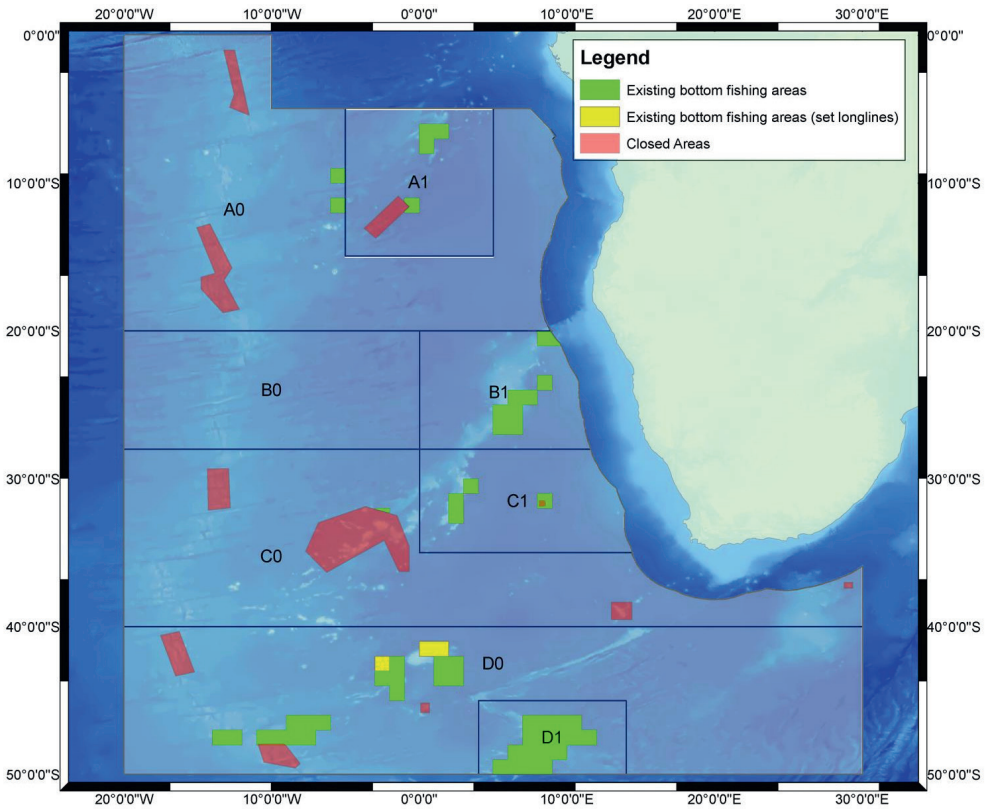
Additional VME closures along the northern part of the MAR were proposed in 2009 and in 2010 the International Council for the Exploration of the Sea (ICES) recommended extending existing closures and implementing a closure on the Reykjanes Ridge,[52] which remains classified as an existing fished area.[53] The 2012 annual meeting did however see the adoption of one additional closure (Edora Bank), and expansion of one other (Hatton Bank).[54]

In June 2013, ICES again advised boundary extensions for existing closed areas, as well as recommending 3 new closures[55] and continuing to recommend closure of Reykjanes Ridge.[56] ICES also advised making temporary closures permanent, given the nature of the VMEs in question.[57] A notable aspect of ICES' advice in relation to the Josephine Seamount is that it advised a *"a closure to bottom fisheries, the boundary of which should correspond to the Josephine Seamount High Seas MPA established by OSPAR".*[58] Such a proposal indicates a willingness to further the cooperative approach to high seas MPAs by continuing to align HSBFCs with high seas MPAs.

At the 2013 annual meeting NEAFC's Permanent Committee on Management and Science (PECMAS) set out the details of the proposed changes

51. European Commission, "North East Atlantic : Only Limited Progress Made to Protect Vulnerable Marine Ecosystems" (April 03, 2009) <http://ec.europa.eu/fisheries/news_and_events/press_releases/030409/index_en.htm>.
52. ICES, Report of the ICES Advisory Committee, 2010. Book 9: Widely Distributed and Migratory Stocks. Copenhagen.
53. NEAFC map: http://www.neafc.org/page/closures
54. NEAFC, "Report of the 31st Annual Meeting of the North-East Atlantic Fisheries Commission 12-16 November 2012" (2012) 8.
55. Hatton–Rockall Basin, Hatton Bank, and the Josephine Seamount. ICES, "Vulnerable Deep-Water Habitats in the NEAFC Regulatory Area." (2013)
56. ICES. (2013). General advice: Assessment of the list of VME indicator species and elements Advice. In ICES Advice 2013, Book 1.
57. ICES, "OSPAR/NEAFC Special Request on Existing and Potential New Management Measures for Ecologically and Biologically Significant Areas (EBSAs)." 1.5.6.6, 1.
58. Ibid. 9.

Map 4. HSBFCs in the SEAFO area



Source: SEAFO. Conservation Measure 26/13 on Bottom Fishing Activities in the SEAFO Convention Area 2013 5

to VME management, including establishing new closed areas. There was considerable debate regarding closure of the Josephine seamount as the seafloor is subject to an outer continental shelf claim by a Member State.[59] The parties were unable agree on any of the recommended closures and PECMAS was asked to attempt to propose measures amenable to all parties at the following meeting.[60]

4.1.2. North-West Atlantic

At present, there are 19 areas that are closed to bottom fishing in the North-West Atlantic.[61] These areas will remain closed until the end of 2014. However, the North Atlantic Fisheries Organisation (NAFO) has previously extended temporary closures.[62] NAFO is also currently undertaking a comprehensive review of its Conservation and Enforcement Measures (CEM) and it is expected that existing HSBFCs will be extended indefinitely.[63] It is envisaged that some of the existing HSBFCs may be enlarged and that new HSBFCs may be implemented.[64]

A number of NAFO bodies have considered implementation of the UNGA resolutions through the identification of VMEs and fisheries closures. These include the NAFO Scientific Council (SC), the SC Working Group on Ecosystem Approach to Fisheries Management (previously WGEAFM, now WG-ESA), the Working Group of Fisheries Managers and Scientists on Vulnerable Marine Ecosystems (WGFMS-VME), which has now been subsumed by the new Fisheries Commission and Scientific Council Working Group on the Ecosystem Approach Framework to Fisheries

59. NEAFC, "Report of the 32nd Annual Meeting of the North-East Atlantic Fisheries Commission 11-15 November 2013" (2013) 9.
60. NEAFC, "Report of the 32nd Annual Meeting of the North-East Atlantic Fisheries Commission 11-15 November 2013."
61. NAFO, "Northwest Atlantic Fisheries Organization Conservation and Enforcement Measures" (2014) 19–23.
62. The official confirmation of the extension, as well as updated management measures, will be effected at the 36th Annual Meeting (22-26 September in Vigo, Spain).
63. Personal communication.
64. Personal communication.

Management (WG-EAFFM), which had its first meeting in July 2014.

