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SC-09-25-Rev1

# Review of VME encounter thresholds, and methods for their definition, in other RFMOs

The SIOFA Secretariat

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<b>Abstract</b>	
<p>The SIOFA Scientific Committee “requested the Secretariat to review and prepare a paper on the individual encounter thresholds resulting in a move-on rule used at other RFMOs and the basis that was used for setting them for discussion at SC9” (paragraph 278, <a href="#">SC8 report</a>).</p> <p>This paper aims to respond to the SC8 request and thus addresses:</p> <ul style="list-style-type: none"><li>- What thresholds are used in RFMOs to trigger a move-on rule</li><li>- What methods were used to define these thresholds</li></ul> <p>Through a review of the available documentation, this paper also details the similarities in encounter thresholds, approaches to threshold definitions and frameworks, and commonalities/dissimilarities across the different organizations that manage deepwater fisheries in international waters.</p>	

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## Recommendations

The SIOFA Secretariat recommends that the SC9:

- **considers** the information provided in this paper during its focused agenda item on Vulnerable Marine Ecosystems (VMEs).
- **identifies**, as it considers needed, potential amendments to [CMM 01\(2023\)](#)~~CMM 013-2023~~ to ensure the effectiveness of SIOFA bottom fishing management measures.
- **discusses** how best to present these amendments to the following SIOFA Meeting of the Parties.

## 1. Introduction

In 2021, at its 8<sup>th</sup> annual meeting, the SIOFA Meeting of the Parties noted that “the PAEWG will work intersessionally to conduct a review of the thresholds, or the processes to agree thresholds, adopted by other RFMOs, such as those described in SPRFMO-SC6-DW09 (Methods for deriving thresholds for VME encounter protocols for SPRFMO bottom fisheries), noted the other ongoing [Vulnerable Marine Ecosystem] VME-related work in the Scientific Committee workplan, and requested that the Scientific Committee submit a proposal to the ninth Meeting of the Parties on how to conduct a review on how to develop better thresholds for VMEs.” (paragraph 100, [MoP8 report](#)).

In 2022, at its 7<sup>th</sup> annual meeting, the SIOFA Scientific Committee noted “that the PAEWG had not been able to conduct an intersessional review of the VME encounter thresholds adopted by other RFMOs as requested by the MoP (para 100, MoP8 Report)” (paragraph 186, [SC7 report](#)) but included this task in its workplan, including the holding of a dedicated Workshop.

The SIOFA Intersessional Workshop on the development of VME management ([WS2022-VME1](#)) attempted to develop strategies that would answer to these questions:

- What are the management options for VME protection in the SIOFA Agreement area?
- How can SIOFA develop scientifically informed VME indicator species thresholds?
- What would potential SIOFA VME indicator species thresholds look like?

Information included in the background document of the meeting ([WS-VME1-2022-01](#), restricted document) was considered, and informed a [Convener Report](#), and both documents were submitted to the 8<sup>th</sup> annual meeting of the SIOFA Scientific Committee. In particular, WS2022-VME1 recommended “that a process for reviewing individual encounters resulting in a move-on be developed by the Scientific Committee” (paragraph 33, [Convener Report](#)).

In 2023, at its 8<sup>th</sup> annual meeting, the SIOFA Scientific Committee after considering the information provided to it and endorsing the recommendation in paragraph 33 of the WS2022-VME1 [Convener Report](#), “requested the Secretariat to review and prepare a paper on the individual encounter thresholds resulting in a move-on rule used at other RFMOs and the basis that was used for setting them for discussion at SC9” (paragraph 278, [SC8 report](#)).

This paper aims to respond to the SC8 request and thus addresses:

- What thresholds are used in RFMOs to trigger a move-on rule
- What methods were used to define these thresholds

This paper does not cover criteria or definitions of what constitutes a VME, of VME indicator taxa or what constitutes a VME unit, even if it attempts to provide working definitions for the convenience of the readers. Other measures which are part of the move-on rule (e.g., move on distances, area closures and review to confirm presence of a VME) after an encounter has occurred are also not included in this paper.

