



Paper for the Ninth Meeting of the Scientific Committee of the
South Pacific Regional Fisheries Management Organisation

Virtually

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Duncan E. J. Currie and Barry Weeber
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**The Precautionary Approach and Ecosystem Approach
in the context of Prevention of Significant Adverse Impacts
on Vulnerable Marine Ecosystems**

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Introduction

This paper describes the role of the precautionary approach and ecosystem approach with respect to the Scientific Committee and the protection of vulnerable marine ecosystems (VMEs), with a view to upcoming issues to be addressed by the 9th Scientific Committee (SC-9). It is to be read in conjunction with Professors Les Watling and Peter Auster’s separately submitted paper *Vulnerable Marine Ecosystems, Communities, and Indicator Species: Confusing Concepts for Conservation of Seamounts*.

*Currie/Weeber:
The Precautionary Approach and Ecosystem Approach and VMEs*

The South Pacific Regional Fisheries Management Organization (SPRFMO) Convention¹ puts the precautionary approach and ecosystem approach at its core:

The objective of this Convention is, through the application of the precautionary approach and an ecosystem approach to fisheries management, to ensure the long-term conservation and sustainable use of fishery resources and, in so doing, to safeguard the marine ecosystems in which these resources occur.

This applies to the Scientific Committee, as a subsidiary body. Under Article 3(1), “[i]n giving effect to the objective of this Convention and carrying out decision-making under this Convention, the Contracting Parties, the Commission and subsidiary bodies established under Article 6 paragraph 2² and Article 9 paragraph 1³ shall: (b) apply the precautionary approach and an ecosystem approach in accordance with paragraph 2.” So there is no doubt that the Scientific Committee shall apply the precautionary approach and an ecosystem approach.

Article 3(2) of the Convention adds specificity:

(a) The precautionary approach as described in the 1995 Agreement and the Code of Conduct shall be applied widely to the conservation and management of fishery resources in order to protect those resources and to preserve the marine ecosystems in which they occur, and in particular the Contracting Parties, the Commission and subsidiary bodies shall:

(i) be more cautious when information is uncertain, unreliable, or inadequate;

(ii) not use the absence of adequate scientific information as a reason for postponing or failing to take conservation and management measures; and

(iii) take account of best international practices regarding the application of the precautionary approach, including Annex II of the 1995 Agreement and the Code of Conduct.

(b) An ecosystem approach shall be applied widely to the conservation and management of fishery resources through an integrated approach under which decisions in relation to the management of fishery resources are considered in the context of the functioning of the wider marine ecosystems in which they occur to ensure the long-term conservation and sustainable use of those resources and in so doing, safeguard those marine ecosystems.

The Scientific Committee is to “provide advice and recommendations to the Commission and its subsidiary bodies on the impact of fishing on the marine ecosystems in the Convention Area including advice and recommendations on the identification and distribution of vulnerable marine ecosystems, the likely impacts of fishing on such vulnerable marine ecosystems and measures to prevent significant adverse impacts on them.”⁴

¹ Convention on the conservation and management of high seas fishery resources in the South Pacific Ocean. Signed 1 February 2010. Entered into force 24 August 2012. At <https://www.sprfmo.int/assets/Basic-Documents/Convention-web-12-Feb-2018.pdf>.

² Article 6(2) The Organisation shall consist of: (a) a Commission; (b) a Scientific Committee; [...]

³ Article 6(1) The Commission may establish other subsidiary bodies, additional to the Scientific Committee [...]

⁴ SPRFMO Convention Article 10(2)(c)

The Commission has a similar task, including to adopt measures to:⁵ “protect the habitats and marine ecosystems in which fishery resources and non-target and associated or dependent species occur from the impacts of fishing, including measures to prevent significant adverse impacts on vulnerable marine ecosystems and precautionary measures where it cannot adequately be determined whether vulnerable marine ecosystems are present or whether fishing would cause significant adverse impacts on vulnerable marine ecosystems.”

Fish Stocks Agreement

The Fish Stocks Agreement⁶ in Article 6 lays down some specific provisions on the application of the precautionary approach, including that:

“1. States shall apply the precautionary approach widely to conservation, management and exploitation of straddling fish stocks and highly migratory fish stocks in order to protect the living marine resources and preserve the marine environment.”