The first NAFO CEM was the closure of four seamount areas to bottom fishing in 2007.[65] The first "Coral Protection Zone" for the closure of a bottom fishery was defined in the 2008 CEM.[66] However, NAFO concluded that little interaction currently takes place between coral indicator species and fishing activity, despite the findings of the SC,[67] and requested that the SC review the data on VME locations.[68]

Two additional seamounts were protected in 2008,[69] and in 2009 the Annual Meeting adopted 11 additional area closures based on the advice of the SC.[70] The DSCC reported that closure of these areas was *"estimated to have affected approximately 0.7 percent of bottom fishing in the NAFO area (…). In other words, the area closures did not affect approximately 99 percent of the bottom fishing that has occurred in recent years"* (DSCC 2011). Since the initial adoption of these closures, NAFO adopted one additional small HSBFC in 2013.[71]

Research reported by the SC in these regions suggests that the actual area of the VMEs is much more extensive than the small areas protected by fisheries closures.[72] The closed areas appear to cover only parts of the fishery that have been relatively little exploited (DSCC 2011). At its June 2014 meeting, WG-EAFFM noted that SC work on SAIs on VMEs is ongoing, with final results due in 2016.[73] It was also noted that available data indicates VME presence in two HSBFC candidate areas, though these have not yet been considered by the annual meeting.[74]

4.1.3. South-East Atlantic

The South East Atlantic Fisheries Organisation (SEAFO) has closed 11 seamount areas where VMEs are present.[75] Closures were initially made on a temporary basis in 10 areas in 2007,[76] with SEAFO subsequently extending the closures until certain conditions were met (mapping of the concerned area, impact assessment, and a research fishery plan).[77] In 2010 the closures were revised and made permanent. SEAFO has also delineated its bottom fishing footprint and implemented exploratory fishing protocols for new fishing in previously unexploited areas.

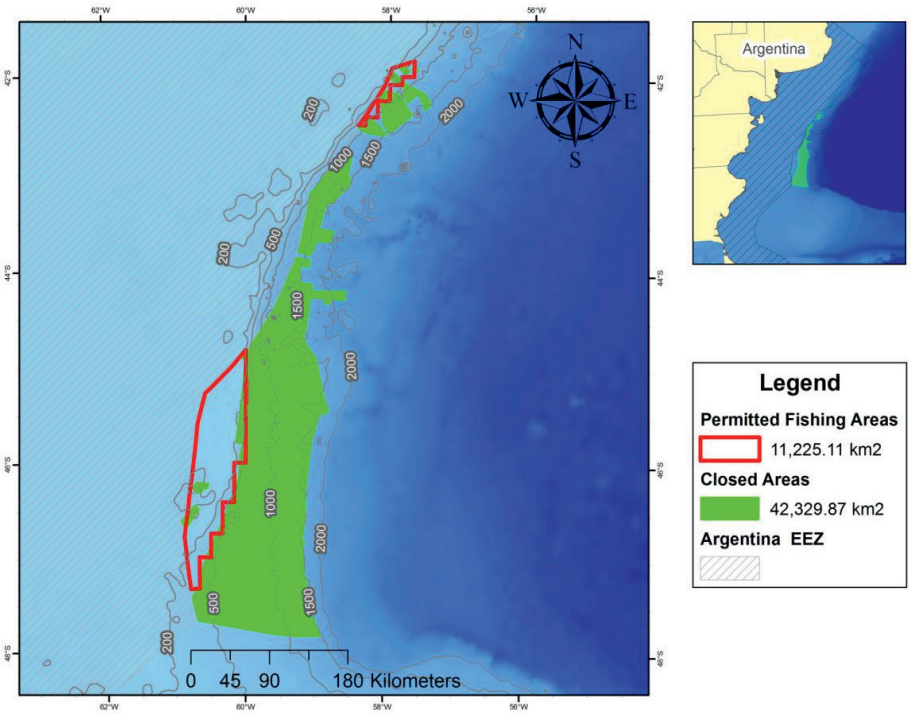
During the 2010 revision, several new closures were adopted, while several initially closed areas were reopened to bottom fisheries. Most contained seamounts at depths greater than 2000 metres and as such are unlikely to be affected (DSCC 2011). The closures were designed to close representative areas of seamounts along the ridge system.

Although several historically fished seamount areas are now subject to closures, areas where most fishing has previously occurred remain open. Of the 11 closed areas, 7 are considered to be unexploited, with the remaining areas being only "slightly exploited".[78]

The Scientific Committee (SC) notes 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"* and appropriate conservation

65. NAFO, "Northwest Atlantic Fisheries Organization Conservation and Enforcement Measures". Vol. 1. NAFO/FC Doc. 07/1 (Revised) (2007). In spite of the closures, small scale and exploratory fishing not exceeding *"20% of the fishable area of each seamount"* was initially permitted, though this condition has now been removed.
66. NAFO, "Northwest Atlantic Fisheries Organization Conservation and Enforcement Measures," vol 1 (2008) 12.
67. NAFO, "Report of the NAFO SC Working Group on Ecosystem Approach to Fisheries Management (WGEAFM) Response to Fisheries Commission Request 9.a" (2008).
68. NAFO, "Meeting Proceedings of the General Council and Fisheries Commission for 2008/2009" (2009) 147.
69. NAFO, "Northwest Atlantic Fisheries Organization Conservation and Enforcement Measures" (2009) 12.
70. NAFO, "Northwest Atlantic Fisheries Organization Conservation and Enforcement Measures" (2010) 13–14.
71. NAFO, "Northwest Atlantic Fisheries Organization Conservation and Enforcement Measures." NAFO/FC Doc. 14/1 (2014) 22.
72. NAFO, "Report of the NAFO SC Working Group on Ecosystem Approach to Fisheries Management (WGEAFM) Response to Fisheries Commission Request 9.a.", NAFO. Scientific Council Meeting, 22-30 October 2008, Copenhagen, NAFO SCS Doc. 08/26. NAFO, Report of the NAFO SC Working Group on Ecosystem Approach to Fisheries Management (WGEAFM). Response to Fisheries Commission Request 9.b and 9.c. Scientific Council Meeting, 4-18 June 2009, Dartmouth, Canada. NAFO SCS Doc. 09/6.
73. NAFO, "Report of the Fisheries Commission and Scientific Council Working Group on the Ecosystem Approach Framework to Fisheries Management". NAFO FC/SC Doc. 14/03 (2014) 7.
74. Ibid 5.
75. Conservation Measures 18/10 on the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area 2010.
76. Conservation Measures 06/06 on the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area.
77. See Conservation Measure 11/07 Laying Down Conditions for the Resumption of Fishing Activities in Areas Subject to Closure through Conservation Measure 06/06.
78. Conservation Measures 18/10 on the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area.

Map 5. HSBFCs unilaterally declared by Spain



Source: Gianni 2012.

measures should consider any such area.[79] Accordingly, substantial areas of seamounts and ridge systems remain open to bottom fishing in the SEAFO area under exploratory fishing protocols. This includes a portion of the Walvis Ridge previously surveyed by Spain and Namibia (DSCC 2011).

The SC has also previously recommended prohibiting all forms of trawling and gillnet fishing to take a precautionary view towards the VMEs that were not closed.[80] However, this was not acted on by the commission (O'Leary 2008).

The introduction of new closures/identification of VMEs has not been a significant topic for discussion at the SEAFO annual meetings since the implementation of the 2010 closures.