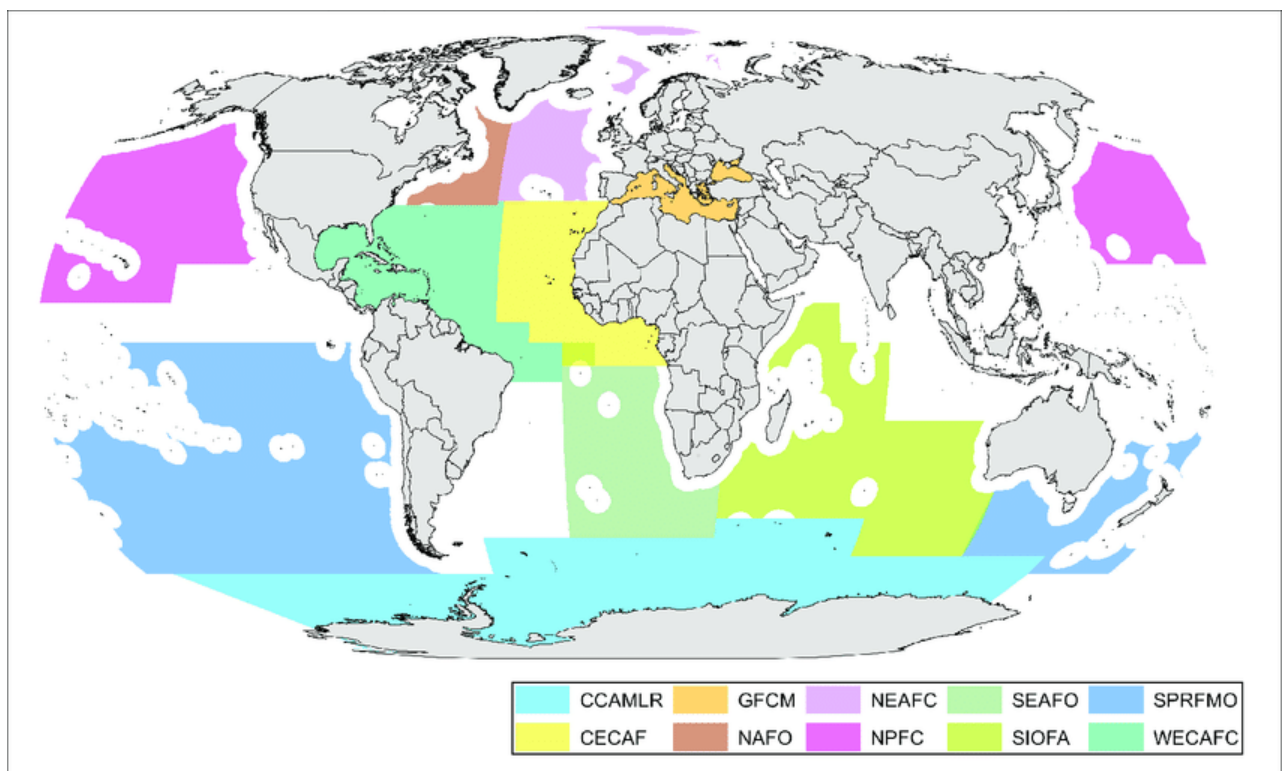
## 2. Methods

This paper was composed by reviewing the individual encounter thresholds resulting in a move-on rule currently published in Conservation Measures (CM) or in Conservation and Management Measures (CMM) of CCAMLR and different RFMOs that deal with deepwater fisheries. Additionally, meeting documents were reviewed to investigate the discussion that led to the establishment of individual encounter thresholds resulting in a move-on rule. Direct links to measures and meeting documentation were provided in the text of Results for further reference. Where appropriate/necessary, entire tables have been provided within this document for easier reference.