“2. States shall be more cautious when information is uncertain, unreliable or inadequate. The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures.”

“3. In implementing the precautionary approach, States shall:

“(a) improve decision-making for fishery resource conservation and management by obtaining and sharing the best scientific information available and implementing improved techniques for dealing with risk and uncertainty;”

“(c) take into account, inter alia, uncertainties relating to the size and productivity of the stocks, reference points, stock condition in relation to such reference points, levels and distribution of fishing mortality and the impact of fishing activities on non-target and associated or dependent species, as well as existing and predicted oceanic, environmental and socio-economic conditions;”

“(d) develop data collection and research programmes to assess the impact of fishing on non-target and associated or dependent species and their environment, and adopt plans which are necessary to ensure the conservation of such species and to protect habitats of special concern.”

“5. Where the status of target stocks or non-target or associated or dependent species is of concern, States shall subject such stocks and species to enhanced monitoring in order to review their status and the efficacy of conservation and management measures. They shall revise those measures regularly in the light of new information.”

These provisions are given more weight since they are made specifically applicable to SPRFMO.⁷

⁵ SPRFMO Convention Article 20(2)(d)

⁶ 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. Adopted 04/08/1995 and opened for signature on 4 December 1995. Entered into force 11/12/2001. At https://www.un.org/depts/los/convention_agreements/convention_overview_fish_stocks.htm.

⁷ SPRFMO Convention Article 3(2).

The FAO Code of Conduct⁸ specifically states that:

6.5 States and subregional and regional fisheries management organizations should apply a precautionary approach widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment, taking account of the best scientific evidence available. The absence of adequate scientific information should not be used as a reason for postponing or failing to take measures to conserve target species, associated or dependent species and non-target species and their environment.

It goes on to state that:

7.5.2 In implementing the precautionary approach, States should take into account, inter alia, uncertainties relating to the size and productivity of the stocks, reference points, stock condition in relation to such reference points, levels and distribution of fishing mortality and the impact of fishing activities, including discards, on non-target and associated or dependent species, as well as environmental and socio-economic conditions.

While the Code is itself voluntary, the SPRFMO Convention implements the precautionary approach as described in the Code of Conduct.⁹ The bottom fishing CMM 03-2021¹⁰ in its preamble specifically recognises Articles 3(1)(b) and (2) of the Convention on the precautionary approach and an ecosystem approach, and also recognises Articles 20(1)(a) and (d) of the Convention, including measures to prevent significant adverse impacts on VMEs and precautionary measures where it cannot adequately be determined whether VMEs are present or whether fishing would cause significant adverse impacts on VMEs. Even more directly, the objective of the CMM is, “through the application of the precautionary approach and an ecosystem approach to fisheries management, to ensure the long-term conservation and sustainable use of deep sea fishery resources, including target fish stocks as well as nontarget or associated and dependent species, and, in doing so, to safeguard the marine ecosystems in which these resources occur, including inter alia the prevention of significant adverse impacts on vulnerable marine ecosystems.”

The CMM requires that for bottom fishing impact assessments, taking into account any recommendations and advice of the Scientific Committee and in line with the precautionary approach, the Commission shall *inter alia* [consider]¹¹ which, if any, additional precautionary measures are required where it cannot adequately be determined whether VMEs are present or whether fishing could cause significant adverse impacts on VMEs.

Applicability to the Work of the Scientific Committee

The SC-9 Agenda has a number of deep-sea items relating to VMEs:

⁸ Code of Conduct for Responsible Fisheries adopted by the Conference of the Food and Agriculture Organisation of the United Nations at its twenty eighth session on 31 October 1995. At <http://www.fao.org/3/i1900e/i1900e00.htm>.

⁹ SPRFMO Convention Article 3(2).

¹⁰ CMM 03-2021. Conservation and Management Measure for the Management of Bottom Fishing in the SPRFMO Convention Area. At <https://www.sprfmo.int/assets/Fisheries/Conservation-and-Management-Measures/2021-CMMs/CMM-03-2021-Bottom-Fishing-12Mar2021.pdf>.