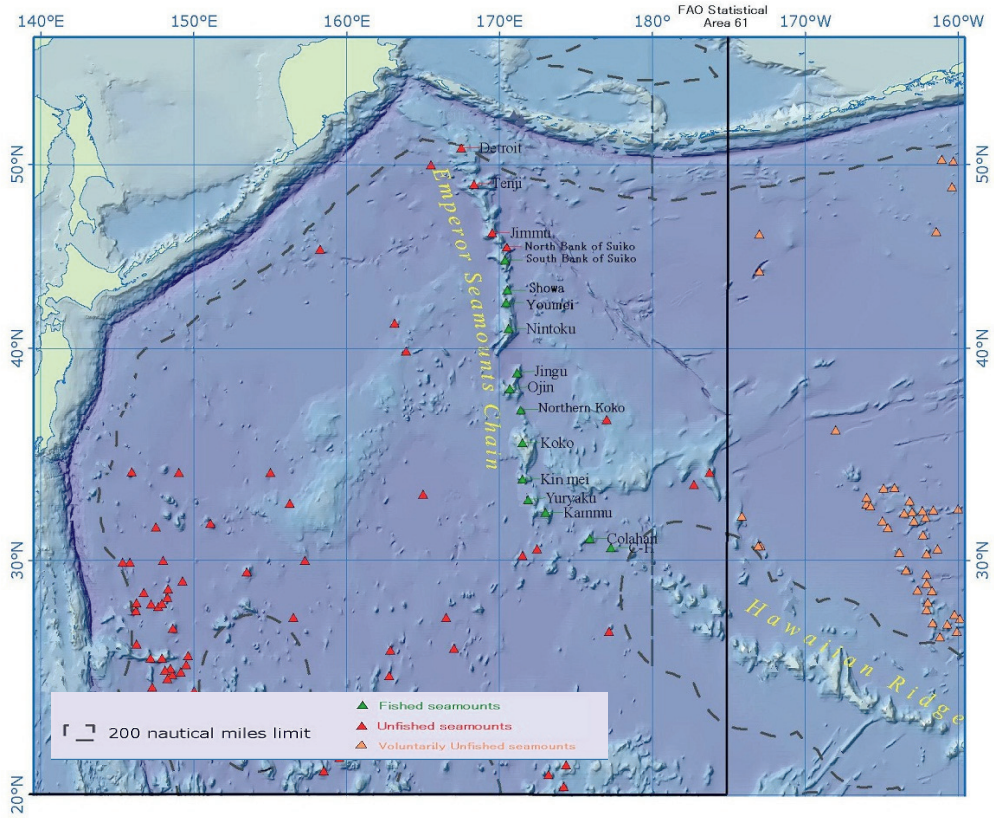
4.1.4. South-West Atlantic

Spain is the only State known to conduct significant bottom fishing activities in the high seas of the South-West Atlantic[81] and has published a list of vessels authorised to bottom fish in ABNJ.[82] In the absence of a RFMO for this region, Spain closed 9 areas to bottom fishing in July 2011, pursuant to a EU regulation that implemented the UNGA resolutions.

Noting that the absence of a competent fisheries body does not exempt States from their obligation to adopt measures for the conservation of marine biodiversity in ABNJ, the EU passed a regulation in 2008 requiring States to identify VMEs in high seas regions where their fishing vessels operate and implement fisheries closures in respect of their vessels.[83] It was envisaged that this regulation would mainly apply to the South West Atlantic.[84]

79. SEAFO, "Report of the SEAFO Scientific Committee" 7–8.
80. SEAFO, "Report of the SEAFO Scientific Committee" (2007) s agenda item 8.
81. One vessel from Estonia also fished in this area in 2010 and was reported to have followed EU regulatory requirements. EU, "EU Report on the Implementation of Measures Pertaining to the Protection of Vulnerable Marine Ecosystems from the Impact of Bottom Fishing on the High Seas in UNGA Resolution 61/105 of 2006 and UNGA Resolution 64/72of 2010" (2010) 6.
82. Spanish Government, "Deep-Sea High Seas Fisheries: Vessels Authorized to Conduct Bottom Fisheries in Areas beyond National Jurisdiction (UNGA 61/105, Paragraph 87)."
83. 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 2008 8, preamble 2.
84. The EU also envisaged application to the Southern Indian Ocean, as there was no RFMO at that time: "EU Report on the Implementation of Measures Pertaining to the Protection of Vulnerable Marine Ecosystems from the Impact of Bottom Fishing on the High Seas in

Map 6. Seamounts within NPOC area



Source: NPOC website. http://nwpbfo.nomaki.jp/Map.html.

The EU initially intended to review this regulation in 2012,[85] but to date such a review has not been carried out.[86]

Between 2007-2009, Spain's Oceanographic Institute (Instituto Español de Oceanografía; IEO) conducted a series of 11 multidisciplinary research cruises with the aim of identifying VMEs on the high seas of the South West Atlantic and making a preliminary assessment of how fishing activity was impacting these areas (Portela *et al.* 2010). The research found the incidence of vulnerable species to be low or negligible at the depths where bottom trawling activities take place and that other fishing activity, mostly for cephalopod species of the Patagonian Shelf, probably has a small adverse impact on VMEs (Portela *et al.* 2010). The IEO proposed closing 9 areas containing VMEs. Beginning in July 2011, these areas were closed for bottom fishing for a period of six months (DSCC 2011).[87] Spain also restricted its bottom fishing footprint to two areas already fished for 25 years, assuming that these areas would not still contain VMEs which could be damaged by bottom fishing.[88]

4.2. Pacific Ocean

4.2.1. North Pacific

No formal HSBFCs have been implemented in the North Pacific as the relevant RFMO is not yet fully functional. Early State reporting on potential

UNGA Resolution 61/105 of 2006 and UNGA Resolution 64/72of 2010" (2010) 2.

85. EU. 2010. "EU Report on the Implementation of Measures Pertaining to the Protection of Vulnerable Marine Ecosystems from the Impact of Bottom Fishing on the High Seas in UNGA Resolution 61/105 of 2006 and UNGA Resolution 64/72of 2010." 2

86. Review of the regulation remains on the Commission's work programme for 2013. See EC, "Commission Actions Expected to Be Adopted: 01/11/2013 - 31/12/2013" 1.

87. Citing Personal Communication from Carmen Paz Marti, Ministry of the Environment, Spain.

88. EU, "EU Report on the Implementation of Measures Pertaining to the Protection of Vulnerable Marine Ecosystems from the Impact of Bottom Fishing on the High Seas in UNGA Resolution 61/105 of 2006 and UNGA Resolution 64/72of 2010" (2010) 6.

VMEs in the region suggests agreement on closure of one seamount, but mixed positions regarding additional closures and measures.

In March 2011, the substantive negotiations of the *Convention on the Conservation and Management of High Seas Fisheries Resources in the North Pacific Ocean* (North Pacific Ocean Convention, NPOC) were concluded.[89] The participants agreed to Interim Measures for the Northeast Pacific Ocean and decided to hold preparatory meetings to prepare for implementation of the Convention and establishment of the North Pacific Fisheries Commission (NPFC).[90] There is little publicly available information regarding the Convention's current status,[91] though the US' National Oceanic and Atmospheric Administration notes that the Convention text was agreed to by the negotiating participants in February 2012 (NOAA 2013).

While no formal discussion of VME measures has yet taken place, the participating States have each published a report identifying VMEs and assessing the impacts caused by bottom trawl fishing activities. Some agreement appears to have been reached in these reports that certain areas should be closed.

Japan stated that *"research results so far do not support the existence of serious adverse impacts on VMEs and marine species"* from its fishing activities, but acknowledged that VMEs may exist in areas not covered by the research and that VMEs may have existed in the past.[92] Taking a precautionary approach Japan suggested a *"tentative"* closed area for part of Koko Seamount where certain species were detected,[93] tentative prohibition of bottom gillnet fishing in areas deeper than 1,500m,[94] and closure of an additional, smaller seamount (C-H Seamount).[95]

South Korea agreed on tentative closure of the relevant part of the Koko Seamount (Map 6) and temporary closure of C-H Seamount[96]. South Korea also suggested "provisionally" prohibiting bottom fishing north of latitude 40 degrees. Russia also noted the Koko Seamount as an area for closure.[97] The US agreed on the Koko Seamount closure and proposed a marine stock rebuilding area (SRA) that would be temporarily closed to bottom trawling and all other bottom-fishing operations for up to 6 years.[98]

The closures suggested in these reports remain proposals only and are provisional in nature until the Convention becomes a functioning RFMO. Even if some countries unilaterally prohibit their vessels from fishing in the proposed areas, others would be free to continue bottom fishing in that area.