This review included the following international organizations with a mandate to manage bottom fisheries (presented in alphabetical order):

- [Convention for the Conservation of Antarctic Marine Living Resources \(CCAMLR\)](#)
- [Fisheries Committee for the Eastern Central Atlantic \(CECAF\)](#)
- [General Fisheries Council for the Mediterranean \(GFCM\)](#)
- [Northwest Atlantic Fisheries Organization \(NAFO\)](#)
- [North-east Atlantic Fisheries Commission \(NEAFC\)](#)
- [North Pacific Fisheries Commission \(NPFC\)](#)
- [South-east Atlantic Fisheries Organisation \(SEAFO\)](#)
- [Southern Indian Ocean Fisheries Agreement \(SIOFA\)](#)
- [South Pacific Regional Fisheries Management Organisation \(SPRFMO\)](#)
- [Western Central Atlantic Fishery Commission \(WECAFC\)](#)

Figure 1 (from Bell et al. 2019) presents a map with the location of each organization, which are going to be referred to hereafter only using their acronyms. Note that, unlike the other organizations, CECAF and WECAFC have only advisory roles but were still included in this review.



*Figure 1 – Area of competence for each organization with a mandate to manage bottom fisheries in international waters, reproduced from Bell et al. (2019). Note that GFCM includes areas within national jurisdiction and that, unlike the other organizations, CECAF and WECAFC have only advisory roles.*

Tuna RFMOs were excluded from this review as their fisheries never contact the seafloor and are thus out of the scope of this paper.

A summary table for side-to-side comparisons of the measures was considered but ultimately not included in this report, capitalizing on the experience of an earlier effort in this direction ([NPFC-2018-WS VME01-WP02](#)) that failed to synthesize in an approachable way because of the diversity in the measures, gears and types of thresholds. However, the discussion addresses similarities in thresholds and approaches in detail.

### 3. Results

Two subsections of Results report separately (and hopefully succinctly and schematically) on encounter thresholds and on the bases to set the thresholds in CCAMLR and in RFMOs. For each organization, thresholds for different types of fishing gear (usually longlines and trawls) are reported separately.

Of all the organizations reviewed, CECAF, GFCM, and WECAFC have not adopted individual encounter thresholds resulting in a move-on rule and were thus included in a separate subsection.

#### 1.1. Encounter thresholds resulting in a move-on rule in CCAMLR and RFMOs

##### CCAMLR

Thresholds in CCAMLR are detailed within [Conservation Measure 22-07\(2013\)](#) (Interim measure for bottom fishing activities subject to Conservation Measure 22-06 encountering potential vulnerable marine ecosystems in the Convention Area, Article 2). Note that this measure is part of Conservation Measure 22-06, which defines its scope.

##### *Longlines*

The move-on rule is triggered when 10 or more VME indicator units (either one litre or one kilogram of VME indicator organisms, depending on the morphology of those organisms) are recovered in one line segment (defined as 1.2km of longline gear or 1000 hooks on longline gear, whichever is shorter).

In addition, CCAMLR has adopted a secondary trigger level of ‘possible encounters’ (currently >5 and <10 VME indicator units recovered within one line segment).

##### *Trawls*

CCAMLR has a prohibition on bottom trawling, so it did not establish thresholds for trawls.

##### NAFO

Thresholds in NAFO are detailed within [CEM 2015-2024](#) (Chapter II protection of vulnerable marine ecosystems (VMEs) in the regulatory area from bottom fishing activities, Article 22) and an encounter is defined as catch per set, without gear-specific thresholds.

An encounter with VME indicator species is defined as catch per set (e.g. trawl tow, longline set, or gill net set) of more than 7 kg of sea pens and/or 60 kg of other live coral and/or 300 kg of sponges.

##### NEAFC

Current thresholds in NEAFC are detailed within [Recommendation 19:2014](#) (Area management measures for the protection of vulnerable marine ecosystems in the NEAFC Regulatory Area, as amended, Article 9). First introduced in 2014, and subsequently amended, including changes in the threshold levels themselves.