¹¹ A word appears to be missing in Paragraph 21(d)(ii) and (iii) but the word ‘consider’ appears immediately above in para (i) so it may be inferred that the missing word is ‘consider’.

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- a) Review of inter-sessional activities
 - b) VME Encounters and benthic bycatch (including potential move on distance)
 - c) CMM 03 request regarding encounters with VMEs (including reported VME encounters)
 - d) CMM 03 request regarding ongoing appropriateness
 - e) Bottom Fishery Impact Assessment review (including protection scenarios)
 - f) CMM 03 request regarding species of concern; and
 - g) Advice to the Commission on Deepwater

In all these matters, there is considerable uncertainty in the underlying data being considered.

1. The modelling is primarily reliant on trawled taxa, rather than systematically sampled taxa.
2. There are significant uncertainties as to the catchability of taxa. For example, Pitcher et al in *Progress with investigating uncertainty in the habitat suitability model predictions and VME indicator taxa thresholds underpinning CMM 03-2019 (SC7-DW21_Rev1)* (2019) found that “fish trawls may catch only ~100 g/Ha of coral when benthic cover with corals is about 4%, only ~100 g/Ha of sponges when benthic cover with sponges is about 9%, and only ~100 g/Ha of gorgonians when benthic cover with gorgonians is about 16%.” These findings are directly applicable to the VME encounters, bycatch and encounter protocols since they underline the need to take catchability uncertainties into account when setting VME taxa thresholds.

The precautionary principle states that when providing advice, the Scientific Committee should “be more cautious when information is uncertain, unreliable, or inadequate;” as well as describe and characterize uncertainty associated with advice and disclose boundaries of uncertainty.¹²

The Pitcher *et al* paper found that:

The results of this work provide strong objective evidence that there are considerable and demonstrable uncertainties as to whether CMM 03-2019 is meeting (or will meet) the objective to manage and prevent SAIs on VMEs at local/site scales, population scales, and regional scales. Given SPRFMO’s mandate to apply a precautionary approach in the face of uncertainty around risks and impacts from fishing, we suggest that the results presented herein (as well as concurrent analyses being undertaken by New Zealand) indicate that additional work is urgently required to further explore the uncertainties and assumptions in the analyses and outputs that underpinned CMM 03- 2019 to ensure that it meets its objectives and relevant Members’ international obligations.

¹² NAFO in 1999 adopted a resolution on the implementation of the precautionary approach within NAFO. It had previously noted the Roles and Responsibilities of Scientists and Managers outlined in Annex 3 to the Report of the Working Group on Precautionary Approach (NAFO/FC Doc. 98/2). At <https://www.nafo.int/Portals/0/PDFs/fc/1998/fc-98-002.pdf>. That Annex 3 recognised the need to describe and characterize uncertainties.

Suggested steps were also provided.¹³ In response, the [SC-7 Report](#)¹⁴ reported that SC-7:

“Agreed that work in progress suggests that uncertainty in the predictions of the habitat suitability models for VME taxa may be higher than previously thought and this leads to increased uncertainty in estimates of the proportion of stony coral protected across the modelled region. Specifically, the new results might indicate that CMM 03-2019 may provide less protection than previously thought;

Agreed that presence of areas of high habitat suitability for VME indicator taxa within the current Bottom Trawl Management Areas contributes to the uncertainty in the estimates of the proportion of VME taxa protected under CMM 03-2019;

Agreed that the VME indicator taxa thresholds outlined in CMM 03-2019 are likely to correspond to high coverage and biomass of VME taxa on the seabed and further work is required to establish whether current thresholds are consistent with the objectives of CMM 03-2019 to prevent significant adverse impacts on VMEs, and that it is important to evaluate whether bycatch of VME indicator taxa that correspond to these thresholds would result in significant adverse impacts;

Agreed that given these increased uncertainties, lower encounter thresholds for VME indicator taxa would help to mitigate risks of significant adverse impacts on VMEs until key uncertainties with the performance of the spatial management measures can be resolved; and

Urged all members to continue working collaboratively to reduce key uncertainties as part of the cumulative bottom fishery impact assessment.¹⁵