4.2.2. South Pacific

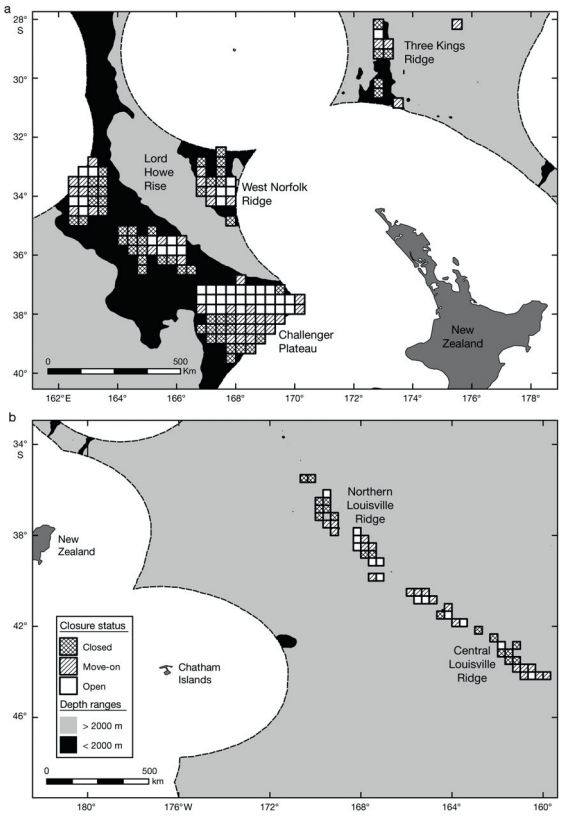
The South Pacific Regional Fisheries Management Organisation (SPRFMO) has implemented conservation and management measures, while New Zealand (NZ) has closed some large fishing blocks to its vessels as a precautionary measure to protect VMEs.

The *Convention on the Conservation and Management of High Seas Fishery Resources in the South Pacific Ocean* was adopted in November 2009 and entered into force in August 2012.[99] The First SC Meeting, held in October 2013, noted that the level of deep-water fishing activity in the SPRFMO area is currently low, but that it may increase. Given that relatively low levels of demersal fishing can quickly cause long-lasting impacts on VMEs, the Preparatory Conference agreed that the Committee should conduct research, including predictive habitat modelling, to evaluate the probability of the presence of VMEs and bycatch assessment.[100]

The interim approach taken since implementation was that each party declared its 2002-2006 bottom fishing footprint and agreed not fish outside that area,[101] effectively closing those outside areas.

89. "Record of the 10th Multilateral Meeting on Management of High Seas Fisheries in the North Pacific Ocean." 2011. Vancouver, British Columbia.
90. Ibid.
91. There are no updates on the Convention's official website since the tenth multilateral meeting in 2011. See http://nwpbfo.nomaki.jp/.
92. Fisheries Agency of Japan, "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 Specie" (2008) 14.
93. Ibid 14–15.
94. Ibid 16.
95. Ibid 17.
96. Republic of Korea Ministry for Food, Agriculture, Forestry and Fisheries, "Reports on Identification of VMEs and Assessment of Impacts Caused by Bottom Trawl Fishing Activities on VMEs And/or Marine Species" (2008) 6–7.
97. Russian Federation, "Report on Identification of VMEs and Assessment of Impact by Bottom Fishing Activities on VMEs and Marine Species" (2008) 7.
98. NOAA Fisheries, "Reports on Identification of VMEs and Assessment of Impacts Caused by Bottom Fishing Activities on VMEs and Marine Species" (2008) 39–40.
99. For current ratification status, see http://www.mfat.govt.nz/Treaties-and-International-Law/01-Treaties-for-which-NZ-is-Depositary/0-sprfmo-convention.php.
100. SPRFMO Scientific Committee, "Research Programme 2013."
101. "Interim Measures Adopted by Participants in Negotiations to Establish South Pacific Regional Fisheries Management Organisation."

Map 7. Open, move-on and closed blocks in NZ's bottom trawl footprint*



Source: Penney *et al.* 2009. *Southern Louisville footprint blocks not shown. Dark grey shading shows the trawlable seabed area <2000 m depth.

At its second meeting in January 2014, the Commission adopted a conservation and management measure (CMM) for the management of bottom fishing[102] that reflects the interim approach, with States agreeing to undertake bottom fishing only within their 2002-2006 footprints until 2016 or until an alternative measure is introduced. As early as 2007 the SPRFMO Science Working Group noted that effective protection of VMEs would likely require the establishment of HSBFCs.[103] The CMM provides for the closure of VMEs to fishing activities, it does not specifically identify such an area.[104] The CMM also calls for further research into VMEs from the Scientific Committee[105] and for States to restrict their bottom fishing activities to their historical footprint and catch levels.[106]

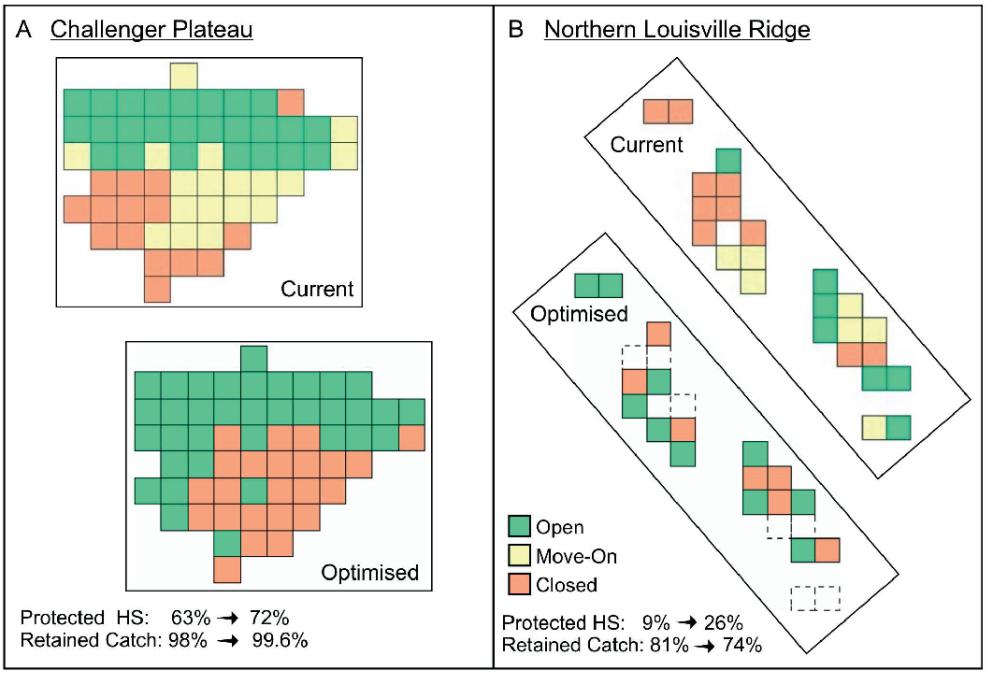
Pursuant to earlier interim measures, and in accordance with the CMM,[107] NZ unilaterally implemented HSBFCs in its footprint area (Map 7).[108] Lightly trawled blocks are closed to bottom fishing and moderately trawled blocks are subject a move-on rule, while heavily trawled blocks generally remain open to bottom fishing.[109] In spatial terms, 41% of the NZ footprint is closed to bottom trawling, 30% is subject to move-on provisions, and 29%, representing 0.13% of the SPRFMO Area, is open.[110] However, only 11 of the 42 large seamounts in NZ's footprint fall within closed areas (DSCC 2011). It is worth noting that NZ's 2002-2006 footprint represents approximately half of NZ's total bottom fishing footprint, as fishing commenced around 1980, suggesting that a much larger area is effectively closed to NZ vessels.[111]

Penney and Guinotte (2013) conducted a detailed analysis of the NZ HSBFCs, concluding that the existing HSBFCs are "sub-optimal for protecting likely coral VMEs in all but one of the high-seas fishing areas constituting the New Zealand historical trawl footprint".