##### *Longlines*

The threshold for evidence of an “encounter” with a VME during fishing that was developed for longline fishing by CCAMLR have been adopted for demersal longline fishing in NEAFC, but NEAFC

has simplified the 'VME indicator unit' to simply be the presence of any VME taxa on 10 hooks per 1000 hooks or per 1200 m line, whichever is shorter.

#### *Trawls*

The threshold for trawl encounters in NEAFC is currently 30 kg for live corals and 400 kg for live sponges (of VME indicators).

#### NPFC

Current thresholds in NPFC are detailed within [CMM 2023-05](#) (Conservation and management measure for bottom fisheries and protection of vulnerable marine ecosystems in the northwestern Pacific Ocean, Article 4.G) and [CMM 2023-06](#) (Conservation and management measure for bottom fisheries and protection of vulnerable marine ecosystems in the northeastern Pacific Ocean, Article 4.j). The two CMMs contain identical non-gear-specific thresholds for the two areas, and these encounter protocols apply in both fished and unfished areas specified in Annex 2, paragraph 4(1)(a) of the measures.

An encounter with VME indicator species is defined as catch of more than 50 kg of cold-water corals or more than 500 kg of sponges in one gear retrieval.

#### SEAFO

Encounter thresholds in SEAFO are defined within [CM30-15](#). (Bottom Fishing Activities and Vulnerable Marine Ecosystems in the SEAFO Convention Area, Annex 6). The thresholds refer to the catch of corals and sponges comprising taxa listed as VME indicators by the SEAFO SC.

#### *Longlines*

The threshold for evidence of an "encounter" with a VME during fishing that was developed for longline fishing by CCAMLR have been adopted for demersal longline fishing in SEAFO, i.e. at least 10 VME-indicator units (of live coral and/or live sponge) in one 1200m section of line or 1000 hooks, whichever is the shorter, in both existing and new fishing areas.

#### *Trawls*

There are two thresholds defined for trawl tows in the SEAFO Area:

- more than 600 kg of live sponges and/or 60 kg of live coral in existing fishing areas and
- more than 400 kg of live sponges and/or 60 kg of live coral in new fishing areas.

#### *Pots*

The threshold for pots was set similar to those of longlines (at least 10 VME-indicator units in one 1200m section of line) in both existing and new fishing areas.

#### SIOFA

Encounter thresholds in SIOFA are defined within [CMM 01\(2023\)](#) (Conservation and Management Measure for the Interim Management of Bottom Fishing in the Agreement Area (Interim Management of Bottom Fishing), Article 12). Note that encounter thresholds in SIOFA mirror those of other organizations (CCAMLR and NAFO).

#### *Longlines*

The threshold for evidence of an “encounter” with a VME during fishing that was developed for longline fishing by CCAMLR was also adopted for demersal longline fishing in SIOFA (i.e. 10 or more VME indicator units recovered in one line segment).

#### *Trawls*

Since 2019, SIOFA adopted a threshold of 60 kg live coral and 300 kg live sponges, consistent with the NAFO measure.

#### SPRFMO

Current encounter thresholds in SPRFMO are defined within [CMM 03-2023](#) (Conservation and Management Measure for the Management of Bottom Fishing in the SPRFMO Convention Area, Annexes 6A and 6B). Note that encounter thresholds in SPRFMO have been revised through the years and are intended to be a backstop measure, whereas the primary measures for management of SAI are spatial closures. This should be kept in mind when evaluating the absolute values of the thresholds.

#### *Longlines*

No thresholds have been specifically defined for longlines.

#### *Trawls*

Two types of thresholds were defined in SPRFMO for trawls, one is a weight threshold, whereas the other is a diversity threshold. The first one ([Table 1](#)~~Table 1~~) applies when the weight threshold is exceeded by any one VME indicator taxa (weight threshold), whereas the second one ([Table 2](#)~~Table 2~~) applies if at least three indicator taxa exceed the threshold (biodiversity threshold).