Spatial Management

In response to a New Zealand paper on spatial management, [SC7-DW17](#), DSCC said that the paper “does not apply a precautionary approach when considering identification, distribution and possible VME impacts.”¹⁶ New Zealand responded that “[t]he FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas (FAO Deep-sea Guidelines) and UNGA resolutions, Convention text and CMM can be interpreted at a bioregional scale and are not necessarily at a site/local scale. The whole debate comes down to one of the scale at which VMEs are defined and the scale at which SAIs on VMEs should be considered. New Zealand noted that sites are mentioned in the FAO Deep-sea Guidelines, but that they interpreted this to be in a wider context.”¹⁷ The SC “Noted that there are a number of unresolved issues, particularly regarding the definitions of SAIs and VMEs, and relevant questions of scale, and that SPRFMO in isolation is currently unable to resolve these

¹³ “In the interim, it may be prudent to adopt a more precautionary approach to managing potential impacts on VMEs—including at local scales (i.e. within Bottom Trawl Management Areas)—which may include, inter alia, lowering the thresholds for some or all VME indicator taxa outlined in CMM 03-2019, and developing a more explicit mechanism within CMM 03-2019 to identify and designate VME habitats at fine scales using all existing and future data. In the future, effectively preventing SAIs on VME could be achieved by requiring fishing vessels to implement cameras on nets/headlines to collect relevant data and prospectively avoid VME habitats in real time. A combination of these approaches (and potentially others) would be more consistent with a precautionary approach and could be used to inform full review of CMM 03-2019 in 2021.”

¹⁴ SPRFMO (2019). 7th Scientific Committee meeting report. 98 p. Wellington, New Zealand 2019. Page 2. At <https://www.sprfmo.int/assets/2019-SC7/Reports/SPRFMO-SC7-Report-2019-V2.pdf>

¹⁵ SC-7 Report para. 145.

¹⁶ SC-7 Report para. 156.

¹⁷ SC-7 Report para. 157.

issues.”¹⁸ The SC “Recommended that the SPRFMO Commission cooperate and coordinate with other RFMO/As and the FAO in refining or developing guidelines on the interpretation of appropriate scale of consideration and assessment of SAIs on VMEs, giving consideration to the FAO Deep-sea Guidelines and relevant UNGA resolutions, and taking into account efforts by RFMO/As to meet their obligations in this regard.”¹⁹

On the uncertainties identified in Pitcher *et al*, “The SC recommended that, in its review of CMM 03-2020 (Bottom fishing), the Commission may wish to consider additional precautionary management measures for areas and taxa at higher risk from bottom trawl fisheries to address uncertainty and provide additional confidence that the CMM will meet its objective. Further, the SC recommended that the Commission provides guidance to the SC on the level of protection, structure, or function of VMEs it requires to assure that Significant Adverse Impacts on VMEs are prevented, or requests advice on this in the multi-annual workplan.”²⁰ The SC agreed that:²¹

“The habitat suitability models have high statistical skill in classifying suitable VME taxa habitat. However, there is great uncertainty in translating model outputs to estimates of abundance of VME taxa on the seafloor, as well as issues of potential model over-prediction leading to over-optimistic estimates of protection for some taxa.”

“Agrees that, although the appropriate scale to assess and manage impacts on VMEs has not been defined in SPRFMO, the smaller scale of the Fishery Management Areas is likely to be a more biologically appropriate scale at which to assess and manage these impacts than larger scales.

Notes that there is currently a lack of a scientific underpinning for defining ecologically appropriate reference points for VME status or protection.

Notes that, in the absence of SPRFMO-agreed reference points for assessment and management of VME status and/or the proportion of suitable habitat protected, it is not possible for the SC to provide a quantitative interpretation of the BFIA results against such reference points.”

Encounter Protocol

On the encounter protocol, a lively debate on the pros and cons of using an “expectedness” criterion based on the habitat suitability index models²² did not result in agreement on the process for evaluating encounters. SC-8 reported that²³ “[c]oncern’s were expressed about the appropriateness of encounters being reviewed for expectedness given the uncertainty demonstrated in the modelling and a need for additional thinking on how to review encounters and benthic bycatch data more generally, pending review of the CMM.”²⁴

¹⁸ SC-7 Report para. 161.