These measures were developed in consultation with industry, environmental non-governmental organisations and government departments. Competing objectives understandably emerged in these consultations, principally the conflict between protection of features known to or likely to support VMEs and access to fisheries. Noting the difficulties of identifying VMEs and SAIs, NZ aimed to balance these competing objectives by implementing measures that provide for *"adequate and representative protection"* (Penney *et al.* 2009, p.344), contrary to the wording of the UN resolutions.

102. SPRFMO, "Second Meeting of the Commission of the South Pacific Regional Fisheries Management Organisation," vol 2014 (2014) 3.
103. Andrew Penney, 'Spatial analysis of Australian and New Zealand historical bottom trawl fishing effort in the SPRFMO Area' (Australian Government, October 2013).
104. SPRFMO, "Conservation and Management Measure for the Management of Bottom Fishing in the SPRFMO Convention Area" (2014) s 22.
105. SPRFMO, "Conservation and Management Measure for the Management of Bottom Fishing in the SPRFMO Convention Area" 5.
106. Ibid 8.
107. Ibid 8(h).
108. New Zealand Government, "Report on New Zealand's Implementation of Operative Paragraphs 80 and 83-90 of Resolution 61/105" 7–12.
109. Additional precautionary closures of representative blocks in the moderately and heavily trawled areas may be implemented and further blocks may be closed in any are found to contain significant evidence of VMEs.
110. New Zealand Government, "Report on New Zealand's Implementation of Operative Paragraphs 80 and 83-90 of Resolution 61/105" 9.
111. Personal Communication. See also Andrew Penney, 'Spatial analysis of Australian and New Zealand historical bottom trawl fishing effort in the SPRFMO Area' (Australian Government, October 2013).

Map 8. Example of optimised HSBFC on the Challenger Plateau and the Northern Louisville Ridge*



Source: Penney & Guinotte 2013. *Assumes closure of 40% of the blocks and achieving at least 75% of the range in average habitat suitability, while retaining at least 75% of total historical catch.

Analyses of the options for HSBFCs shows that there may be win-win options for better optimising HSBFCs in some parts of the footprint, in particular ensuring that areas with a high likelihood of the presence of VMEs are closed (Map 8; Penney & Guinotte 2013; Leathwick *et al.* 2008; Leathwick *et al.* 2006). Any such analysis and ultimate HSBFC must respect the UN resolutions and give a sufficiently wide margin of error to account for the known destructive nature of bottom fishing techniques.

As previously highlighted in relation to Norway's approach within NEAFC, the UNGA resolutions do not mention *"adequate"* or *"representative"* areas. It is noted, however, that despite the similarities in approach, the NZ approach is broader, using a wide range of available information to design representative protection measures across the full extent of the fishing footprint,[112] whereas the NEAFC HSBFCs target specific seamounts and coral areas (Penney *et al.* 2009). NZ's approach also complies in a more explicit manner with the FAO Guidelines.

Nonetheless, these were only ever intended to be interim measures. In the long term, *"effective protection of benthic VMEs in the Pacific Ocean high seas will probably require the establishment of a series of international spatial closures designed to protect adequate and representative areas of habitats and ecosystems"* (Penney *et al.* 2009).

4.3. Southern Ocean

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) established a MPA covering South Orkney Island's southern shelf in 2009,[113] and discussions are ongoing regarding the establishment of a network of MPAs (Rochette *et al.*, 2014; Druel *et al.* 2012). CCAMLR has also established a number of HSBFCs. Commercial bottom trawling is prohibited in the high seas within the CCAMLR region, with regulations applying to longline fisheries.

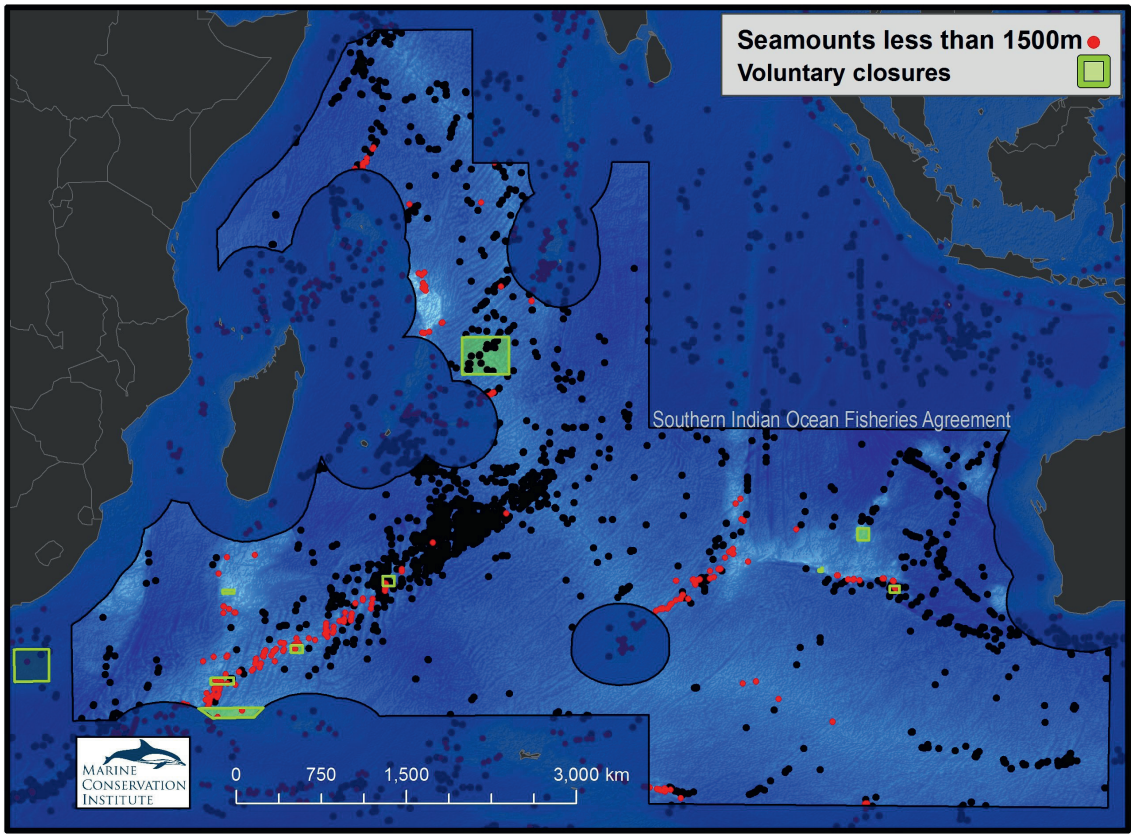
The CCAMLR passed a HSBFC in 2009, prohibiting fishing for toothfish in depths shallower than 550m in order to *"protect benthic communities"*.[114] A framework conservation measure for the management of bottom fisheries came into force in 2007 (CM 22-06), setting out the procedures for assessment of bottom fishing activities by the Scientific Committee, encounters with VMEs and monitoring

112. Such as on fishing intensity, connectivity, depth zones, biogeographic zones and topography, as recommended by Williams and Bax (2009).