*Table 1 – Weight threshold for triggering VME encounter protocol in any one tow for a single VME indicator taxa from Annex 6A of SPRFMO [CMM 03-2023](#).*

Taxonomic Level	Common Name	Weight Threshold (kg)
<i>Vulnerable taxa</i>		
Phylum Porifera	Sponges	25
Phylum Cnidaria		
Class Anthozoa		
Order Scleractinia	Stony corals	60
Order Antipatharia	Black Corals	5
Informal group Gorgonian Alcyonacea	Seafan octocorals	15
Order Actiniaria	Anemones	35
Order Zoantharia	Hexacorals	10



Table 2 – Weight threshold for triggering VME encounter protocol in any one tow for three or more different VME indicator taxa from Annex 6B of SPRFMO [CMM 03-2023](#).

Taxonomic Level	Common Name	Weight Threshold (kg)
<i>Vulnerable taxa</i>		
Phylum Porifera	Sponges	5
Phylum Cnidaria		
Class Anthozoa		
Order Scleractinia	Stony corals	5
Order Antipatharia	Black corals	1
Order Alcyonacea	True soft corals	1
Informal group Gorgonian Alcyonacea	Seafan octocorals	1
Order Pennatulacea	Sea pens	1
Order Actiniaria	Anemones	5
Order Zoantharia	Hexacorals	1
Class Hydrozoa	Hydrozoans	1
Order Anthoathecatae		
Family Stylasteridae	Hydrocorals	1
Phylum Bryozoa	Bryozoans	1
Phylum Echinodermata		
Class Asteroidea		
Order Brisingida	Armless stars	1
Class Crinoidea	Sea lillies	1

## 1.2. Bases to set the encounter thresholds in CCAMLR and RFMOs

### CCAMLR

Consideration of encounter thresholds by the CCAMLR Scientific Committee were based on the collection of benthic bycatch data from the longline fishery and the content of draft preliminary assessments of the known and anticipated impacts of proposed bottom fishing activities on VMEs by Members in the development of an implementable approach to measuring VME ‘abundance’ in defining a threshold. The advice from the CCAMLR Scientific Committee that the quantity of 10 VME-indicator-units to be used as VME-evidence was derived from the data and experience from fishing in the Ross Sea and the Indian Ocean. The discussions leading to these agreed definitions included benthic ecologists, scientific observers and fishing industry experts, although, as is often the case, the detail of those discussions is not included in the report of the meeting (Keith Reid, [NPFC-2023-SSC BFME04-WP06](#)).

## NAFO

NAFO has been the leading organizations addressing trawling impacts, and the first to develop encounter thresholds for trawling.

In 2008, NAFO's ad hoc Working Group of Fishery Managers and Scientists (WGFMS) included a Proposal for "Operational Procedures in Existing and New Fishing Areas" ([WGFMS report](#), Annex 5) in which an encounter threshold of more than [50] kg of coral [and/or 200kg of sponge] per set was proposed (the proposal included the square brackets around the threshold values). However, little details were provided in the report as to the basis on which this proposal was built on.

In 2009, document [NAFO SCR Doc. 09/6](#) described the scientific basis for determining encounter protocols for sponges in the NAFO regulated area. The analysis was based on cumulative weight distribution of sponges catches, and on a sponge spatial density analysis based on bycatch data.

In 2011, further work in NAFO leveraged on detailed survey data, spatial kernel density model and simulations to refine the trawl threshold (see document [NAFO SCR Doc. 11/75](#)). Their approach was based on spatially-explicit cumulative catch curves, coupled with considerations on gear efficiency and selectivity, incidental mortality and recoverability (which were enabled by the data-rich environment of NAFO), and described in great detail.

## NEAFC

A distinctive feature of NEAFC is that it uses an independent science advisory body, the International Council for the Exploration of the Seas (ICES), rather than a Scientific Committee.

The threshold for evidence of an "encounter" with a VME during longline fishing that was developed by CCAMLR were adopted in NEAFC, but NEAFC simplified the 'VME indicator unit' to simply be the presence of any VME taxa on 10 hooks per 1000 hooks or per 1200 m line, whichever is shorter.