¹⁹ SC-7 Report para. 161.

²⁰ SC-8 Report, page 2.

²¹ SC-8 Report, para 73.

²² SC-8 paras 46-64

²³ SPRFMO (2020). 8th Scientific Committee meeting report. 76 p. Wellington, New Zealand 2020. <https://www.sprfmo.int/assets/2020-SC8/Report/SPRFMO-SC8-Report-2020.pdf>.

²⁴ SC-8 Report page 2.

The Relevance of the Precautionary Approach and Ecosystem Approach to SC-9

Precautionary Approach

The need for precaution has been clear in the face significant uncertainties in the science underpinning the bottom fishing measure. That need for precaution in treating uncertainties will be very much in evidence in addressing issues on the evaluation of VME encounters (the encounter protocol) and the role, if any, of spatial management. This will need to be borne in mind when considering agenda items and papers for SC-9, including the need to be more cautious when information is uncertain, unreliable, or inadequate as well as to adequately describe and characterize uncertainty associated with advice and disclose boundaries of uncertainty.

Ecosystem Approach

In addressing the very complex modelling approaches, addressing the problem of inadequate data and uncertainty in its different manifestations and in addressing the request made to the SC in the [work plan](#)²⁵ as follows, the SC will need to ensure that it has implemented both the precautionary approach and the ecosystem approach:

Develop protection level options for VME indicator taxa at ecologically-meaningful spatial scales, using different approaches. Scenarios should encompass protection levels 70%, 80%, 90%, 95% for the modelled VME indicator taxa using temporally static and temporally dynamic assessment methods. The Scientific Committee should also explicitly account for uncertainties in current model predictions, the relative availability of VME indicator taxa in an area, and information from other RFMOs or guidance documents (if any) when formulating its recommendations to the Commission. Evaluations should be undertaken at spatial scales comparable to the Fisheries Management Areas described in SC8-DW07_rev1.

This request has within it the potential for some to suggest that SPRFMO needs to do less than protect all VMEs. This cannot be the case. Article 10(2)(c) of the Convention specifically requires the SC to provide advice and recommendations on “identification and distribution of vulnerable marine ecosystems, the likely impacts of fishing on such vulnerable marine ecosystems and measures to prevent significant adverse impacts on them” – and here we can emphasised “on them”. This task must be read in conjunction with the task of the Commission under Article 20(2)(d) to adopt measures to “protect the habitats and marine ecosystems in which fishery resources and non-target and associated or dependent species occur from the impacts of fishing, including measures to prevent significant adverse impacts on vulnerable marine ecosystems and precautionary measures where it cannot adequately be determined whether vulnerable marine ecosystems are present or whether fishing would cause significant adverse impacts on vulnerable marine ecosystems.”

In other words, it must “protect” habitats and marine ecosystems from the impacts of fishing, as well as include measures to prevent significant adverse impacts on VMEs and precautionary measures where it cannot adequately be determined whether VMEs are present or whether fishing would cause significant adverse impacts on VMEs.

²⁵ COMM 9 – Report ANNEX 4a 2021 Scientific Committee Multi-Annual Plan (COMM 9 – Doc 06_rev3). At <https://www.sprfmo.int/assets/0-2021-Annual-Meeting/Reports/Annex-4a-2021-Scientific-Committee-Multi-Annual-Plan.pdf>

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These provisions should also be read in conjunction with the United Nations General Assembly (UNGA) resolutions, commencing with UNGA resolution 61/105,²⁶ which called upon regional fisheries management organizations (RFMOs) and States to “to adopt and implement measures, in accordance with the precautionary approach, ecosystem approaches and international law” the following measures:

- (a) To assess, on the basis of the best available scientific information, whether individual bottom fishing activities would have significant adverse impacts on VMEs, 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;
- (b) To identify VMEs 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;
- (c) In respect of areas where VMEs, including seamounts, hydrothermal vents and cold water corals, 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 VMEs;
- (d) To require members of the RFMOs or arrangements to require vessels flying their flag to cease bottom fishing activities in areas where, in the course of fishing operations, VMEs are encountered, and to report the encounter so that appropriate measures can be adopted in respect of the relevant site;²⁷