113. Conservation Measure 91-03.

114. CCAMLR, "Conservation Measure 22-08: Prohibition on Fishing for Dissostichus Spp. in Depths Shallower than 550 M in Exploratory Fisheries."

Map 9. SIODFA Benthic Protected Areas as of 2011 and seamounts at fishable depths within the Southern Indian Ocean Fisheries Agreement area



Source: Marine Conservation Institute, 2011 (unpublished data). In October 2013, SIODFA announced that a further two areas were to be closed;* these BPAs are at fishable depth.**
* IUCN, "Biggest Zone Closed to Fishing Announced" (2014) http://www.iucn.org/fr/presse/communiques/?13875/Biggest-zone-closed-to-fishing-announced.
** Personal Communication

and control.[115] In 2008 the CCAMLR created a VME registry to manage data provided in VME encounter reports.[116]

In 2008 the first specific HSBFCs for VMEs were instituted, comprising two small areas totalling 4.64km.[117] This followed two notifications of encounters with potential VMEs made under CM 22-06 and subsequent recommendations of the Working Group on Ecosystem Monitoring and Management (WG-EMM) and the Scientific Committee that these areas be closed.[118] These areas were the first VME encounters in an area still open to toothfish fishing, and therefore represented the first opportunity to further protect VMEs in the CCAMLR area.[119] In 2012, a further two VMEs were identified and 37km were closed to bottom fishing.[120] These areas, in the Dumont d'Urville Sea, fall within an area currently closed to bottom fishing. At its 31st meeting in 2012, the Commission noted, *"all VMEs are currently afforded protection through specific area closures… and general closures to bottom fishing activities"*.[121] No further VMEs were highlighted as requiring additional protection in

115. CCAMLR, "Conservation Measure 22-06: Bottom Fishing in the Convention Area."
116. See http://www.ccamlr.org/en/wg-fsa-10/07.
117. CCAMLR, "Conservation Measure 22-09: Protection of Registered Vulnerable Marine Ecosystems in Subareas, Divisions, Small-Scale Research Units, or Management Areas Open to Bottom Fishing."
118. Scientific Committee of the Conservation of Antarctic Marine Living Resources, "Report of the Thirtieth Meeting of the Scientific Committee" (2011) 33, 362.
119. Ibid 164. 32 notifications had been made in areas where bottom-fishing activities were already restricted.
120. CCAMLR, "Conservation Measure 22-09: Protection of Registered Vulnerable Marine Ecosystems in Subareas, Divisions, Small-Scale Research Units, or Management Areas Open to Bottom Fishing."
121. Scientific Committee of the Conservation of Antarctic Marine Living Resources. 2012. "Report of the Thirty-First Meeting of the Scientific Committee". Hobart. (Scientific Committee of the Conservation of Antarctic Marine Living Resources 2012, p.34)

the 2013 meetings of the Scientific Committee and discussions centred on other issues.[122]

4.4. Indian Ocean

The South Indian Ocean Fisheries Agreement (SIOFA) has only recently been concluded, and no HSBFCs have yet been implemented. However, the Southern Indian Ocean Deep Sea Fishers Association (SIODFA), an association of commercial fishing operators in the region has declared 13 voluntary HSBFCs.

Following the establishment of the Indian Ocean Tuna Commission (IOTC) in 1996, the former Indian Ocean Fishery Commission's (IOFC) activities were substantially reduced as it was envisaged that non-Tuna could be managed by smaller fishery bodies at sub-regional levels (Marashi 1996). The IOFC was ultimately abolished in 1999 but the FAO, noting the wishes of the IOFC's Committee for the Management and Development of Fisheries in the South West Indian Ocean, recommended that the former members convene meetings towards establishing a new regional fisheries management body.[123] Intergovernmental Consultations on the Establishment of a Southwest Indian Ocean Fisheries Commission took place and the Final Act of the Conference on the Southern Indian Ocean Fisheries Agreement was signed in July 2006[124] and entered into force in June 2012.[125]

During their first meeting in October 2013, Contracting Parties recognised the need to give effect to the UNGA resolutions prior to the next meeting in 2015. Until the Rules of Procedure are adopted, Parties may agree by consensus to interim measure, including on protection of VMEs.[126] SIOFA has entered into force and had its first meeting in Melbourne in 2013, and is expected to adopt measures at its next meeting in Mauritius in 2015.

Following the meetings to establish SIOFA, there was concern among some commercial fishery operators that little more could be achieved at the political level until a fisheries agreement was ratified, yet this process was proving time-consuming and there was no certainty as to when an agreement would be concluded (Shotton 2006). In the meantime, fishing operations continued unabated with no leadership or direction regarding capturing catch and effort data. Realising that they would play the major role in implementing an eventual agreement, three of the four operators in the region approached the FAO to seek its assistance in organising informal meetings to advance management and prepare for implementation of SIOFIA (Shotton 2006). In 2006 the four operators formed the Southern Indian Ocean Deepsea Fishers Association (SIODFA) and held two meetings to discuss management actions for the fishery.

A key outcome of these meetings was the decision to declare eleven areas in the southern Indian Ocean as *"benthic protected areas"* (BPA) (Map 9). SIODFA stated that it sought to ensure that BPAs were declared only in areas where their trawlers actually operated. The Association decided that *"extending the boundaries of the no-trawling zones to large areas of adjacent abyssal areas simply to 'make the numbers look good'"* would be counterproductive, particularly as some of these adjacent areas may be the subject of extractive activities in the future (Shotton 2006). Overall, 94.5% of seamounts and 93.3% of the seafloor of fishable depth using current technology (less than 1500m) remain available to fishing (Map 9; Marine Conservation Institute, 2011, unpublished data). The majority of fishing currently takes place at depths of less than 1000m,[127] suggesting that the level of current protection may be underestimated in the map below. However, as the trend of fisheries is to fish progressively deeper over time (Watson & Morato, 2013), it is reasonable to conclude that deeper areas left accessible to fishing may be targeted in the future.

Clark *et al.* (2011) note: *"the number and "class" of seamounts protected under the SIODFA BPA network was clearly inadequate. Most protected seamounts were in one class (which was too deep for trawling), and the total number of seamounts protected was comparatively low"*. SIODFA disputes some of Clark's conclusions, arguing that many of the unprotected seafloor features, though ostensibly 'accessible', have never been associated with commercial fishing or are unfishable for other reasons.[128] Some of the accessible areas may nonetheless be fished in the future if left unprotected.

One global study has noted the pitfalls of allowing users to self-regulate in a similar context, that of conservation measures implemented by fishing quota owners, stating that under-protection is common and that, *"the protection of both benthic*

122. Scientific Committee of the Conservation of Antarctic Marine Living Resources, "Report of the Thirty-Second Meeting of the Scientific Committee (Preliminary Version)" (2013) 46–48.

123. Final Act of the Conference on the Southern Indian Ocean Fisheries Agreement 2006.

124. Ibid.

125. "Southern Indian Oceans Fisheries Agreement: Signatories and Parties to the Agreement."