In 2009, NEAFC discussed the harmonization of trawl encounter thresholds between NAFO and NEAFC. The commentary from NEAFC Parties at that time included the suggestion that following NAFO would be "in line with the ICES comment to use more precautionary threshold levels" and also that while "NEAFC levels were not based on science, the NAFO levels had some scientific basis".

The initial adoption of a threshold of 100 kg of live coral and/or 1000 kg of live sponges was followed by subsequent revisions aligning to changes agreed in NAFO (see e.g. [AM 2009 report](#), Annex H).

## NPFC

In 2016, NPFC adopted a 50 kg encounter threshold for corals, irrespective of fishing gear type, and this remained in place until 2023, where a threshold for sponges was added. For either of these adoptions, this review could not retrieve documentation that detailed the basis of proposals or decisions on the encounter threshold.

NPFC continues its efforts to base its approach on quantitative methods to identify gear-specific VME encounter thresholds (see e.g. [NPFC-2023-SSC BFME04-WP04](#)) including both using established methods using fisheries bycatch data (bycatch cumulative curves), and a new method that relates fishery bycatch data to density data from stereo-camera surveys.

## SEAFO

The longline encounter threshold in SEAFO has been adopted following the CCAMLR one, with an extension of the same threshold to pot fishing.

In 2008, SEAFO adopted Conservation Measure 12/08 On Bottom Fishing Activities in the SEAFO Convention Area (see Annex 3 of the [2008 SEAFO Commission report](#)) that included a threshold of 100 kg of coral and/or 1000 kg of sponges. However, the basis of this choice is not fully documented.

The threshold was lowered in 2009, to 60 kg of corals and/or 800 kg of sponges, based on a SEAFO SC concern that the encounter threshold for VMEs set by most RFMOs, including SEAFO, may be too high ([SEAFO SC report 2009](#), paragraph 7). In 2014, SEAFO aligned its trawl threshold in new fishing areas following the NAFO threshold, while the threshold in old fishing areas remained less restrictive, perhaps as a result of observations that there were instances of sub-threshold levels of incidental captures of VME, but the basis for this difference could not be tracked in meeting reports.

The current thresholds in SEAFO are more permissive on the quantity of sponges compared to the NAFO thresholds, irrespective of the area.

## SIOFA

The encounter threshold for longline fishing in SIOFA was adopted from CCAMLR, while the trawl threshold was set to be consistent with the NAFO encounter threshold (excluding sea pens).

Some discussion in SIOFA has revolved around the use of cumulative curve methods (similar to NAFO) to develop SIOFA-area-specific thresholds (see e.g. [WS2022-VME1 report](#)), as the data collected might allow this kind of considerations.

## SPRFMO

SPRFMO has clearly separated the scientific processes used to derive candidate VME thresholds, and the policy and management choices of selecting from those candidate VME thresholds.

The different candidate thresholds proposed in SPRFMO are based on the cumulative distribution of the weight of catch of VME taxa (methodology developed in NAFO), presented as percentiles intervals of the distribution. Further details on the methodology used to derive thresholds for VME encounter protocols for SPRFMO bottom fisheries are provided in paper [SC6-DW09](#).

The choice of a specific percentile among the candidate thresholds proposed by the Scientific Committee reflects the Commission choice of a risk/precaution level to avoid SAIs, accounting for uncertainties in the estimates of spatial protection levels.

### 1.3. Advisory bodies and other RFMOs

#### CECAF

Historically in the CECAF region, there are no well-developed deep-sea fisheries in the ABNJ, but there are some in the EEZs covered by this advisory body. An FAO Technical Workshop on Deepsea Fisheries and Vulnerable Marine Ecosystems of the Eastern Central Atlantic took place in 2016 ([Report](#)). The topic was considered again in 2018, at the meeting of the Scientific Sub-Committee ([Report](#)), but with no apparent conclusions on encounter thresholds and, as far as could be reconstructed from meeting documents, was not considered again since in formulating its advice.