The 2020 UNGA fisheries resolution [75/89](#)²⁸ places modelling (both benthic ecosystem modelling and predictive modelling) in context:

200. Recognizes that different types of marine scientific research, such as seabed mapping, mapping of vulnerable marine ecosystems based on information from the fishing fleet, on-site camera observations from remote vehicles, benthic ecosystem modelling, comparative benthic studies and predictive modelling have resulted in the identification of areas where vulnerable marine ecosystems are known or are likely to occur and in the adoption of conservation and management measures to prevent significant adverse impacts on such ecosystems, including the closure of areas to bottom fishing in accordance with paragraph 119 (b) of resolution 64/72.

In other words, the role of modelling is to identify areas where VMEs are known to be or likely to occur, as well as to assist in adopting measures to prevent SAIs on VMEs, including closure of areas to bottom fishing.

²⁶A/RES/61/105 “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. 6 March 2007. At <https://undocs.org/A/RES/61/105>.

²⁷ UNGA resolution 61/105 para. 83.

²⁸ UNGA resolution 75/78 (2020). A/RES/75/89. -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. 18 December 2020. At <https://undocs.org/en/A/RES/75/89>

It is not the role of modelling to calculate, for example, how many VMEs can be destroyed to facilitate fishing: this is stated to avoid any impression that the task of the SC is to give the green light to fish on areas that VMEs are known or likely to occur. The UNGA resolutions make this clear, as does the SPRFMO Convention, but in addition, the precautionary approach is clear that the uncertainties need to be taken into account and plans need to be adopted which are necessary to ensure the conservation of species and to protect habitats of special concern.

But beyond this concern, the term itself “protection level options for VME indicator taxa” carries with it an essential flaw in this approach: protection of taxa does not equate with protection of ecosystems. Even if – and this appears highly unlikely – the accounting for uncertainties, and availability and reliability of indicator taxa are considered acceptable from the point of view of the precautionary approach, the approach 1) would not prevent SAIs on VMEs according to UNGA resolution 61/105 and (2) would not allow for VMEs to be destroyed by bottom trawling even though they are known to occur or likely to occur under paragraph (c).

In essence, the task, at best, equates protection of taxa with protection of VMEs. In its reliance on a model, this is even starker: it is based on groups of related taxa at the level of Class, Order or Family made up of many species (e.g. true soft corals and black corals), and only four stony (Scleractinian) corals are considered at the individual species level. So even on the narrow basis of protecting taxa it fails because it only protects some taxa. Cryptic and rare species which the model does not account for or address are at risk of destruction or even extinction. But the problem is broader: protection of some taxa, as opposed to VMEs properly considered, is not consistent with the ecosystem approach.

The importance of the ecosystem approach was underlined in Professors Watling and Auster’s paper, separately submitted,²⁹ *Vulnerable Marine Ecosystems, Communities, and Indicator Species: Confusing Concepts for Conservation of Seamounts*. The professors argue that VME indicator species are too often conflated to indicate whether a VMEcosystem is present or not, often ignoring the connections of such species to the communities of organisms in which they reside. Focusing on single easily detected species, having been captured in fishing gear as bycatch – as is the case with the modelling undertaken here – does not, they say, equate to the extent of the interactions defining the ecosystem or the connectivity of the vulnerable seafloor community.

The whole community can be vulnerable where only part of a seamount is protected, thus not necessarily protecting the integrity of the seamount communities. This leads to error: Defining significant adverse impacts to indicator species alone merely defines a set of minimum bounds on the effects of human actions on VMEcosystems – it does not necessarily protect the VME itself. Watling and Auster note that on seamounts VME indicator species can be distributed widely, in dense clusters or sparsely. A dense cluster of scleractinian corals or sponges, for example, is not an ecosystem, but is a community, likely one of many that make up the ecosystem. Small species are part of the web of interactions and flow of materials/energy on the seamount. Thus spatial management approaches need to be considered that better address ecologically relevant space and time scales. They emphasise that the concept of a VME is linked to the ecosystem in which populations, communities and

²⁹ Les Watling and Peter Auster. *Vulnerable Marine Ecosystems, Communities, and Indicator Species: Confusing Concepts for Conservation of Seamounts*. 2021. 8 *Frontiers in Marine Science*. DOI=10.3389/fmars.2021.622586

At <https://www.frontiersin.org/articles/10.3389/fmars.2021.622586/full>

habitats are nested and interact at a functional level, whereas too often the concept of indicator species has been conflated with the ecosystem itself.