126. Personal communication.

127. Personal communication.

128. Ibid.

Table 1: Summary of HSBFCs

Region	Body/ State	Type of body	Parties	HSBFCs
North-East Atlantic	NEAFC	RFMO	Denmark (Faroe Islands & Greenland), EU, Iceland, Norway, Russia	11 HSBFCs
North-West Atlantic	NAFO	RFMO	Canada, Cuba, Denmark (Faroe Islands & Greenland), EU, France (Saint Pierre & Miquelon), Iceland, Japan, South Korea, Norway, Russia, Ukraine, US	19 HSBFCs
South-East Atlantic	SEAFO	RFMO	Angola, EU, Japan, South Korea, Namibia, Norway, South Africa	11 HSBFCs
South-West Atlantic	EU Spain Estonia	State		9 temporary HSBFCs
North Pacific	NPFC	RFMO	Canada, Japan, Russia, South Korea, US	Formal HSBFCs yet to be declared, agreement on tentative closure of one seamount, and some agreement on tentative closure of another.
South Pacific	SPRFMO	RFMO	Australia, Belize, Chile, China, Cook Islands, Cuba, EU, Denmark (Faroe Islands), New Zealand, Russia, South Korea, Chinese Taipei (Taiwan), Vanuatu	Formal HSBFCs yet to be declared, 'footprint' approach taken effectively limits fishing activity, unilateral HSBFCs implemented by New Zealand
Southern Ocean	CCAMLR		Australia, Argentina, Belgium, Brazil, Bulgaria, Canada, Chile, China, Cook Islands, EU, Finland, France, Germany, Greece, India, Italy, Japan, Korea, Mauritius, Namibia, Netherlands, New Zealand, Norway, Pakistan, Panama, Peru, Poland, Russia, South Africa, Spain, Sweden, Ukraine, UK, US, Uruguay, Vanuatu	1 MPA, 1 blanket HSBFC in relation to toothfish fisheries, 4 additional HSBFCs. Commercial bottom trawling prohibited throughout the CCAMLR region. Regulations apply to mainly longline fisheries.
Indian Ocean	SIOFA	RFMO	Australia, Cook Islands, EU, Mauritius, Seychelles	Formal HSBFCs yet to be declared, in process of agreeing conservation measures.
Indian Ocean	SIODFA	Industry association	Austral Fisheries (Pty) Ltd, (Australia) ORAFCO Limited (Cook Islands) United Frame Investments Ltd (Cook Islands) Kanai Fisheries Co. Ltd., Hokkaido (Japan) B&S International Ltd (Mauritius)[1]	13 BPAs

ecosystems and essential fish habitat (EFH) are marginal at best when quota owners have primacy in determining the boundaries of bottom trawl closures" (Rieser *et al.* 2013).

Unlike RFMO HSBFCs, the SIODFA BPAs apply only to member companies,[129] with no means of compelling non-members or new operators to comply,[130] and, like other HSBFCs, the BPAs cannot control other activities in these areas. Nonetheless, the SIODFA has noted the limitations of its BPAs and stated that *"a decision by the members of the IOTC to observe the BPAs would be welcome"* and that it hoped that *"other agencies would observe and support this initiative and not undermine its intent"* (Shotton 2006).

In this regard, the BPAs form part of the licensing conditions in two of the three flag States (Australia & Cook Islands).[131] The Japanese government does not oppose the BPAs but has not yet been in a position to formally endorse them through licensing conditions; the Japanese member has agreed to observe the BPAs.[132]

Summary of HSBFCs

Table 1 provides a summary of the HSBFCs implemented to date.

129. Under the UNFSA, non-members of RFMOs are obliged to comply with RFMO conservation and management measures.

130. Though SIODFA membership is predicated on acceptance of the BPAs: http://www.siodfa.org/programmes/iucn-project/.

131. Personal communication.

132. Personal communication.

5. WHAT ROLE FOR RFMOS IN BIODIVERSITY CONSERVATION?

5.1 The shortcomings of RFMOs

The above discussion of HSBFCs shows that few additional closures have been implemented since the previous reviews were carried out by the UN Review Conferences[133] and civil society (DSCC 2011; Weaver *et al.* 2011; Rogers & Gianni 2010). There also remain some issues regarding how HSBFCs are identified and implemented. This reflects broader discontent with the ability or willingness of RFMOs to effectively integrate biodiversity conservation into fisheries management.

RFMOs have sometimes been slow to follow the advice of their respective scientific bodies in considering HSBFCs, either disregarding recommendations or adopting closures that do not fully meet the demands of the scientific evidence. In many cases, the pace of action is inconsistent with the precautionary principle, with RFMOs requesting further evidence of the presence of VME rather than taking a precautionary approach. RFMOs have at times not closed areas where there is strong evidence of the presence of VMEs, implemented temporary closures when permanent closures are needed, and closed only representative areas. Often HSBFCs cover depths that are considered unfishable in any case (Rieser *et al.* 2013; Gianni 2012), or do not cover relevant seamounts and other structures. When identifying VMEs, the focus has generally been on corals and sponges, rather on the wide range of other species and habitats that would fit the criteria in the FAO Guidelines (Ardron *et al.* 2014). There is therefore a strong likelihood that a great many VMEs remain open to bottom fishing in ABNJ.

Finally, a number of RFMOs have taken the approach of 'freezing the footprint' of fishing activities, meaning that HSBFCs are implemented only in non-fished areas. However, even in heavily fished areas evidence has been found of highly biodiverse seabed areas (Clark & Rowden 2009; Waller *et al.* 2007), possibly because *"unfished areas occurring within 'fished area' footprints defined at coarse resolution are likely to contain undamaged benthic communities"* (Penney & Guinotte 2013). Therefore HSBFCs should also be implemented in areas that are currently fished, in some particular cases.

Taken together, these shortcomings evidence an approach to HSBFCs, and to conservation generally, that is piecemeal, inconsistent, and contrary to the precautionary approach. This unsatisfactory situation persists in regions with established regulatory frameworks, yet in some regions, such as the Indian Ocean and North Pacific, the competent RFMOs are fledgling. Their development has generally been very slow or only weak interim measures have been implemented, if action has been taken at all.

Moreover, RFMOs have only a limited mandate, and hence at best could only establish measures directed at specific fishing activities. RFMOs cannot establish MPAs directed at the full range of threats posed by other industries. Given the foregoing, it is clear HSBFCs can therefore only ever be a starting point, but also a very important part of a broader framework for integrated conservation that considers the full range of human pressures and threats

5.2. Improving RFMO performance in HSBFCs and biodiversity conservation

Despite the issues raised above, there are some positive lessons learned from the experiences of RFMOs in implementing HSBFCs. CCAMLR provides an example of a regulatory body that is reacting quickly to protect VMEs, following up on VME encounters, and following the advice of its SC. Nonetheless, CCAMLR is not without problems of its own, and discussions on MPAs established for broader conservation purposes have been in deadlock for some years. The MoU between NEAFC and OSPAR, and the Madeira Process, highlights a potential avenue for furthering conservation through cooperation between Regional Seas programmes and RFMOs, while the establishment of SIODFA highlights a potential role for industry associations and voluntary closures. Nonetheless both of these approaches also require substantial elaboration and improvement if they are to be effective. For example, Voluntary organisations, such as SIODFA, have no formal powers: they can only engage member companies and compliance is entirely voluntary

Against this background, some recommendations can be made for RFMOs to better ensure the conservation of high seas biodiversity, specifically in relation to HSBFCs.