#### GFCM

In GFCM, bottom fishing measures are set out in Resolution [GFCM/43/2019/6](#). All encounters with VME indicator taxa are to be reported, but no management measures are currently applied following these reports. GFCM planned to receive proposals on VME management measures in 2022 (23<sup>rd</sup> session of their Scientific Advisory Committee SAC) but SAC did not formulate proposals, and therefore also the consequential adoption by the GFCM of corresponding measures was delayed.

#### WECAFC

Focuses on fisheries which do not require VME thresholds.

## 4. Discussion

### *Overarching similarities*

There are clear commonalities across the RFMOs, with some organizations taking the lead in developing methodologies and specific encounter thresholds while others adopt these thresholds for their own areas, presumably under the assumption that VME definition and detection using fishing gear could be translated across oceanographic regions, driven by the need to implement measures in absence of information, and perhaps also out of the need to align provisions across neighboring conventions.

CCAMLR has led the work on encounter thresholds for demersal longline fisheries, and their limits have been adopted by NEAFC (with a simplification), SEAFO (including for pot fisheries) and SIOFA.

NAFO has led the work on encounter thresholds for trawls, thanks to their data-rich environment that allowed more data-demanding analyses. NAFO thresholds for encounters of corals and sponges using trawls have been adopted in NEAFC, SIOFA, and SEAFO (with modifications and area-based distinctions).

### *Exceptions and deviations*

There are a few important examples of peculiar approaches that deviate from the pattern described in the overarching similarities paragraphs above.

None of the RFMOs adopted the CCAMLR sub-encounter threshold for longlines. And CCAMLR has not adopted an encounter threshold for trawls given that trawling is banned.

NEAFC established a longline encounter threshold based on the CCAMLR threshold, but applied a simplification that could be potentially more restrictive (presence of a VME indicator taxa on a hook is considered equivalent to at least 1 unit/kg, irrespective of actual quantity).

NPFC established a single threshold for all fishing operations, irrespective of the type of fishing gear used. This threshold is slightly more restrictive on the quantity of corals, but more permissive on the quantity of sponges, compared to the NAFO threshold from which it was derived. Recommendations were made to consider establishing gear-specific thresholds (see [NPFC-2021-SSC BFME02-WP10](#)).

The current threshold in SEAFO is more permissive on the quantity of sponges compared to the NAFO threshold from which it was derived, irrespective of the area of application (fished or new areas within SEAFO).

SPRFMO adopted an encounter threshold for trawls, but not for longlines (which are currently not frequently used in the convention area). Furthermore, SPRFMO adopted both a weight threshold and a biodiversity threshold, reflecting two different aspects of potential VME encounters, which is a unique feature among RFMOs. The SPRFMO encounter weight and biodiversity thresholds are more taxonomically prescriptive than in other RFMOs (e.g. there are specific thresholds for Orders of corals).

### *Availability of documentation detailing the basis and the process of encounter thresholds*

NAFO and SPRFMO have provided detailed documentation on the principles, data and scientific process that led to the development of their encounter thresholds, while the management process that led to the selection of precise threshold levels. NPFC has also documented their process in detail, but many of their documents are not publicly available.

However, it seems there is an exception among RFMOs. Generally, there is poor documentation of the scientific or decision-making process that contributed to setting the specific thresholds in many

RFMOs, and this holds true also for CCAMLR whose encounter thresholds have been consequently adopted by other RFMOs. Therefore, some caution should be exercised when formulating any considerations on this topic.

## 5. Acknowledgments

The SIOFA Secretariat acknowledges the kind help of Dr Keith Reid (Ross Analytics) for the discussions on this topic over the span of the last 2 years, which were extremely useful when composing this report, and for his recent work in NPFC ([NPFC-2023-SSC BFME04-WP06](#)) which was used in drafting this report.

## 6. References

Bell, J. B., Guijarro-Garcia, E., & Kenny, A. (2019). Demersal fishing in areas beyond national jurisdiction: a comparative analysis of regional fisheries management organisations. *Frontiers in Marine Science*, 6, 596.