Conversely, the sparse distribution (occasional presence) of indicator species may be wrongly interpreted to mean that the species is not within a VME – emphasising “ecosystem”. Relevant to the habitat suitability index (HSI) model, they cite the example of studies purportedly showing *Solenosmilia* VMEs, which in fact show *Solenosmilia* communities, which are only a part of the larger ecosystem. Whole seamounts need to be treated as VMEcosystems or as part of a larger ecosystem.³⁰

The Status and Role of the Presence-Only Habitat Suitability Model

A recent paper, Stephenson et al (2021),³¹ [*Presence-only habitat suitability models for vulnerable marine ecosystem indicator taxa in the South Pacific have reached their predictive limit*](#), has summarised the limitations of the presence-only habitat suitability model underpinning CMM 03-2021. The paper found that “the models are likely to overestimate the extent of suitable habitat. Thus, if the management objective is to keep fishing grounds open or largely open with the proviso that some level of suitable habitat for VMEs occur in closed areas, then there is a high risk that the amount of apparently protected VME area is less than predicted by presence-only models”.³² Therefore the authors “suggest that these [presence-only] types of models should be used judiciously (with due appreciation of likely uncertainties) in environmental management and only used when no better alternatives exist.”³³ The authors found that “[t]his finding means that we are highly unlikely to be able to provide environmental managers with more accurate presence-only habitat suitability models for VME indicator taxa, and that considering the current issues and limitations of such models we suggest a fundamentally different modelling approach is adopted in the future.”³⁴ The authors found that “the limits of presence-only modelling for these VME indicator taxa in the SPRFMO area, with the currently available environmental predictor variables, have been reached... Meanwhile, in the absence of new data collection, the updated presence-only habitat suitability models reported here represent the best available evidence for the potential presence of VMEs, and are a useful platform for the identification of areas where further data collection or model validation would be of use for spatial management”.

This is a key finding and the Scientific Committee should take careful note of it. However, their conclusion is at variance with the precautionary approach. That is, the finding that “in the absence of new data collection, the updated presence-only habitat suitability models reported here represent the best available evidence for the potential presence of VMEs,” does

³⁰ Finally, Watling and Auster recommend:

- (1) using indicator species to identify individual seamount VMCommunities, recognizing that protecting part of a seamount identified only by the presence and distribution of an indicator species is not enough;
- (2) using a seamount classification system to delimit groups of similar seamounts to focus conservation management efforts and to distinguish between rare and abundant seamount types;
- (3) examining the similarities among adjacent groups of seamounts to see whether they should be considered to be part of a larger ecosystem group; and
- (4) evaluating the spatial extent of these larger units so that significant adverse impacts measures can be used to determine whether to allow some bottom fishing within a seamount ecosystem group.

³¹ Fabrice Stephenson, Ashley A Rowden, Owen F Anderson, C Roland Pitcher, Matt H Pinkerton, Grady Petersen, David A Bowden, *Presence-only habitat suitability models for vulnerable marine ecosystem indicator taxa in the South Pacific have reached their predictive limit*, ICES Journal of Marine Science, 2021;, fsab162, <https://doi.org/10.1093/icesjms/fsab162>

³² Stephenson *et. al.* (2021) page 10.

³³ *Ibid.*

³⁴ Stephenson *et. al.* (2021) page 11.

not mean they are fit for purpose. Far less does it mean the model can be used to “Develop protection level options for VME indicator taxa at ecologically-meaningful spatial scales, using different approaches” using protection levels 70%, 80%, 90%, 95% for the modelled VME indicator taxa.

The model is simply too uncertain to base such a management approach on. Instead, SC-9 should advise the Commission that there is high risk that the amount of apparent VME areas closed to fishing is less than that predicted by presence-only models, and therefore the mandated UNGA resolution approach of closing areas where VMEs are known to occur or likely to occur should be followed.