First, it is crucial that RFMOs follow the advice of their respective scientific bodies more closely and

133. UN DOALOS, 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 to 26 May 2006 and 24 to 28 May 2010), http://www.un.org/depts/los/convention_agreements/review_conf_fish_stocks.htm.

in a timely manner. Temporary closures should be made permanent where VMEs persist in the area, and HSBFCs should be quickly established in all areas where a VME encounter has been reported or VMEs are likely to exist. In turn, move-on rules must be much more precautionary in their formulation, and better implemented and monitored. HSBFCs must not only be implemented in fished areas and/or representative areas where there is minimal impact to fisheries (Devillers *et al.* 2014). The tendency for discussions to be of a political nature should be reversed; rather, the focus should return to environmental protection and implementation of the UNGA resolutions. The value of global scrutiny and assessment of regional progress should not be underestimated, but it is clear that three years is too long an interval for UNGA review given the slow progress being made.

RFMOs also need to collaborate with other regional bodies, especially Regional Seas programmes. For instance, SPRFMO could collaborate with the South Pacific Regional Environment Programme (SPREP) to establish joint MPAs/HSBFCs in the high seas 'pockets' between Pacific island States. Similarly, the possible extension of the Abidjan Convention to ABNJ could enable collaboration with fisheries bodies in the Atlantic Ocean to establish MPAs based on existing HSBFCs.[134] Such cooperation could greatly improve high seas governance, particularly in relation to the establishment of high seas MPAs.

Beyond HSBFCs, other studies have noted that RFMOs have been *"slow in incorporating modern management principles such as the ecosystem or precautionary approaches"* (Lodge *et al.* 2007) and recommend a range of best practices that should be followed by RFMOs in relation to conservation (Lodge *et al.* 2007; Mooney-Seus & Rosenberg 2007; Cullis-Suzuki & Pauly 2010). A range of best practices and reforms have also been proposed in relation to other aspects of RFMO operation, particularly participation, transparency, accountability and enforcement (Ardron *et al.* 2014; Global Ocean Commission 2013; Cullis-Suzuki & Pauly 2010; Lodge *et al.* 2007).

134. At its most recent meeting, the COP to the Abidjan Convention requested that the secretariat to set up a working group to study all aspects of the conservation and sustainable use of marine biological diversity in ABNJ within the framework of the Abidjan Convention. The Convention does not currently apply to ABNJ, however this working group could be the first step towards extended the scope of the Convention. Decision CP. 11/10. *Conservation and Sustainable use of the Marine Biodiversity of the Areas Located beyond National Jurisdictions* (2014).

5.3. Fisheries in the discussions regarding a new international agreement

Given the strong views of some States, the role of fisheries in any new international agreement is open for debate.

To achieve the goal of integrating biodiversity conservation into the activities of sectoral organisations, at minimum, any agreement should spell out the obligation of all States and relevant/competent organisations to integrate biodiversity conservation into their decision-making processes, elaborate on the role of sectoral organisations, including RFMOs with respect to biodiversity conservation and call/invite them (directly and through their State members) to actively seek opportunities to cooperate, and to work with regional partners to advance conservation efforts. An agreement could further elaborate upon the obligation of States and competent organisations, such as RFMOs and Regional Seas bodies, to better cooperate and coordinate their activities in the protection of marine living resources, including VMEs. The UNFSA already details the duties of States to cooperate with RFMOs, however recent experience suggests that such a provision could more clearly call for States to *"proactively promote the implementation of the principles and objectives of the [agreement] inside relevant competent organizations, and include a provision for regular review of implementation at the global level"* (Gjerde, 2008). An international agreement could also draw the attention of States to previously agreed measures established and applied by RFMOs, urging them to respect RFMO conservation measures.

However, the failure of RFMOs reviewed here to fully implement the conservation requirements of the UN resolution 61/105 and subsequent resolutions, or otherwise to integrate biodiversity considerations into fisheries management suggests that there are other ways a new agreement could benefit fisheries management.

The starting point would be strengthening the role of RFMOs in the conservation of marine biodiversity by building on elements of the Package Deal. Development of basic EIA requirements could complement and strengthen the call for EIA in the UNGA resolutions on high seas bottom fisheries, and make them applicable to all fisheries, while the role of RFMOs in the future establishment and management of MPAs in ABNJ could be clearly expressed.

A new agreement could provide common overarching principles and objectives (Houghton, 2014, Gjerde 2008), reiterating those in the UNGA resolutions and expanding on them where

necessary. An agreement could also be provide a level of harmonisation of RFMOs, better aligning mandates and setting out universal standards for performance while also maintaining the regional system of governance.

A key failure of the current regime is the lack of oversight of RFMOs, which is in turn compounded by a lack of transparency (Ardron *et al.* 2014; Lodge *et al.* 2007). HBFCs are just one aspect of fisheries governance that has suffered as a result. A new international agreement could require RFMOs to improve transparency and better facilitate external participation and review. RFMOs could also be made subject to the mandate of any newly established compliance committee or similar mechanism. Less developed RFMOs could benefit from a facilitative role played by such a committee, while established RFMOs could be held accountable under a committee's enforcement mandate.

If States wish to undertake a more ambitious agenda they might also consider how a new agreement could also supplement the current RFMO frameworks by providing a backup regulatory regime for areas where RFMOs are not functional or where they are not adequately meeting their obligations. As identified above, while some RFMOs are relatively advanced, others have been slow to progress, and some regions may lack the political will to properly develop the necessary institutional capacity. Such an intervention could be made dependant on the receipt of a request from relevant States.

The seventh BBNJ WG meeting, held in April 2014, evidenced a clear divide between States arguing that the existing framework for fisheries is adequate, and States arguing that gaps in the existing framework warrant the inclusion of fisheries. This dichotomy continued at the eighth meeting (Wright *et al.*, 2014), where a number of States, predominantly fishing nations,[135] argued strongly that there is no place for fisheries in a new agreement as this is already covered by the UNFSA and RFMO regulations. On the other hand, many States argued that fisheries management will necessarily be implicated by any agreement on high seas biodiversity as: fish form part of the biodiversity of the high seas; fishing is one of most impacting activities in ABNJ; and elements of the package deal, such as MPAs, involve fisheries. The IUCN intervened, noting that RFMOs are sectoral and so do not have a comprehensive mandate to establish MPAs, and proposing that a new agreement could place further reporting requirements on States.

Given the foregoing, ensuring that any recommendation to negotiate an international agreement does not exclude fisheries from consideration as part of an international agreement will be one of the most important challenges during the ninth meeting of the BBNJ working group.[136]

6. CONCLUSION

Exploitation of the high seas has increased dramatically in recent decade, as have efforts to regulate activity and preserve marine biodiversity. Bottom fishing has been a particular concern due to its destructive nature, and the international community has repeatedly called on RFMOs to take action.

Experience with HSBFCs shows that RFMOs can respond to global calls to protect ecosystems, but that their response to date has been weaker than is necessary if marine biodiversity in ABNJ is to be adequately preserved. Specifically, RFMOs have been slow to implement additional HSBFCs and to act in a precautionary manner based on available scientific evidence, have often implemented temporary or representative closures, and have made closures that do not in fact restrict ongoing fishing activity. While some positive outcomes provide examples of good practice, particularly in the North East Atlantic and Southern oceans, it is clear that much remains to be done if the full intent of the UNGA resolutions is to be realised.

While RFMOs will most likely continue to be the primary vehicle for fisheries management and stopgap conservation measures in ABNJ in the short- to medium-term, their role in the conservation of marine biodiversity should be re-considered. It is clear that RFMO measures, including HSBFCs, can only ever be one element of a broader framework for integrated conservation. In particular, and in spite the concerns of a few high seas fishing nations, the evidence points towards a pressing need for any new international agreement to play a much more active role in the protection of biodiversity, including commercial fish species.

135. Russia, Iceland, Japan, and South Korea.

136. 20-23 January 2015.

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