Other Implications for the Work of SC-9

The Watling and Auster paper has wide-ranging ramifications for the work of this Scientific Committee, which is legally obligated to apply the ecosystem approach. For the encounter protocol, firstly, the assessment of encounters aim at preventing “significant adverse impacts”, following UNGA resolution 64/72³⁵ para. 119(d):

Establish and implement appropriate protocols for the implementation of paragraph 83 (d) of its resolution 61/105, including definitions of what constitutes evidence of an encounter with a vulnerable marine ecosystem, in particular threshold levels and indicator species, based on the best available scientific information and consistent with the Guidelines, and taking into account any other conservation and management measures to prevent significant adverse impacts on vulnerable marine ecosystems, including those based on the results of assessments carried out pursuant to paragraph 83 (a) of its resolution 61/105 and paragraph 119 (a) of the present resolution;

But it must also prevent significant adverse impacts “on vulnerable marine ecosystems”. UNGA resolution 71/123 (2016)³⁶ called on States and RFMOs to “To use, as applicable, the full set of criteria in the Guidelines to identify where vulnerable marine ecosystems occur or are likely to occur as well as for assessing significant adverse impacts.” The FAO Deep-Sea Guidelines³⁷ in paragraph 42 lists characteristics to be used as criteria in the identification of VMEs – which the emphasis on identifying vulnerability (“A marine ecosystem should be classified as vulnerable based on the characteristics that it possesses.”). They are uniqueness or rarity, fragility, life-history traits of component species that make recovery difficult, and structural complexity.

If, as seems be the case, the scientists behind the recommended encounter protocol have instead used only one criteria, structural complexity, due to data limitations, this firstly raises the need to explicitly identify this limitation, which breaches UNGA resolution 71/123, but also exemplifies the failure to implement the ecosystem approach, which would also imply use of the full set of criteria.

³⁵ UNGA resolution 64/72. A/RES/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 19 March 2010. At <https://undocs.org/A/RES/64/72>.

³⁶ A/RES/71/123. 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 13 February 2017. At <https://undocs.org/A/RES/71/123>.

³⁷ FAO. International Guidelines for the Management of Deep-sea Fisheries in the High Seas. 2009. At <http://www.fao.org/documents/card/en/c/b02fc35e-a0c4-545a-86fb-4fc340e13b52>.

Further, different types of marine scientific research, including seabed mapping, mapping of VMEs based on information from the fishing fleet, on-site camera or video observations from remote vehicles, benthic ecosystem modelling, comparative benthic studies and predictive modelling can all result in identification of areas where VMEs are known or are likely to occur.³⁸ But the UNGA resolutions, and the precautionary and ecosystem approaches, show the appropriate response to such research is not to give a green light to fish where VMEs are known or likely to occur, but the opposite: to protect those areas.

Conclusion

The application of the precautionary approach and the ecosystem approach by the Scientific Committee, as mandated by the Convention, together with the UNGA resolutions means that SC-9 needs to:

1. Apply the ecosystem and precautionary approaches in its advice to safeguard marine ecosystems;
2. Recognise and describe the uncertainties inherent in the scientific approaches used, including catchability of different VME taxa;
3. Advise the Commission that there is high risk that the amount of VME areas closed to fishing is less than predicted by the models, and therefore the mandated UNGA resolution approach of closing areas where VMEs are known to occur or likely to occur should be followed;
4. Advise that it is not possible to develop reliable protection level options for VME indicator taxa at ecologically-meaningful spatial scales, using different approaches to encompass protection levels 70%, 80%, 90%, 95% due to the inadequate data and identified uncertainties in the models;
5. Advise that where VMEs are known to occur or likely to occur, the Commission should close such areas to bottom fishing and ensure that bottom fishing does not proceed, and advise that to date, reliable conservation and management measures can not be established to prevent significant adverse impacts on VMEs;
6. Ensure in its advice that all species, including rare and cryptic species, will be protected; and
7. Ensure in its advice that the Commission identifies and protects vulnerable marine ecosystems properly so called, rather than just single taxa.

³⁸ UNGA resolution 75/89 para. 200.